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Terra Preta, the Forgotten Treasure: politics, science and international relations in the history of the Amazon

(Terra Preta, o Tesouro Esquecido:

política, ciência e as relações internacionais na história da Amazônia)

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Resumo

Em um mundo no qual o meio ambiente ganha cada vez mais espaço na agenda política nacional e internacional, a Amazônia se destaca. Conhecida ao redor do mundo por sua riqueza, a floresta sul-americana é alvo de diferentes visões, muitas vezes contraditórias, e mexe com a imaginação de todos. É nesta região que se encontra a *terra preta de índio*, horizonte de solo fértil com elevados teores de carbono de origem antrópica, que gera grande interesse da comunidade científica. Estudos sobre este solo, e sobre suas características tão singulares, têm gerado discussões cruciais acerca do passado, do presente e do futuro de toda a região amazônica.

Apesar da suas características particulares, a importância da terra preta de índio – e a história de uma Amazônia mais produtiva e populosa - ficou adormecida desde o seu descobrimento, por volta de 1880, até 1980, quando é possível identificar o início do aumento no número de trabalhos sobre estes horizontes de solo. Estes cem anos entre o descobrimento da terra preta de índio e o início do aumento do interesse em torno dela foram palco de mudanças estruturais tanto no plano nacional, com a ditadura militar e uma mudança no lugar ocupado pela Amazônia na política interna, quanto no plano das relações internacionais, mudanças essas que redesenharam o papel do meio ambiente nas agendas políticas e científicas e o papel do Brasil no contexto global.

O objetivo deste trabalho é analisar o papel da terra preta de índio no cenário atual de desenvolvimento da Amazônia. Para isso será preciso voltar no tempo, tanto no âmbito interno quanto no externo, ao longo da segunda metade do século para analisar a sua trajetória. Será igualmente necessário analisar as questões atuais que envolvem a Amazônia – desenvolvimento sustentável e mudanças climáticas - e como de fato elas ainda reproduzem alguns dos problemas que marcaram a história da floresta, tais como a relativa ausência da terra preta de índio como tema relevante para a Amazônia.

Abstract

In a world in which the environment gains each time more space in the national and international political agenda, the Amazon stands out. Known around the world for its richness, the South-American forest is the target of different visions, often contradictory ones, and it plays with everyone's imagination. This is where the terra preta de índio – Amazonian Dark Earths - are found, a fertile soil horizon with high concentrations of carbon with anthropic origins, which has generated great interest from the scientific community. Studies on these soils and their so singular characteristics have triggered crucial discussions on the past, present and the future of the entire Amazon region.

Despite its singular characteristics, the importance of Amazonian Dark Earths – and a history of a more productive and populated Amazon – was hidden since its discovery around 1880 until 1980, when it is possible to identify the beginning of an increase in the number of research on these soil horizons. These hundred years between the first records and the beginning of the increase in the interest around these soils witnessed structural changes both in the national arena, with the military dictatorship and a change in the place of the Amazon within internal affairs, and in the international arena with changes that reshaped the role of the environment in the political and scientific agendas and the role of Brazil in the global context.

The aim of this thesis is to analyse the role of terra preta de índio in the current development scenario in the Amazon. To do so it is necessary to go back in time, both in the national and international sphere, through the second half of the last century to analyse its trajectory. It will be equally important to analyse the current issues regarding the Amazon – sustainable development and climate change – and how they still reproduce some of the problems that marked the history of the forest, such as the absence of Amazonian dark earths as a relevant theme to the Amazon.

Terra Preta e Joana –amor à segunda vista

Joana Bezerra

O tema "terra preta de índio" chegou aos meus ouvidos por meio de um professor na Inglaterra, que achou que o fato de eu ser brasileira era suficiente para que eu me interessasse sobre o tema. Extremamente feliz por tem encontrado alguém que obviamente iria escrever um artigo sobre isso, ele me passou todas as referências que tinha sobre o assunto. Confusa com o rumo que aquela conversa tinha tomado, eu saí da sala e fui assistir um documentário sobre terra preta de índio da BBC de 2002 – *O Segredo de El Dorado* - que ele me emprestou. "Assista até o final" – disse ele com um sorriso no rosto. Eu fui em direção à biblioteca tentando encontrar uma maneira de sair daquela situação. Assisti o vídeo e confesso que tive vontade de parar no meio, mas lembrei do comentário do professor. O vídeo começou a ficar interessante e eu comecei a ficar intrigada. As revelações sobre esse solo, a qualidade única dele, e suas implicações me fizeram aceitar o desafio de escrever sobre um solo presente na Amazônia. O título do trabalho era '*How has historical reseach changed our understanding of the Amazonian Environment?*'. Foi aqui que começou o meu trajeto até o Nepam.

Desde então foram leituras, apresentações de trabalhos e incursões a sítios arqueológicos de terra preta de índio. Este sítio-escola ocorreu em julho-agosto de 2007. Eu fui convidada por William Woods, professor da Universidade do Kansas com quem troquei emails quando estava escrevendo o artigo sobre terra preta de índio na Inglaterra. Ao trocar idéias com ele e com o professor que instigou o meu interesse sobre o tema, cheguei a uma pergunta que seria respondida no meu trabalho de conclusão do curso de especialização em gestão ambiental na UFRJ: "Por que a terra preta – e a história de uma populosa e produtiva Amazônia – ficou invisível entre 1900 e 1980?" Por ser uma questão complexa, eu não fiz o trabalho de conclusão sobre este tema.

Neste ponto surgiu a possibilidade de escrever um projeto para o doutorado. Tendo a pergunta de cima como base, uma das questões que eu me perguntava era se a questão política internacional não teria influenciado – ou até mesmo determinado – a trajetória da terra preta de índio.

A terra preta faz parte de um contexto maior e muito complexo, o contexto da Amazônia. Esta região, tão presente ultimamente, especialmente nas discussões internacionais, apresenta um valor estratégico não apenas para o Brasil mas também para os países amazônicos. Ela também é alvo de grandes debates internacionais, tanto sobre direitos de propriedade, soberania e desmatamento. A emergência da questão ambiental no cenário internacional e aumento do número de organizações internacionais que lidam com isso ajudaram a colocar a Amazônia no centro deste debate. Portanto, é plausível dizer que houve sim uma influência internacional na trajetória da Amazônia. Se esse é o caso, por que não na trajetória da terra preta? Vendo a terra preta como uma metáfora para Amazônia – uma vez que também apresenta qualidades únicas e um valor estratégico, podemos supor que sim, que o quadro político internacional influenciou a trajetória deste solo. E assim surgiu o tema para o projeto de seleção para o doutorado.

Terra Preta and Joana – love at second sight

I became aware of *terra preta de índio* through a professor in England, who thought that the fact that I was Brazilian was enough to make me interested in the soil. He was so happy to have found someone that would surely write a paper on this that he gave me all the references he had on the matter. Confused with the turn that our conversation was taking, I left his office and went to the library to watch a 2002 BBC video on terra preta de índio – *The Secret of El Dorado* - that he lended to me. "Watch it until the end" – he said with a smile on his face. As I walked towards the library I was trying to find a way out of that situation. I watched the video and I admit that I wanted to stop it half way through – but I remembered my professor's words. The video became interesting and I became intrigued. The revelations o this soil, its unique qualities and its implications made me accept the challenge of writing a paper on an Amazonian soil. The paper was entitled 'How has historical research changed our understanding o the Amazonian environment?'. This was the beggining of my path towards Nepam.

Since then there have been readings, presentations and incursions in archaeological terra preta de índio sites. This excavation took place in July-August 2007. I was invited by William Woods, a professor from Kansas University with whom I exchanged emails while I was writing my paper in England. The exchange of ideas with him and with my professor back in England led to the question that would be answered in the final paper for my environmental course at the Federal University of Rio de Janeiro – "Why was terra preta – and the history of a more populated and productive Amazon – invisible between 1900 and 1980?" As it was a complex question I did not pursue this as my final paper for that course.

At this point the opportunity to apply for the PhD arose. Having that question as the foundation, I wondered if the international political agenda did not influence - or even determined – the trajectory of terra preta de índio.

Terra preta is part of a bigger and more complex context, the context of Amazonia. This region, so much talked about lately, specially from the emergence of an international environmental agenda onwards, presents a strategic value not only for Brazil but also for all the Amazonian countries. The forest is also the target of great international debate on property rights, sovereignty and deforestation. The emergence of the environmental issue in the international scenario increased the number of international organisations that work with the environment and help put the Amazon in the centre of the debate. Therefore it is possible that there was an international influence in the trajectory of the Amazon. If that was the case, why did this not influence the trajectory of terra preta? Seeing terra preta de índio as a metaphor for the Amazon - which also has unique qualities and a strategic value - we can assume that the international political framework did influence the trajectory of this soil. This is how the idea for the PhD project came about.

Table of Contents

List of Abbreviations

ABRACOS – Anglo-Brazilian Climate Observational Study – Estudo Anglo-Brasileiro de Observação do Clima

BASA – Bank of Amazonia – Banco da Amazônia

CCX – Chicago Climate Exchange – Bolsa de Clima de Chicago

CER – Certified Emission Reduction – Certificado de Redução de Emissões

CONABIO – Biodiversity National Commission - Comissão Nacional de Biodiversidade

CONAFLOR – National Forestry Commission - Comissão Nacional de Florestas

COP – Conference of the Parties – Conferência das Partes

CPI – Parliamentary Commission of Inquiry – Comissão Parlamentar de Inquérito

EMATER – Rural Extension and Technical Assistance Enterprise - Empresa de Assistência Técnica e Extensão Rural

EMBRAPA – Brazilian Agricultural Research Corporation – Empresa Brasiliera de Pesquisa Agropecuária

FAO – Food and Agriculture Organisation of the United Nations – Organização das Nações Unidas para Agricultura e Alimentação

FETRAGRI – Agricultural Workers Federation - Federação dos Trabalhadores na Agricultura

FNO – Constitutional Fund for the North Region – Fundo Constitucional para o Norte

FUNAG – Alexandre Gusmão Foundation – Fundação Alexandre Gusmão

FUNAI – National Indigenous Foundation - Fundação Nacional do Índio

G7 – Group of 7 – Grupo dos sete países industrializados (Japão, Estados Unidos, França, Alemanha, Reino Unido, Itália, Canada)

GDP – Gross Domestic Product – Produto Interno Bruto

GEF – Global Environmental Facility – Fundo Global para o Meio Ambiente

GHG – Greenhouse Gases – Gases de Efeito Estufa

IAN – Agronomic Institute of the North - Instituto Agronômico do Norte

IBAMA – Brazilian Institute for the Environment and Renewable Natural Resources - Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis

IBDF – Brazilian Institue for Forest Development - Instituto Brasileiro de Desenvolvimento Florestal

IBGE – Brazilian Institute of Geography and Statistics - Instituto Brasileiro de Geografia e Estatística

ICMbio – Chico Mendes Institute for Biodiversity Conservation - Instituto Chico Mendes de Conservação da Biodiversidade

ICMS – Imposto sobre Circulação de Mercadorias e Serviços – Tax on Goods and Services

IISD – International Institute for Sustainable Development

IIHA – International Institute of the Amazonian Hiléia - Instituto Internacional da Hiléia Amazônica

INCRA – National Institute of Colonisation and Agrarian Reform - Instituto National de Colonização e Reforma Agrária

INPA – National Institue for Amazonia Research - Instituto Nacional de Pesquisas da Amazônia

INPE – National Institute of Spacial Research - Instituto Nacional de Pesquisas Espaciais

IPCC – Intergovernmental Panel for Climate Change – Painel Intergovernmental para Mundaças Climáticas

IPEA – Research Institute of Applied Economics - Instituto de Pesquisa Econômica Aplicada

IPEAN – Agricultural Research and Experiment Institute of the North - Instituto de Pesquisas e Experimentação Agropecuárias do Norte

IPHAN - National Historic and Artistic Heritage Institute - Instituto do Patrimônio Histórico e Artístico Nacional

IPRI – International Relations Research Institute - Instituto de Pesquisa em Relações Internacionais

ITTO – The International Tropical Timber Organisation – Organização Internacional de Madeira Tropical

IUCN – International Union for Conservation of Nature – União Internacional para a Conservação da Natureza

LBA – The Large Scale Biosphere-Atmosphere Programme in Amazonia - Programa de Grande Escala da Biosfera-Atmosfera na Amazônia

MAB – Man and the Biosphere – o Homem e a Biosfera

MEA – Millenium Ecosystem Assessment

MPEG – Emílio Goeldi Pará Museum - Museu Paraense Emílio Goeldi

NEPAM – Environmental Studies Group – Núcleo de Estudos e Pesquisas Ambientais

NGO – Non-Governmental Organisation – Organização Não Governamental

PAB – Programme Avança Brasil – Avança Brasil

PAC – Programme of Accelerated Growth – Programe de Aceleração do Crescimento

PAS – Sustainable Amazon Plan – Plano Amazônia Sustentável

PIN – National Integration Programme - Programa de Integração Nacional

PND – National Development Plan – Plano de Desenvolvimento Nacional

PNMC – National Climate Change Plan - Plano Nacional sobre Mudança do Clima

PNRA – National Programme for Agriarian Reform - Programa National de Reforma Agrária

PPA – Multi-Annual Plans – Planos Plurianuais

PPCDAM – Action Plan for the Prevention and Control of the Deforestation in the Legal Amazon - Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal

PPG-7 – Pilot Programme for the Protection of Tropical Forests in Brazil - Programa Piloto para a Proteção das Florestas Tropicais do Brasil

PROBOR – Programme to Stimulate Natural Rubber Production – Programa de Incentivo à Produção de Borracha Natural

PROTERRA – Programme of Land Redistribution and Incentive to Agribussness in the North and Northeast - Programa de Redistribuição de Terras e de Estímulo a Agroinsdústria do Norte e do Nordeste

RADAM – Brazilian Radar Project - Projeto Radar Brasileiro

REDD – Reduction Emissions from Deforestation and Degradation – Redução de Emissões por Desmatamento e Degradação

RPPN – Private Reserve of Natural Heritage - Reserva Particular do Patrimônio Natural

SBPC – Brazilian Society for the Progress of Science - Sociedade Brasileira para o Progresso da Ciência

SBF – Superintendence of Biodiversity and Forests - Superintendência de Biodiversidade e Florestas

SBSTA – Subsidiary Body for Scientific and Technological Advice – Órgão Subsidiário de Assessoramento Científico e Tecnológico

SEMA – Environment Secretariat - Secretaria do Meio Ambiente

SHIFT – Studies of the Human Impacto n Forests and Floodplains in the Tropics – Estudos dos Impactos Humanos nas Florestas e Áreas Inundadas nos Trópicos

SISNAMA – National Environmental System - Sistema Nacional do Meio Ambiente

SIVAM – Amazon Surveillance System - Sistema de Vigilância da Amazônia

SNUC – National Conservation Units System - Sistema Nacional de Unidades de Conservação

SOM – Soil Organic Matter – Matéria Orgânica do Solo

SPVEA – Superintendence of the Economic Valorisation of the Amazon - Superintendência da Valorização Econômica da Amazônia

SUDAM – Superintendence of the Amazonian Development - Superintendência do Desenvolvimento da Amazônia

SUDHEVEA – Superintendence of the Rubber – Superintendência da borracha

SUFRAMA – Superindentence of the Manaus Superintendência da Zona Franca de Manaus

TCA – Treaty of Amazonian Cooperation - Tratado de Cooperação da Amazônia

TPI – Indigenous Terra Preta – Terra Preta do Índio

UN – United Nations – Nações Unidas

UNCCD – United Nations Convention to Combat Desertification – Convenção das Nações Unidas de Combate à Desertificação

UNDP – United Nations Development Programme – Programa de Desenvolvimento das Nações Unidas.

UNEP – United Nations Environment Programme – Programa das Nações Unidas para o Meio Ambiente

UNESCO – United Nations Educational, Scientific and Cultural Organisation - Organização das Nações Unidas para a Educação, Ciência e Cultura

UNFCCC – United Nations Framework Convention on Climate Change – Convenção-Quadro das Nações Unidas sobre Mudanças Climáticas

WWF – World Wide Fund for Nature –

ZFM – Manaus Free Trade Zone - Zona Franca de Manaus

Table of Figures

List of Photographs

Introdução

A condição histórica do homem é a de escassez (OPHLUS, 1977). No entanto, o aparentemente inesgotável fluxo de recursos dos últimos séculos obscureceu esta condição. A realidade atual, no entanto, traz para o centro do debate internacional este fato. Vivemos uma crise cuja existência não está mais em questão. O ser humano e a natureza sempre estiveram relacionados. Tanto é assim que a história do homem é, na verdade, a história da sua relação com o meio ambiente. Entretanto, o aumento do impacto da ação humana na natureza alterou o significado do meio ambiente. Este deixou de ser um fator estável e entrou na agenda política tanto no nível nacional quanto no internacional (HURRELL & KINGSBURY, 1992). Presenciamos, no momento atual, uma verdadeira reavaliação da natureza no cenário global. Neste contexto, a Amazônia, um dos três grandes estoques de natureza do mundo (BECKER, 2007), ganha um novo espaço tanto nacional como internacionalmente.

A riqueza da Amazônia é imensa, em todos os aspectos possíveis: cultural, histórico, social, e natural. Não por acaso, a floresta amazônica tem sido foco de grandes debates internacionais. A sua presença no debate de políticas internacionais é cada vez mais importante e decisiva. Embora não seja o "inferno verde" nem o "pulmão do mundo", a Amazônia tem um papel chave na estabilidade do clima (MALHI, 2008). Apesar de defendidas por setores da sociedade e até mesmo por instituições, cabe ressaltar que todas essas representações escondem interesses políticos e econômicos nem sempre visíveis na superfície dos discursos correntes.

A Amazônia é um lugar singular. Esta floresta se estende por oito países e pela Guiana Francesa e representa 1/20 da superfície da terra (VIANA, 2001). A floresta tropical da América do Sul é o habitat de 1,8 milhão de espécies diferentes de plantas, animais e microorganismos (BECKER & STENNER, 2008). A Amazônia engloba um terço da floresta tropical do planeta (FALEIRO, 2001). Além disso, é o lugar mais biodiverso do mundo (EWERS & LAWRENCE, 2006: 2003; GARDA, DA SILVA, BAIÃO, 2010; Da SILVA, RYLANDS, FONSECA, 2005; HOORN et al 2010), onde estão localizadas as

bacias hidrográficas mais importantes da terra, com 17% da água doce do mundo (BECKER, 2004). Apesar de a Amazônia ser única, isto não significa que ela é homogênia. Esta diversidade transparece até mesmo nas diferentes delimitações da floresta brasileira. A definição política da Amazônia brasileira ultrapassa as fronteiras dos limites biofísicos do bioma. Adiciona-se a isso o fato de dentro da Amazônia existirem diferentes realidades, diferentes características que transformam a floresta em várias, em outras palavras, existem várias Amazônias dentro das delimitações da Amazônia.

A percepção dessa riqueza da floresta, no entanto, não se estendia aos solos da região. Os solos úmidos das zonas trópicas são geralmente descritos como inférteis, o que representava um obstáculo ao uso sustentável do solo (GLASER, 2001). Tanto a terra firme quanto a várzea apresentam pontos positivos e negativos em relação à produção agrícola. A terra firme, de maneira geral, é composta por solos ácidos com baixa concentração de nutrientes e altos níveis de alumínio. Mesmo com estas características, a terra firme pode ser utilizada para a agricultura, mas há o risco da falta de chuva. Na várzea[1] os solos sofrem outras influências e, diferente da terra firme, eles são férteis[2]. Entretanto, devido à incerteza da época de cheia, é um risco semear nessas terras. Além das inundações periódicas, há também o risco de inundações extremas (DENEVAN, 1996; ADAMS, MURRIETA, SANCHES, 2005). Portanto, em relação à agricultura, paira uma incerteza. A várzea teria sido responsável pelos maiores assentamentos antes da chegada dos europeus. Mesmo assim, muitos autores[3] acreditam que a incerteza das cheias da várzea fez com que as sociedades pré-cabralianas não dependessem exclusivamente delas, utilizando também a terra firme. No entanto, a incerteza das chuvas também gera insegurança sobre a agricultura na terra firme. Os solos da Amazônia foram, por muito tempo, entendidos como desgastados e pobres em nutrientes, e constituíram o argumento mais forte contra a

[1] Várzea é uma área que apresenta solos que se originam da decomposição de sedimentos levados pelo corpos d'água ou pelas encostas devido à erosão causada pela chuva. Os solos da várzea se desenvolvem em sedimentos na época de cheia. Quando o período da cheia acaba e o volume dos rios diminui, os sedimentos ricos em nutrientes ficam no solo. Isso, junto com o alto nível de água sbterrânea e as inundações regulares cria um processo de formação de solo (TEIXEIRA et al, 2007).

[2] Poucas áreas da várzea apresentam limitações a produção agrícola e de maneira geral são áreas às margens de lagos, ou seja, áreas que recebem um carga menor de sedimentos ricos em nutrientes (TEIXEIRA et al, 2007).

[3] Como por exemplo Denevan 1996 e Carneiro 1995.

possibilidade de existência de agricultura sustentável e, conseqüentemente, de uma civilização na floresta[4].

Este era o cenário da região amazônica: floresta riquíssima e solo infértil. Era, não é mais. A razão desta mudança é uma terra escura escondida na vastidão da Amazônia. Sua presença foi identificada já no século XIX por Hartt em 1874 e 1885 e por Smith em 1879 (WOODS & MCCANN, 2009). Entretanto, foi apenas a partir de duas a três décadas atrás que ela ganhou efetivamente a atenção da comunidade científica nacional e internacional. *Terra preta de Índio*[5] é o nome deste solo, que mudou profundamente o nosso entendimento do meio ambiente da Amazônia[6].

Os sítios de terra preta de índio são encontrados principalmente em ferrasolos e acrisolos, mas também são encontrados em outras classes (SOMBROEK, 1966; SMITH, 1980; KAMPF & KERN, 2005; GLASER & WOODS, 2004). O solo em questão tem altas concentrações de cálcio, potássio, fósforo e nitrogênio (GLASER et al, 2001). Em contraste com os outros solos da região, a terra preta apresenta grandes quantidades de matéria orgânica estável (GLASER et al, 2003; LEHMANN et al, 2002; TEIXEIRA & MARTINS, 2003; GLASER, 2007; FALCÃO et al, 2009), elemento importante na formação e retenção de nutrientes pelo solo, tendo um grande impacto nas características físicas, químicas e biológicas do mesmo (FERREIRA, 2004). A grande quantidade de matéria orgânica está ligada a alta capacidade de troca de cátions, o que evita a lixiviação do solo e influencia sua cor, propriedades hidráulicas e estrutura.

Em relação aos outros solos da floresta, o estoque de carbono é três a quatro vezes maior (GLASER et al, 2003). Todos estes componentes fazem da terra preta de índio um solo fértil, sendo isto um ponto indiscutível. Entretanto, a razão para a manutenção

[4] É importante frissar o fato de a Amazônia não ser homogênea. A Amazônia apresenta variações em seus solos, sendo possível, por exemplo, encontrar solos férteis em terra firme (como no Pará e no Acre). O fato é que a floresta como um todo ficou conhecida por ter solos inférteis.

[5] "Terra preta", "terra preta do índio" e "terra preta arqueológica" referem-se ao mesmo solo. A expressão "terras pretas da Amazônia" engloba a terra preta e a terra mulata - solo marrom encontrado em volta da terra preta. Em inglês, usa-se Amazonian Dark Earths. Daqui para frente usarei *terra preta*.

[6] É importante ressaltar o papel curcial de Dirse Kern en Nestor Kampf et al, que no final da década de 1980 e durante a década de 1990 foram os cientistas brasileiros que conduziram pesquisas e publicaram trabalhos sobre a terra preta do índio.

desta fertilidade[7] no ambiente tropical ainda não é totalmente clara[8]. Períodos de descanso do solo podem ser de apenas 6 meses. Além disso, produtores perceberam que a TPI não fica "cansado" de maneira geral, o solo fica "cansado" para alguns cultivos, continuando produtivo para outros (GERMAN, 2003b)[9]. Em ferrasolos o período é normalmente de 8 a 10 anos (GLASER et al, 2003).

As propriedades químicas, físicas e biológicas de solos de terra preta de índio são o resultado da junção de pedogênese e atividade antrópica (TEIXIERA et al, 2010). No caso das TPI, os assentamentos humanos foram responsáveis pela melhora das condições químicas do solo (KERN & KAMPF, 1989). Os solos adjacentes às TPI servem como testemunha. Estes solos são na sua maioria ferrasolos e acrisolos, e a maioria das TPI são esses solos com horizonte A antrópico (LIMA et al, 2002). Quando os processos de formação de terra preta de índio forem compreendidos, este conhecimento pode ser empregado na recuperação de solos degradados. Além disso, a alta concentração de carbono no solo poderá iniciar uma nova prática de manejo que diminua a emissão e aumente o seqüestro de carbono, tendo um impacto na redução deste elemento na atmosfera (TEIXEIRA et al, 2010).

No início do debate sobre este solo, existiam quatro teorias sobre a sua formação e sua raíz antrópica não era unanimidade entre elas (GLASER & WOODS, 2004). Estudos sobre suas características químicas e biológicas, e o material arqueológico encontrado no solo, comprovaram efetivamente a sua origem antrópica. Sua origem não é mais um assunto constestado (NEVES et al, 2003; GLASER ET AL, 2004, GLASER, 2007, WOODS & DENEVAN, 2009). Em outras palavras, as populações que viveram na Amazônia modificaram o meio ambiente, tornando os solos da região mais próprios para a agricultura e para a ocupação (KAWA & COYCEDO, 2008; DENEVAN, 2001; HECKKENBERGER et al, 1999; STAHL, 2002).

[7] Um solo é fértil quando ele é capaz de "fornecer nutrientes essenciais, nas quantidades e proporções adequadas, para o crescimento da planta" (EMBRAPA Glossário).

[8] É importante fazer aqui uma observação: cada sítio de terra preta de índio é diferente em relação às concentrações de nutrientes.

[9] Um exemplo seria a mandioca. Produtores observaram que a mandioca só pode ser produzida por um ano, o que os leva a concluir que a mandioca requer muito do solo. Já o feijão e o milho são cultivos que não falham (GERMAN, 2003b).

Solos antrópicos são solos que resultam das redistrubuições e alterações causadas pela ocupação humana (WOODS, 2003). A existência destes solos é conhecida desde a origem da agricultura. Os solos antrópicos *plaggen* do norte da Europa talvez sejam os mais conhecidos. Os solos *plaggen* foram elaborados com a adição de esterco, atividade também registrada em outros continentes, como na África. Apesar de ser um solo antrópico, a terra preta de índio se diferencia dos demais. A TPI é encontrada por toda a Amazônia (SOMBROEK, 1966; SMITH, 1980; WOODS & McCANN, 1999; KERN et al, 2003). E esterco não foi a alteração que originou o solo. Além disso, a TPI é um artefato arqueológico. A alta concentração de carbono pirogênico também distingue a TPI de outros solos antrópicos (ERICKSON, 2003b). Todos esses elementos tornam a TPI um pouco mais intrigante.

Apesar de seu grande atrativo - não só pelo grande impacto na história do país, como por sua fertilidade surpreendente, com desencadeamentos para a agricultura não só Brasil, mas no mundo (BINNS, 2006; MARRIS, 2006) - a terra preta ficou na obscuridade por um longo período (WOODS & MACCANN, 1999). Para compreender a razão deste fato, é preciso entender a história da Amazônia como um capítulo de uma história mais geral, buscando explicações deste fenômeno no jogo de interesses políticos nacionais e internacionais que influenciaram, de modo nem sempre perceptível, o desenvolvimento de atividades científicas e das políticas de desenvolvimento no Brasil.

Hoje, a Amazônia alcança uma relevância maior do que jamais teve por dois fatores. O primeiro é o aumento da importância do regime do clima no contexto global, trazendo à tona temas como a governança da biodiversidade. O segundo é o deslocamento no modo como a natureza é representada, movimento que vem atribuindo a ela importância crescente nas esferas política e econômica. Todas as discussões ambientais presentes e futuras passam pela a floresta sul-americana, grande reguladora de serviços ecossistêmicos. Apesar de sempre ter ocupado um lugar no cenário internacional, com este novo contexto, a Amazônia passa a ter uma importância estratégica para todo o planeta.

A descoberta deste solo tem impacto tanto no passado quanto no presente e no futuro da região. No passado porque sua existência muda a história não apenas do Brasil, mas também da América Latina no que diz respeito a ocupação humana. No presente

porque diz respeito à produção de alimentos para a população que vive na região. No futuro porque a sua fertilidade – ligada à presença de biocarvão – tem relação direta com a discussão de mudanças climáticas. Além disso, o estoque de carvão vegetal no solo pode ser um serviço ecossistêmico, outro tema que tem crescido em importância nos últimos tempos no mundo e é intrínseco ao debate sobre um modelo de desenvolvimento menos agressivo para a floresta. As características da terra preta de índio são suficientes para explicar a conotação de tesouro dada ao solo no título do trabalho[10].

A descoberta do Brasil por Portugal é tida, na história oficial, como o início da história deste país. O período que antecede este marco é denominado por alguns de pré-história[11]. Evidências, no entanto, sugerem que a região tem sido habitada por pelo menos 12.000 anos (MORAN, 1993). A Amazônia tem sido ocupada desde o pleistoceno superior (ROOSEVELT, 1996)[12]. Meggers (1954) afirmava que a região não poderia ter abrigado um contingente populacional significativo, as limitações ecológicas do meio ambiente amazônico impossibilitariam seu desenvolvimento. A fertilidade da terra preta de índio, porém, é um forte argumento contra esta tese. Julian Steward foi o primeiro a elaborar um modelo teórico que reforçava o papel cental da ecologia no processo de desenvolvimento e consequentemente de diferenciação tanto cultural quanto econômica nas sociedades antigas (ADAMS, MURRIETA, SANCHES, 2005). Meggers expandiu a teoria de Steward e colocou a subsistência em detaque na relação entre cultura e ambiente.

Os críticos de Steward e Meggers levantaram suas vozes nas décadas seguintes. Não abandonando à teoria de limitações da floresta tropical, esses autores desenvolveram hipóteses alternativas para a suposta falta de sociedades complexas na Amazônia. Carneiro defendeu a idéia de que a falta de forças sócio-economicas, que desencaderia uma evolução política, foi o ponto crucial. Já Gross (1975) e Lathrap (1968) propuseram

[10] Betty Meggers, uma pesquisadora Americana que estuda a Amazônia há mais de meio século, diz que de tempos em tempos pesquisadores aparecem em busca do El Dorado. Desta vez, seria a terra preta o El Dorado?

[11] A pré-história se refere ao período que antecedeu a escrita, ou seja, grande parte do período de existência da espécie humana já que apenas 0,1% deste tempo se refere ao período em que havia a escrita. No entanto, no continente Americano, a "pré-história" se refere ao período que antecede a chegada dos europeus a América no século XV (FUNARI & NOELLI, 2009).

[12] Roosevelt et al conduziram sua pesquisa em Monte Alegre no Pará.

que a baixa densidade de proteína animal era a chave para a ausência de sociedades complexas. Sponsel (1986) argumentou que a grande questão era a hierarquia de fatores ambientais que eram limitantes. Foi a partir de 1980 que o determinismo ecológico presente no debate começou a ser questionado de maneira mais veemente. Assim, outras hipóteses foram elaboradas e defendidas.

Um aspecto crucial nos estudos sobre o impacto da terra preta de índio diz respeito ao seu potential para reduzir as emissões de carbono (BINNS, 2006; MANN, 2002; MARRIS, 2006) e à razão da sua elevada fertilidade. O entendimento dessas características, e um conhecimento mais profundo da região como um todo, tem um valor estratégico para o Brasil e para os países vizinhos na formulação de estratégias para o desenvolvimento da Amazônia, principalmente com a importância cada vez mais notória dos serviços ambientais. Em um mundo que vive sob a ameaça das mudanças climáticas, a concentração de biocarvão da terra preta de índio ganha destaque e tem sido usada como referência para experimentos que procuram emular seus efeitos (SOMBROEK et al, 2003; KAWA & CAYCEDO, 2008). Em outros solos que não os da Amazônia, ou seja, em outros lugares do Brasil e do mundo, a produção de biocarvão e sua mistura ao solo, tem sido utilizada com este propósito. Não sem razão, para muitos a fertilidade da terra preta de índio pode trazer benefícios a agricultura no Brasil e em outros países com o mesmo clima. Em um cenário global no qual as mudanças climáticas atingem um patamar de notoriedade nunca antes alcançado, a reprodução da fertilidade da terra preta também ganha outra conotação.

As discussões sobre mudanças climáticas e governança da biodiversidade, temas que dominam os debates sobre meio ambiente, tendem a permanecer na agenda internacional com a chegada ao fim do protocolo de Quioto e a necessidade de um novo acordo para o período pós-2012 e com o aumento do debate sobre governança dos recursos naturais. Na verdade, as discussões sobre o biocarvão já foram apresentadas nas reuniões da Conferências das Partes da Conveção-Quadro do Clima em Bali, em 2007. Também esteve presente nas reuniões seguintes em Poznan, na COP14 e em Copenhague na COP15. Pesquisadores sobre o tema organizam eventos paralelos e o biocarvão chegou a fazer parte da agenda de Copenhague. No entanto, o fracasso da COP15 esfriou as discussões sobre o tema. Portanto, é importante entender como a Amazônia aparece nesses debates e até que ponto e de que maneira as questões ligadas a população entram na discussão. A terra preta, com todas as suas implicações,

pode iluminar esta discussão que tem como ponto final a elaboração de uma nova realidade para a Amazônia. Com as discussões sobre REDD recebendo cada vez mais atenção, o estoque de carbono no solo poderá gerar créditos de carbono. O que começou como um modo de melhorar a produção do pequeno produtor ganhou conotações muito mais ambiciosas.

O debate sobre a terra preta de índio não se esgota com discussões bioquímicas. Ele também atravessa temas políticos. As decisões tomadas por políticos, acadêmicos e/ou gestores evidenciam a dinâmica de um determinado momento que favorecia certos temas. É preciso manter em mente a verdadeira natureza da crise ambiental. Sua essência não é ecológica ou econômica, ela é de fato política (GUIMARÃES, 1991). A politização da questão ambiental, junto com a revalorização da natureza coloca a Amazônia ainda mais no centro dos debates ambientais. A questão amazônica é importante para o desenvolvimento nacional, e a posição do Brasil em relação a esta e a outras questões ambientais vai definir a qualidade do nosso desenvolvimento e, conseqüentemente, do nosso futuro.

Além disso, a existência da TPI indica a importância fundamental do conhecimento produzido localmente para o entendimento das características e potencialidades desse ambiente e para a criação de uma relação harmoniosa entre homem e natureza. Pesquisas sobre a terra preta de índio auxiliariam o desenvolvimento de políticas voltadas para o uso sustentável da Amazônia, uma vez que o solo quebra algumas concepções a respeito da floresta, demonstrando que outro tipo de relação com ela não só é possível, mas já existiu.

Ao longo de sua história, a Amazônia foi alvo de visões conflitantes, quando não contraditórias. Ora vista como o pulmão do mundo ou a vilã responsável por mudanças climáticas em outros lugares do planeta, a Amazônia e sua riqueza sempre foram o alvo de teorias acadêmicas e políticas diversas, muitas das quais, na verdade, refletiam ou reproduziam mitos que nem sempre condiziam com a realidade da floresta. Somam-se a este fato imensos problemas internos de gestão desse ambiente, o que já foi reconhecido pelas autoridades brasileiras. Verifica-se uma intercessão entre fatores internacionais e nacionais na constituição dos desafios e impasses presentes no horizonte político, econômico e científico encontrado na Amazônia. Em razão disto,

estudos acerca da influência do cenário ambiental internacional nas políticas do Brasil dirigidas à floresta se tornam cada vez mais importantes.

Os paradigmas políticos internacionais são de grande importância no entendimento da difusão do conhecimento acerca da terra preta e da política adotada em relação à floresta, uma vez que as dinâmicas internacionais repercutem na política interna de um país. Uma breve introdução ao surgimento da agenda ambiental internacional e ao papel do meio ambiente na política externa do país facilitaria a identificação da dinâmica da relação entre esses dois fatores. Para entender de forma mais profunda e completa o papel exercido pelas políticas internacionais na formação nas políticas nacionais em relação à Amazônia é necessário fazer um estudo sobre as dinâmicas de poder que vigoraram em relação à floresta ao longo da segunda metade do século XX até os dias de hoje.

As discussões sobre a Amazônia nem sempre abrangiam todos os temas inerentes à ela. O conjunto de temas e discussões que envolvem a população local - tanto a atual quanto a do passado – é talvez o maior exemplo deste equívoco: tendem sempre a serem relegadas a um segundo plano. Esta situação pode ter suas raízes em uma das visões predominantes sobre a floresta, que rotulava a região como sem história, com populações pequenas e atrasadas demais para serem relevantes. As ações dos habitantes delineiam a história da floresta. Foi assim no passado, é assim no presente e assim será nos tempos que virão. Não se pode pensar no futuro da Amazônia sem levar em consideração as questões ligadas à população. Estratégias que envolvam a população local não apenas na aplicação das políticas públicas, mas também na formulação delas, não são uma opção. Elas são indispensáveis a qualquer projeto consistente para a Amazônia.

A apropriação do debate sobre a Amazônia pelas ciências naturais também pode ser visto no caso da terra preta de índio. O debate sobre seqüestro e estocagem de carbono no solo tem claramente monopolizado as atenções em torno da TPI, em detrimento de discussões acerca dos impactos do solo na história e cultura da região, e da exploração de suas aplicações voltadas para a produção de alimentos para a

população que vive lá atualmente. O solo tem um papel fundamental no desenvolvimento de populações, delineando o seu declínio ou ascensão[13].

É importante lembrar que os seres humanos são parte integral de quase todos os ecossistemas (REDMAN et al, 2004). Atividades humanas são extremamente relevantes para o ambiente e as condições ambientais de um determinado local exercem um papel importante na escolha das atividades que serão feitas. Isto está intimamente relacionado as ciências interdisciplinares. Existe uma falha no trabalho conjunto entre as ciências naturais e as ciências humanas. Gestores de conservação não dão a devida atenção às instituições políticas (STOLL-KLEEMANN, 2005). A recíproca é verdadeira e tomadores de decisão muitas vezes deixam de incluir biólogos e químicos na hora de fazer política.

Esta tese defende o ponto de vista de que para o estabelecimento de um novo modelo de desenvolvimento para a região é preciso um entendimento mais completo da mesma, que leve em consideração tanto as questões naturais quanto as questões ligadas às populações que a habitam. Dois fatores sobre a terra preta precisam ser ressaltados: seu estudo vem desconstruindo visões sobre a floresta, e as discussões em torno dela evidenciam a importância central dos temas ligados à população no debate sobre a floresta.

O trabalho apresenta três perguntas centrais que o nortearam. A primeira, que deu origem ao projeto, é: Por que a existência da terra preta, com toda a sua riqueza – e a história de uma populosa e produtiva Amazônia – ficou relativamente desconhecida entre 1880 e 1980, tanto na agenda científica como na agenda pública? Depois de uma pesquisa inicial outras perguntas também se tornaram fundamentais. A segunda é: o que fez estas visões mudarem a partir da década de 1980? Como estas visões delinearam o lugar ocupado pela Amazônia no cenário científico e político de 1980 até os dias de hoje? A segunda questão se desdobra em mais uma questão: por que, nas discussões sobre a Amazônia, as questões sócio-culturais são quase sistematicamente colocadas em segundo plano em relação às questões técnicas e econômicas? A terceira questão norteadora do projeto também se refere ao momento atual: como o

[13] Jared Diamond em "Armas, Germes e Aço: os destinos das sociedades humanas". Rio de Janeiro: Record, 2006, 472p apresenta uma interessante discussão sobre o desenvolvimento das populações nos continentes, explorando as diferenças entre eles, entre elas a domesticação da natureza e produção de alimentos.

conhecimento sobre a terra preta – e o que o solo nos diz sobre a importância do conhecimento da população local - pode influenciar na elaboração de políticas ambientais para Amazônia?

A pesquisa apresenta quatro temas que perpassam o trabalho. O primeiro tema é que a terra preta é importante para o passado, o presente e o futuro da Amazônia. A divisão dos capítulos reflete isso. O segundo tema que transcorre pelo trabalho é a influência do modo como a Amazônia era vista no âmbito internacional nas políticas públicas internamente. O segundo capítulo em especial reflete este tema. O terceiro tema é que até as discussões sobre clima e serviços ambientais, foco do capítulo quatro, deixam de fora as questões ligadas à população da região - essas discussões sobre serviços que acontecem em um pedaço de terra, que é propriedade de alguém, que tem hábitos e entendimentos específicos, que ocupou aquela terra por alguma razão, que usou aquela terra de certa maneira, que é quem de fato vai sofrer diariamente os impactos das mudanças decorrentes de novas políticas - reproduzindo um entendimento unifocal sobre a Amazônia, priorizando o valor econômico da floresta. O quarto tema que perpassa o trabalho é que para a elaboração de um novo modelo de desenvolvimento na região, assim como para um entendimento mais completo da região, o aspecto cultural da mesma precisa sair do segundo plano e ser reconhecida como crucial para a viabilização de qualquer modelo.

O objetivo deste trabalho é analisar o papel da terra preta no cenário atual de desenvolvimento da Amazônia. Para isso será preciso voltar no tempo, tanto no âmbito interno quanto no externo, ao longo da segunda metade do século para analisar a sua trajetória. Será igualmente necessário analisar as questões atuais que envolvem a Amazônia – desenvolvimento sustentável, mudança climática - e como de fato elas ainda reproduzem alguns dos problemas que marcaram a história da floresta, tais como a relativa ausência da terra preta como tema relevante para a Amazônia.

A tese é dividida em quatro capítulos, além de introdução e conclusão. O primeiro capítulo é dedicado à terra preta, suas características, a história de sua pesquisa e as diferentes visões sobre o solo da Amazônia. O segundo capítulo é dedicado ao papel que a Amazônia ocupou no plano político interno, focando em 1970 em diante. O terceiro capítulo também é dedicado ao papel da Amazônia mas desta vez no cenário internacional, focando a partir de 1970 com o início da agenda ambiental internacional e

a participação do Brasil na sua formação. O quarto capítulo aborda as questões atuais do desenvolvimento sustentável e o regime do clima.

O trabalho vai testar duas hipóteses. A primeira hipótese é que a terra preta ficou fora da agenda política e científica por conta de visões engendradas no imaginário brasileiro e internacional da região como uma "ilha verde", um espaço desocupado sem importância estratégica. A segunda é que questões sócio-culturais aparecem em segundo plano no debate sobre a floresta porque há um domínio das questões naturais referentes à floresta.

Esta pesquisa pode ser divida em duas partes. A primeira é uma análise histórica da Amazônia no cenário nacional e internacional a partir de 1970. A segunda é o papel da terra preta de índio no contexto do desenvolvimento sustentável na Amazônia. Portanto, a primeira parte da estratégia de pesquisa apresenta uma pesquisa histórica seguida por uma análise. A segunda parte focará mais em pesquisa (YIN, 2005), já que esta estratégia aborda tanto o passado como eventos contemporâneos, o que neste projeto são as discussões sobre desenvolvimento sustentável e REDD. Apesar do foco da pesquisa ser terra preta de índio, não houve pesquisa de campo porque este trabalho não me permitiria fazer a discussão sobre a Amazônia como um todo. A análise apresentada aqui é qualitativa.

A pesquisa é descritiva, explanatória e exploratória. É descritiva porque cobre as principais características dos planos de governo e dos encontros das Nações Unidas sobre o meio ambiente. É explanatória porque o que foi encontrado na seção descritiva será analisado para iluminar o que é o principal objetivo da pesquisa. É também exploratória porque aborda as razões para a ausência da terra preta de índio na agenda política.

Os quatro capítulos foram escritos de maneira independente, ou seja, para escrever um captiulo não foi necessário ter o capítulo anterior já terminado. Portanto, todos os capítulos apresentam três fases. A primeira fase é de coleta de dados. A segunda fase é de elaboração da análise descritiva de uma questão específica (no primeiro capítulo são as três visões sobre o solo, no segundo são os planos de governo para Amazônia, no terceiro capítulo são as conferências da ONU e no quarto são os pagamentos por serviços ambientais e as propostas de REDD). A terceira fase é uma análise sobre o

que foi encontrado na segunda fase para responder a pergunta que deu origem ao projeto de pesquisa.

As seguintes atividades foram realizadas:

Levantamento bibliográfico existente sobre terra preta de índio, planos de governo para Amazônia e sua evolução, as três conferências da ONU sobre meio ambiente – Estocolmo, Rio de Janeiro e Joanesburgo -, o conceito de desenvolvimento sustentável e a emergência do REDD.

Identificação de problemas e melhorias chave nos planos de governo do passado.

Identificação dos atores envolvidos e de seus interesses na formulação dos planos de governo e na construção da posição Brasileira na agenda ambiental internacional.

Análise dos planos de governo para Amazônia e o público alvo dos mesmos.

Análise do fenômeno da globalização e suas implicações para a esfera ambiental internacional.

Análise da ascensão do regime do clima.

Análise do conceito de desenvolvimento sustentável.

Análise da ascensão do pagamento por serviços ecossistêmicos.

Um levantamento foi realizado para identificar os documentos de agências governamentais que seriam úteis. As agências identificadas foram: Ministério do Meio Ambiente, Instituto de Pesquisa Econômica Aplicada, Superintendência da Amazônia, Ministério do Planejamento, Instituto Brasileiro de Geografia e Estatística.

O método utilizado na pesquisa foi a análise de discurso. Existem vários segmentos dentro da análise de discurso, mas todos procuram entender o mundo social através de sistemas e ordens simbólicos e ideacionais (ARTS & BUIZER, 2009). Discursos são vistos como o fim e ou como o meio da ação humana (HAJER, 1995). A análise de discuso pode focar na comunicação, tendo como fontes primárias textos, ou pode ser mais abrangente sendo entendida como uma estrutura de significado. A análise de discurso também pode ser levada a outro nível e ser entendida como prática social (ARTS & BUIZER, 2009).

Neste projeto de pesquisa vimos o discurso muito relacionado a prática. No primeiro capítulo pode ser visto como os discursos da fertilidade dos solos da Amazônia mudaram ao longo do tempo. No segundo capítulo vemos como os planos de governo postos em prática refletem a os discursos dominantes sobre a floresta. O quarto capítulo foca na análise do desenvolvimento sustentável e no REDD, que também são discursos. Apesar de outras teorias serem relevantes em todos os capítulos, é possível dizer que a análise de discurso é a mais importante.

Para a pesquisa bilbiotecas em Campinas, no Rio de Janeiro e na Holanda foram utilizadas. Na Universidade estadual de Campinas, as bibliotecas do Instituto de Filosofia e Ciências Humanas, de Economia, da Coleção de Livros Raros da biblioteca central, da Faculdade de Educação, da biblioteca de Engenharia e Arquitetura, do Núcleo de Estudos e Pesquisas Ambientais, e do Núcleo de Estudos de População foram utilizadas. Em Campinas, a biblioteca do Instituto Agronômico de Campinas foi utilizada. No Rio de Janeiro, a biblioteca Nacional, as bibliotecas de Economia, Botânica e de Antropologia da Universidade Federal do Rio de Janeiro e a biblioteca da Fundação Getulio Vargas foram visitadas. O Instituto de Pesquisa Econômica Aplicada teve a gentileza de enviar por correio um documento e a biblioteca da Embrapa Ocidental enviou artigos por email. Na Holanda a biblioteca da Universidade de Wageningen foi muito útil.

Introduction

The historical condition of the human being is one of scarcity (OPHLUS, 1977). However, the apparent unlimited flux of resources of the last centuries has obscured this condition. The reality today, however, brings this fact to the centre of the international debate. We live in a crisis whose existence is no longer disputable. Human beings and nature have always been intertwined. So much so that the history of humankind is in fact the history of its relationship with nature. However, the increase of the impact of human action in nature altered the meaning of environment, which became no longer a stable factor and went into the national and international political agenda (HURRELL & KINGSBURY, 1992). We are witnessing a true re-evaluation of nature in the global scenario. In this context the Amazon, one of the three large stocks of nature in the world (BECKER 2007), gains a new space both nationally and internationally.

The wealth of the Amazon is enormous, in all the possible aspects: cultural, historical, social and natural. Not out of the blue the Amazon forest has been the focus of great international debates. Its presence in the international political debate is increasingly important and decisive. Although it is neither the 'green hell' nor the 'lungs of the world', the Amazon has a key role in the stability of the climate (MALHI, 2008). Although these representations are defended by sectors of society and even by institutions, it is worth pointing out that all of them hide economic and political interests, not always visible on the surface in the current discourses.

The Amazon is a unique place. This forest extends itself into eight countries and the French Guyana and it represents 1/20 of the Earth's surface (VIANA, 2001). The tropical forest of South America is the home to 1,8 million different species of plants, animals and microorganisms (BECKER & STENNER, 2008). The Amazon encompasses one third of the area of tropical forests in the world (FALEIRO, 2001). Furthermore, it is the most biodiverse place in the world (EWERS & LAWRENCE, 2006; GARDA, DA SILVA, BAIÃO, 2010; DA SILVA, RYLANDS, FONSECA, 2005; HOORN et al 2010), where one could find the most important watersheds in planet Earth, with 17% of the freshwater of the world (BECKER, 2004). The Amazon is unique but it is also heterogenous. This diversity becomes evident even in the fact that there are different boundaries of the Brazilian forest. The political definition of the Brazilian rainforest exceeds the biophysical limits of the biome. In addition, inside the Amazon there are different realities, different

characteristics that transform the forest into several forests, there are many Amazonians inside Amazonian boundaries.

The perception of this richness of the forest, however, did not extend itself to the soils of the region. The humid soils of the tropical zones are generally described as infertile, what represented an obstacle to the sustainable use of the soil (GLASER et al, 2001). Both the uplands and the floodplains present positive and negative aspects in relation to agricultural production. Uplands, in general, are composed of acidic soils with low concentrations of nutrients and high levels of aluminium. Even with these characteristics, the uplands could be used for agriculture, but there is the risk of lack of rain. Other factors influence the soil in the floodplains[14], which makes them, in contrast to the uplands, fertile[15]. However, due to the uncertainty of the rainy season, it is a risk to use these lands for agriculture. Besides the periodic flooding, there is also the risk of extreme flooding (DENEVAN, 1996; ADAMS, MURRIETA, SANCHES, 2005). Therefore, in relation to agriculture, uncertainty looms. Floodplains have been responsible for the largest settlements before the arrival of the European. Even so, many authors[16] believe that the uncertainty of the floodings in the floodplains drove pre-Cabralian societies not to depend exclusively on them, using the uplands. However, the uncertainty of the rain also creates insecurity regarding the agriculture in the uplands. The soils of the Amazon were, for a long time, understood as weathered and poor in nutrients, which constituted a strong argument against the possible existence of sustainable agriculture and consequently, of a civilization in the forest[17].

This was the scenario in the Amazon region: an incredible rich forest with infertile soils. This is no longer the case. The reason for this change is a soil of dark colour hidden in the vastness of the Amazon. Its presence in the forest was identified in the nineteenth

[14] Floodplain is an area that presents soils originated from the decomposition of sediments carried down by watercourses or brought by the hillsides due to the erosion effects of the rain. The soils of the várzea or floodplains developed on sediments that are brought by the rivers when the rivers are high. When the rivers receed those sediments, which are rich in nutrients, they remain in the soil. That, added to the high level of groundwater and the regular floodings, creates an early process of soil formation (TEIXEIRA et al, 2007).

[15] Very little areas of the floodplains present limitations to agricultural production and, in general, they are located near rivers or lakes, which are areas that receive a smaller load of sediments rich in nutrients.

[16] Such as Denevan 1996 and Carneiro 1995.

[17] It is important to stress the fact that the Amazon is not homogenous. The soils of the Amazon have variations within them, and it is even possible to find fertile soils in the uplands (in Pará and Acre, for example). The fact is that the forest has been considered as having infertile soils.

century by Hartt in 1874 and 1885 and Smith in 1879 (WOODS & MCCAIN, 2009). However, it was only in the last two to three decades that this soil gained attention from the national and international scientific community. *Terra preta de Índio*[18] is the name of this soil that deeply changed the understanding of the Amazonian environment[19].

The sites of terras pretas are found mainly in ferralsoils and acrisoils, but they are also found in other soil classes (SOMBROEK, 1966; SMITH, 1980; KERN & KAMPF, 2005; GLASER & WOODS, 2004). Terra preta de índio has high concentrations of calcium, potassium, phosphorus and nitrogen (GLASER et al 2001). In contrast to the other soils of the region, terra preta de índio contains large quantities of stable organic material (GLASER et al 2003; LEHMANN et al 2002; TEIXEIRA & MARTINS, 2003; GLASER, 2007; FALCÃO et al, 2009), an important element in the formation and retention of nutrients by the soil, which has great impact on its physical, chemical and biological characteristics (FERREIRA, 2004). The high quantity of organic material is related to the high capacity to exchange cations, which avoids leaching and influences its colour, hydraulic properties and structure. In comparison to other soils of the forest, the storage of carbon is three to four times higher (GLASER et al, 2003). All these components make terra preta de índio a fertile soil, which is an undisputable characteristic. However, the reason and the persistence of this fertility[20] in a tropical environment are not yet totally clear[21]. Fallow periods can be as short as 6 months. In addition, producers realised that TPI does not necessarily becomes 'tired' generally, the soil needs a rest from certain crops, being able to maintain production for other crops (GERMAN, 2003b)[22]. In ferralsols this period is 8 to 10 years (GLASER et al, 2003).

The chemical, physical and biological properties of terra preta de índio are the outcome of the mixing of pedogenesis and anthropic activities (TEIXEIRA et al, 2010). In the case

[18] 'Terra Preta', 'Terra Preta do Índio', 'Terras Pretas dos Índios' and 'Archaeological Terra Preta' refer to the same soil. From here onwards I will mainly use terra preta de índio (TPI).

[19] It is important to highlight the crucial role of Dirse Kern and Nestor Kampf et al, that in the end of the 1980s and during the 1990s onwards were Brazilian scientists that conducted research and published their results on terra preta de índio.

[20] A soil is fertile when it is capable of providing the essential nutrients, the adequate proportions and quantities, for the growth of a plant (EMBRAPA, Glossary).

[21] It is important to stress that each terra preta de índio site is different regarding nutrient concentration.

[22] An example of such a crop would be manioc. Farmers have noticed that manioc can only be produced for a year, which leads them to conclude that manioc requires a lot from the soil. Beans and corn, in another hand, are crops that never fail (GERMAN, 2003b).

of TPI, human settlements were responsible for the improvement of the chemical condictions of the soil (KERN & KAMPF, 1989). Adjacent soils to TPI can serve as control. These soils are usually ferralsols and acrisols and the majority of TPI are these soils with an anthropic A horizon (LIMA et al, 2002). When the formation processes of TPI are understood, this knowledge can be used in the recovery of degraded soils. In addition, the high concentration of carbon in the soil can initiate a new management that would diminish carbon emissions and increase carbon sequestration, which would have an impact on in the reduction of this element in the atmosphere (TEIXEIRA et al, 2010).

In the beginning of the debate on these soils, there were four theories on its formation and its anthropic roots were not unanimous among them (GLASER & WOODS, 2004). Studies on its chemical and biological characteristics together with the archaeological material found in the soils, however, effectively demonstrate its anthropic origins, something that is no longer contested (NEVES et al, 2003; GLASER et al, 2004; GLASER, 2007; WOODS & DENEVAN, 2009). In other words, the population that lived in the Amazon modified the environment, making the soils of the region more suitable for agriculture and settlement (KAWA & COYCEDO, 2008; DENEVAN, 2001; HECKENBERGER et al 1999; STAHL, 2002).

Anthropic soils are the outcome of redistributions and alterations caused by human occupation (WOODS, 2003). The existence of these soils is known since the beginning of agriculture. The anthropic plaggen soils of the north of Europe maybe the best known example. The plaggen soils were enriched with the addition of manure, an activity also seen in other continents, such as Africa. Despite being an anthropic soil, terra preta de índio differs from the others. TPI is found all over the Amazon (SOMBROEK, 1006; SMITH, 1980; KERN et al, 2003). Manure was not the alteration that gave origin to the soil. Besides, TPI is an archaeological artifact. The high concentration of pyrogenic carbon also distinguishes TPI from other anthropic soils (ERICKSON, 2003b). All these elements make TPI a little more intriguing.

Despite their great attractiveness – not just by its impact in the history of the country, but also for its surprising fertility with follow ups for agriculture in Brazil and abroad (BINNS, 2006; MARRIS, 2006) – terra preta de índio remained invisible for a long period (WOODS & MCCANN, 1999). To understand the reason for this, it is important to understand the history of the Amazon as a chapter of a more general history, searching

explanations for this phenomenon in the interplay of both national and international political and economic interests that influenced, not always in a perceptive way, the development of scientific activities and policies in the development of Brazil.

Today, the Amazon reaches a relevance greater than ever before for two main reasons. The first is the increase in the importance of the climate regime in the global context, bringing to the surface themes such as biodiversity governance. The second is the shift in the way that nature is represented, a movement that is attributed to its growing importance in the political and economic spheres. All the present and future environment discussions go through the South-American rainforest, great regulator of ecosystems services. Despite always occupying a place in the international scenario, with this new context, the Amazon starts to have a strategic importance for the entire planet.

The discovery of terra preta de índio has an impact on the past, present and future of the Amazon. In the past because its existence changes the history not only in Brazil, but also in Latin America, regarding human occupation. In the present because it refers to agricultural production for the people that live in the region. In the future because its fertility – which is intimately linked to the presence of biochar – is directly related to the climate change debate. Furthermore, the storage of biochar by the soil can be an ecosystem service, another theme that has grown in importance lately in the world and is an intrinsic theme to the debate of a less aggressive development model in relation to the forest. The characteristics of terra preta de índio are sufficient to explain the treasure connotation given to this soil in the title of the work[23].

The discovery of Brazil by Portugal is understood, in the official history, as the beginning of the history in this country. The period that comes before this milestone is denominated by some as prehistory[24]. Evidences, however, suggest that the region has been inhabited for at least 12000 (MORAN, 1993). The Amazon has been occupied since the late Pleistocene (ROOSELVET, 1996)[25]. Meggers (1954) asserted that the region could

[23] Betty Meggers, an American researcher that has studied the Amazon for over half a century, says that from time to time researches looking for El Dorado appear. This time, would terra preta be the El Dorado?

[24] Prehistory refers to the period before writing, which represents great part of the period of the human being existence as only 0,1% of that time refers to the period when there was writing. However, in the American continent, prehistory refers to the period before the arrival of the European in the Americas in the Fifhteenth century (FUNARI & NOELLI, 2009).

[25] Roosevelt et al. conducted a research in Monte Alegre, Pará.

not have held a large population, since the ecological limitations of the Amazonian environment would impair their development. The fertility of the terra preta de índio, however, is a strong argument against that theory. Julian Steward was the first to elaborate a theoretical model that reinforced the central role of ecology in the development process and consequently in the differentiation both cultural and economic of ancient societies (ADAMS, MURRIETA, SANCHES, 2005). Meggers expanded the Steward's theory and emphasised subsistence in relation to culture and the environment.

Critics of Steward and Meggers raised their voices in the following decades. Not leaving the theory of limitation of the tropical forest, these authors developed alternative hypotheses for the so-called lack of complex societies in the Amazon. Carneiro defended the idea that the lack of socio-economic strengths, which would lead to political evolution, was the crucial point. Gross (1975) and Lathrap (1968) argued that the low availability of the animal protein was key to the absence of complex societies. Sponsel (1986) defended that the hierarchy of environmental factors was limiting. It was from the 1980 onwards that ecological determinism in the debate came to be questioned in a more feverous manner. Therefore, other hypotheses began to be put forward.

Another crucial aspect in the studies of the impact of terra preta de índio regards its potential to reduce carbon emissions (BINNS, 2006; MANN, 2002; MARRIS, 2006) and the underlying factors of its high fertility. The understanding of these characteristics, as well as a deeper knowledge of the region as whole, has a strategic value for Brazil and for its neighbouring countries in the formulation of development strategies of the Amazon, especially with the ever-growing importance of environmental services. In a world that lives under the threat of climate change, the high biochar concentration of terra preta de índio gains notability and has been used as a reference for experiments that aim at reproducing its effects (SOMBROEK et al 2003; KAWA & CAYCEDO, 2008). In non-Amazonian soils the production of biochar and its mixture to the soil, has been used for this purpose. Not without reason, for many the fertility of terra preta de índio could bring benefits to agriculture in Brazil and in any part of the world with similar climatic conditions. In a global scenario in which climate change reaches a level of notoriety never before seen, the reproduction of terra preta fertility also gains another connotation.

The discussions on climate change and biodiversity governance, themes that dominate the debates in the environment, tend to remain on the international agenda with the arrival of the end of the Kyoto Protocol and the need for another accord for the period post-2012 and with the increase in the governance debate regarding natural resources. In fact, the discussions on biochar have already been introduced to the Conference of the Parties of the Climate Change Conventions in Bali, 2007. Biochar was also part of the meeting in Poznán in the COP14 and in Copenhagen in the COP15. Researchers organised parallel events and biochar was even in the agenda of Copenhagen. However, the failure of COP15 put a cold blanket over these discussions. Therefore, it is important to understand how the Amazon appears in these debates and to what extent the issues related to its population go into the discussion. Terra preta de índio, with all its implications, could shine a light on this discussion that has as the end result the elaboration of a new reality for the forest. With the discussions on REDD receiving increasing attention, carbon storage in the soil could generate carbon credits. What started as a way to improve the production of the smallholder producer, has gained now much more ambitious connotations.

The debate on terra preta does not end with biochemical discussions. It also goes through political issues. The decisions taken by politicians, academics and/or managers demonstrate the dynamic of a given moment that favoured certain topics. It is necessary to keep in mind the true essence of the environmental crisis. Its essence is not ecological or economic; it is in fact political (GUIMARAES, 1991). The politicisation of the environment, together with the revalorisation of nature puts the Amazon even more in the centre of the environmental debate. The Amazon is important for national development, and the position of Brazil in relation to other environmental questions will define the quality of our development and consequently of our future.

Furthermore, the existence of TPI indicates the fundamental importance of knowledge produced locally for the understanding of the characteristics and potential of a given environment for the creation of a harmonious relation between humans and nature. Research on terra preta de índio could help in the development of policies for the sustainable use of the Amazon, as the soil breaks some conceptions on the forest, demonstrating that another type of relation is not only possible but it has already existed.

Throughout its history the Amazon has been the target of conflicting - if not contradictory - visions. Once seen as the lungs of the world or the villain responsible for climate change in other places of the world, the Amazon and its richness have always been the target of diverse academic and political theories, many of which in fact reflected or reproduced myths that not always related to the reality of the region. In addition, there were great environmental management problems, which have already been recognised by the Brazilian authorities. An intersection between international and national factors can be identified in the making of challenges and impasses present in the political, economic and scientific horizon found in the Amazon. Because of that, both studies regarding the influence of the international environmental scenario and the policies in Brazil towards the forest have become more important.

The international political paradigms are of great importance to the understanding of the diffusion of knowledge regarding terra preta de índio and of the policy adopted in relation to the forest. This is so as the international dynamics reverberate in the internal political arena of a country. A brief introduction in the emergence of the international environmental agenda and the role of the environment in the foreign policy of Brazil would ease the identification of the dynamics in relation to these two factors. To deeply understand the role played by international policies in the formulation of national policies towards the Amazon it is necessary to conduct a study on the power dynamics that have ruled in relation to the forest throughout the second half of the twentieth century until today.

The discussions on the Amazon did not always reach all the themes inherent to the Amazon. The group of themes and discussions that involve the local population – both the current and the past – are perhaps the biggest example of this mistake: they tend to be relegated to the backstage. This situation could have had its roots in the predominant vision of the forest, that branded the region as without history, with a small population too backward to be relevant. This was the case in the past, it is the case today and it will remain so in the future. One cannot think about the future of the Amazon without taking into consideration the issues related to the population. Strategies related to local population, not only in the application of public policies but also in the formulation of them are not an option. These are indispensable to any consistent project for the Amazon.

The appropriation of the debate on the Amazon by the natural sciences can also be seen in the case of terra preta de índio. The debate on carbon sequestration and storage in the soil has clearly monopolised the attention around terra preta de índio over discussions on the impact of the soil in the history and culture of the region and over the exploration of its applications in food production for the population that lives there. The soil has a key role in the development of a population, shaping its decline or rise[26].

It is important to remember that human beings are an integral part of almost any ecosytem (REDMAN et al, 2004). Human activities are extremely relevant for the environment and the environmental conditions of a given place play a key role in defining the activities that will be carried out. This is intimately related to interdisciplinary science. There is a flaw in the joint work between the natural and human sciences. Conservation managers do not give the necessary attention to political institutions (STOLL-KLEEMAN, 2005). This flaw exists in both ways and decision-makers leave out biologists and chemists when designing policies.

This thesis argues that to establish a new model of development for the region it is imperative to have a more complete understanding of it, one that takes into consideration the natural issues and the issues related to the local populations. Two factors on terra preta have to be stressed: its study has been deconstructing visions on the forest and the discussions around the soil emphasise the central importance of the themes related to the population in the debate on the forest.

This project has three main guiding questions. The first one, which originated in the project: Why did the existence of terra preta de índio, with all its richness – and the history of a more populated and productive Amazonia – remain relatively unknown between 1880 and 1980, both in the scientific and the political agenda? After an initial research, other questions also became fundamental. The second question is: what made these visions change from the 1980s onwards? How do these visions delineate the place occupied by the Amazon in the scientific and political scenario from 1980 until today? The second issue unfolds into one more question: Why, in discussions on the Amazon, are socio-cultural issues almost systematically put in a second plan in relation the technical and economic issues? The third guiding question of the project refers to the

[26] Jared Diamond in “Arms, Germs and Steal”Rio de Janeiro: Record, 2006, 472p. Presents an interesting discussion on population development in different continents, exploring the different between both the populations and the continents, the domestication of nature and food production.

current model: How can the knowledge of terra preta – and what the soil tells us about the importance of local knowledge – influence the elaboration of environmental policies for the Amazon?

This research presents four themes that run throughout the thesis. The first is the importance of terra preta de índio for the past, the present and the future of the Amazon. The division of the chapters reflect that. The second theme is the influence of the way the Amazon was seen in the international arena on internal public policies. The second chapter especially reflects that. The third theme that runs through this thesis is how the people of the forest appear in the discussions related to the forest. Even the discussions related to climate and ecosystem services, which are discussed in chapter four, leave out the issues related to the population of the region. These issues on ecosystem services take place on a piece of land, which is someone's property, that has specific habits and understandings, that occupied that land for a reason, that used it in a specific way, who is the one that suffers the daily impact of changes triggered by new policies – reproducing a unifocal understanding of the Amazon, prioritising the economic value of the forest. The fourth theme is the elaboration of a new model for the region, as well as for a more complete understanding of it, its cultural aspect will have to leave the backstage to be recognised as crucial for the viability of any project.

The aim of this research is to analyse the role of terra preta in the current scenario of development in the Amazon. To do so it is important to go back in time throughout the second half of the last century to analyse its trajectory both in the national and international arena. It will be equally necessary to analyse current issues that involve the Amazon – sustainable development, climate change – and how these still reproduce some of the problems that marked history in the forest, such as the relative absence of terra preta as a relevant theme for the Amazon.

This thesis is divided into four chapters, besides introduction and conclusion. The first chapter is dedicated to terra preta de índio, its characteristics and the history of its research and the different visions of the soils of the Amazon. The second chapter is dedicated to the role of the Amazon in the internal sphere, focusing on the 1970s onwards. The third chapter is dedicated to the role of the Amazon in the international sphere, also from 1970s onwards with the rise of an international environmental agenda

and the participation of Brazil. The fourth chapter is on sustainable development and climate regime and how terra preta appears in it.

The research will test two hypotheses. The first hypothesis is that terra preta was out of the political and scientific agenda due to the visions embedded in the Brazilian and in the international imaginary of the region as a 'green island', a space unoccupied and without strategic importance. The second hypothesis is that socio-environmental issues appear in the second plan of the debate of the forest because there is a overpowering of the natural issues related to the forest.

This research could be divided in two. The first is a historical analysis of the Amazon in the national and international scenario from the 1970s onwards. The second part is on the role of terra preta in the context of a sustainable development in the Amazon. Therefore, for the first part of the research strategy has both a historical investigation followed by an analysis. The second part, on the another hand, focuses more on a survey (YIN, 2005), as this strategy deals with both the past and contemporary events, which in the project in question refers to the discussions on sustainable development and REDD. Although the focus of the research was terra preta de índio, there was no fieldwork as that would not allow me to discuss on terms of the Amazon as a whole. The analyses presented here are based on a qualitative approach.

The research is descriptive, explanatory and exploratory. It is descriptive because it encompasses the main features of the government plans and the main characteristics of the UN meeting on the environment, but it is also explanatory since the results found in the descriptive part will be analysed to enlighten what is the main purpose of the research. It also has an exploratory character as it goes through the reasons for the absence of terra preta de índio on the political agenda.

The four chapters were written independently from each other, in other words, in order to write one chapter, I did not necessarily need to have a previous chapter already finished. Therefore, all the chapters comprise three main phases. The first phase was of data collection. The second phase would be to present a descriptive analysis of a specific issue (in the first chapter that would be the three views of the soils in the Amazon, in the second chapter the government plans for the Amazon in the 1970s, 1980s and 1990s, in the third chapter it would be UN meetings and in the fourth chapter the analysis would be the payment for ecosystem services and the REDD proposal). The third phase is an

analysis of what was found in the second phase in order reach the answer for the question that gave rise to this research project.

The following activities were carried out:

Bibliographic surveys of the existing material on terra preta studies, government plans for the Amazon region and their evolution, the three United Nations meetings on Environment – Stockholm, Rio de Janeiro and Johannesburg -, the concept of sustainable development and the emergence of reduction of emissions from deforestation and degradation.

Identification of key improvements and key problems in the past plans.

Identification of the actors involved as well as their interests in the formulation of the government plans and in the formulation of the Brazilian position within the international environmental agenda.

Analyses of the government plans for the Amazon and the target audience for them.

An analysis of the globalisation phenomenon and its implications for the international environmental arena.

An analysis of the rise of the climate change regime.

An analysis of the concept of sustainable development.

An analysis of the rise of the payment for ecosystem services.

A survey to identify documents from government bodies that would be useful. These bodies were – Ministry of the Environment, Research Institute of Applied Economic Research, The Superintendence of the Amazon, the Ministry of Planning, the Brazilian Institute of Geography and Statistics.

The method used in this research was discourse analysis. There are many branches within discourse analyses but all of them seek to understand the social world through ideational and symbolic systems and orders (ARTS & BUIZER, 2009). Discourses are seen as the outcome and the medium of human action (HAJER, 1995). Discourse analysis can focus on communication, it can have texts as a primary source or it could

be seen in broader terms, being seen as a shared frame of meaning. It can even be taken to another level, and be understood as a social practice (ARTS & BUIZER, 2009).

In this research project we tend to see discourse closely related to practice. In the first chapter, one can see how the discourse related to the fertility of Amazonian soils changed through time. In the second chapter, we look at government plans put into practice and how they reflect the dominance of certain discourses of the forest. The fourth chapter focuses on the analysis of sustainable development and REDD, which are both discourses. Although there are obviously other theories that each chapter goes through, I believe it is safe to say that this is the main one.

For the research, libraries in Campinas, Rio de Janeiro, in Brazil, and Wageningen, in the Netherlands, were used. In the State University of Campinas, the libraries of the Economics Institute, the Rare Book collection in the Main library, the Faculty of Education, the Institute of Philosophy and Human Sciences, the Engeneering and Architecture library, the Environmental Research Group and the Population Research Group were used. In Campinas, I also visited the library of the Agronomic Institute of Campinas. In Rio de Janeiro, the National Library, the libraries of the Economics Institute, Anthropology and the Botanic library of the Rio de Janeiro Federal University and the library of the Getulio Vargas Foundation were used. The Research Institute of Applied Research was kind enough to send a document by post and the library of West Embrapa also sent an article by mail. In the Netherlands, the library of Wageningen University was very useful.

Chapter 1

Terra Preta and its characteristics

Despite being the subject of exploitation and theories since the time of the discovery of Brazil, the Amazon still holds secrets. Anthrosoils are spread all over the world, but there is something very unique about the one found in the dense vegetation of the South American rainforest. It is precisely the unique features of this soil horizon that has triggered some interesting debates and revisions on the history of the Amazon.

In this chapter a study of the terra preta de índio will be conducted with the aim to explore the unique quality of this anthropic soil horizon, and the changes that it triggers in the history of the continent and for Brazilian agriculture. It is from this chapter that the questions of the other chapters will come from.

Different people throughout time have represented the Amazon rainforest in different ways. How the forest was seen helped to delineate the policies for the region. Not only the forest itself, but also the soils of the Amazon were represented in different ways throughout its history. In this chapter I will analyse the terra preta de índio, going through its chemical characteristics and the implications of its discovery. The chapter is divided into five sections. The first section is dedicated to the terra preta de índio itself, what it is, why it is different, what are the discussions that this soil participates in. The second section goes through the history of the research on the topic. The aim of this section is to identify key moments in the history of the research. The third section analyses the three different views of the Amazonian soils. The first view saw the soils of the South American rainforest as fertile due to the luxurious quality of is vegetation. The second view goes against the first and sees the soils of the Amazon as infertile. The following section focuses on the pristine myth that was cast on the Amazon rainforest. The fifth section addresses the importance of TPI in the current scenario.

Terra Preta do Índio

The Amazon rainforest is impressive. With a territory that encompasses eight countries and the French Guiana, the home of the longest river flowing in the world, the forest still has its mysteries. The Amazon covers 40% of the Brazilian territory and it expands to seven million square kilometres in South America (NEVES, 2006), an extension almost the size of the European continent.

The Amazon, one of the last resource frontiers of the world, presented a contradiction. The region was known for having poor soils and yet had a strong fauna and flora diversity. The richness was found above ground. The low fertility of the soils of the Amazon would be the result of natural characteristics of the region, as the forest is exposed to tropical climate variation. These extreme conditions – torrential rain, strong sun – acidify the soils, making them incapable of holding nutrients[27]. This conception of the forest as a green hell – a place inhospitable for not allowing agriculture, and therefore human life – is no longer dominant.

In the centre of the debate that is changing this conception is the terra preta de índio. The soil itself is an archaeological artefact. The soil represents a cultural complexity that deserves to be highlighted. Most of the TPI sites cover an area of 2 to 5 hectares, but the size of these sites in upland areas can vary from less than 1 and up to 500 hectares (SMITH, 1980, KERN et al, 2010). Terra preta de índio is a soil horizon that draws attention[28], and it's a soil horizon can vary from 10 to 200 cm deep. On avereage TPI sites are soil horizons of 30 to 60 cms deep (KERN et al, 2010). They are the trace of centuries of communities that lived in the region, changing the soils and each producing a variety of unique chemical and physical traits (WOODS, 1995). This soil is found all over the Amazon (PETERSEN, NEVES, HECKENBERGER, 2001). The soil is not just found in the Brazilian Amazon, it is found in other countries as well, such as in Colombia (EDEN et al,1984; ANDRADE, 1986), Bolivia, Peru, Venezuela and the Guianas (JUNQUEIRA et al, 2010). There are, however, differences between the terra preta de

[27] The nutrients are washed away.

[28] Terra preta de índio is a soil horizon, it is the superficial horizon on top of various soils. A soil horizon is the vertical section that, cutting from the surfice, goes down until the intemperismo, showing in most cases several layers one on top of the other horizontally, parallel to the surfice. Each horizon has different characteristics.

índio found by rivers and the one found away from it[29]. The patches of soil found near rivers are considerably bigger and more concentrated. This difference is connected to the period and intensity of human occupation in the place. See below a picture of TPI and notice the ferralsols underneath terra preta de índio.

Photo 1 - Terra Preta do Índio - Laguinho Amazonas

Source: TPI in Laguinho, Amazonas. Taken by the author

The Amazonian Dark Earths have different characteristics. The soil, which the colour varies from black to brown –refering to the terra preta and terra mulata[30] (WOODS & MCCANN, 1999) – contains large quantities of nutrients, such as phosphorus, calcium and magnesium (GLASER et al 2001; SOMBROEK, 1966; WOODS & MCCAIN, 1999; LEHMANN et al, 2003). Potassium and zinc are also found at higher levels than the surrounding soils. Being of lighter colour than the terra preta, terra mulata does not have as many archaeological artefacts as the former and also less phosphorus (SOMBROEK et al 2002). Terra preta de índio also has high cation exchange capacity[31]. In addition, in

[29] TPI sites along rivers are most of the time larger and more linear than interfluve areas (SMITH, 1980).

[30] Terra Mulata is a term coined by Sombroek in 1966.

[31] High cation exchange capacity is good because when chemical elements, such as calcium for example, goes into the soil solution, it is hold by the soil and it does not go away. It works as a changeable storage place.

general, terra preta presents high microbiological diversity (COSTA et al, 2010)[32]. Residues of incomplete combustion, in other words, charcoal, are found in the soil. This component, together with the aromatic humic substances, would be responsible for the persistency of the organic material in the soils.

The activities of the people who lived in the forest before and after the arrival of the Europeans led to an accumulation of residues from plants, animals, large amounts of charcoal and several chemical elements such as phosphorus, magnesium, zinc, calcium and manganese. These stocks could play a key role in the formation of the soil, as well as to a higher pH[33] (NOVOTNY et al, 2009). One important factor regarding TPI is its resilience; the soil remains fertile for centuries.

Some elements in the soil give away its history. Phosphorus, for example, is one of them. Initial studies on this element were restricted to the North of Europe (WOODS, 2010), but that later changed. This element is an indicator of past anthropic activities. Cultural deposits, which involve urine, plants, animal tissue and bones contain large amounts of phosphate[34].

The fertility of the terra preta de índio is amazing. The origin of this fertility is likely due to the high concentration of carbon in the soil (WOODS & DENEVAN, 2009), which retains nutrients and humidity. These are twice more productive than nearby soils (MARRIS, 2006). Studies carried out by Bruno Glaser in the University of Bayreuth, Germany, revealed that 1 hectare of terra preta 1 meter deep contains 250 tonnes of carbon, a number that contrasts with the quantity of carbon in other soils of the region – 100 tonnes. The carbon of terra preta is not only in the charcoal, but also in the organic carbon and the bacteria biomass. The quantity of carbon present in the soil has great implications for climate change. The capture of carbon in the atmosphere is a crucial subject nowadays, as is food production. Both subjects are related to terra preta. See

[32] Biochar can affect the soil biological community. In the case of terra preta de índio it has been demonstrated that it increases soil microbial biomass (LEHMANN et al 2011; TSAI et al 2008).

[33] Higher than adjancet soils, which are acidic. For example, in the text cited, the control soil (non-TPI) had a pH of 4.4 where the TPI had 5.4.

[34] Colour, pH, carbon, nitrogen, calcium (can come from human and animal faeces, bones and other organic and inorganic residues), potassium, magnesium (the last two would indicate vegetal ash), copper and zinc (mainly in urine and faeces, respectively, which would indicate intense occupation or occupation for a long period).

the picture above with the black terra preta de índio and the high content of ceramic pottersheds.

Photo 2 - Terra Preta de Índio Pottersheds

Source: Laguinho, Amazonas. Picture taken by the author.

Research carried out in the Amazon has discovered that most of the terra preta de índio in the sites studied were formed between 500 and 2500 years ago (NEVES et al., 2003). Soil Organic Matter (SOM) is a key factor in the fertility of a soil (NOVOTNY, 2010) and deserves further attention. In tropical soils, the SOM is usually low as the soils are highly weathered. In the tropics, SOM plays a key role, as it is major pool of nutrients such as nitrogen, phosphorus and sulphur (STEINER, TEIXEIRA, ZECH, 2004). SOM also influences the pH, the cation exchange capacity, the anion exchange capacity and the structure of the soil.

The existence of terra preta de índio raises an important issue regarding its formation. Human activities transform the fertility of the soil, and, since the beginning of agriculture, organic fertilisers have been added to enrich soils. Although the origin of TPI was still an

issue open to debate in the twentieth century, the anthropic origin of the soil in now unquestionable (GERMAN, 2006). The chemical and biological processes that culminated with the terra preta de índio are the result of cultural activities, such as deposits and funerals[35]. Based on carbon dating of the soil, these activities took place in the Amazon before the arrival of the European.

A debate that has not yet reached an end is the one around the intentionality of terra preta creation (FRASER & CLEMENT, 2008). The soil can also be the involuntary product of years of deposit patterns of indigenous populations, as defended by Kern and Kampf. How it was "created" – intentionally or not, which acts led to its formation – are still under discussion. Macedo (2008) conducted research in the floodplains of the Solimões river and concluded that terra preta de índio was not intentionally created for agricultural purposes. As the floodplains are already fertile, there is not much point creating fertile soil horizons there. This demonstrates that the discussion is in fact very much open. It is important to stress that ceramic archaeological artefacts are generally found in this soil, indicating the cultural value of the history of the soil.

Terra preta de índio also has a great historical-anthropological importance. The Amazon rainforest was, for centuries, seen as virgin (CLEARLY, 2001). The soil had a central role in the defense of the argument against the existence of complex civilisations in the forest. The so-called 'backwardness' of the people found there, subject to nature, was part of the European discourse of the arrival of the first colonisers. The Amazon was for a long period represented as a space of nature, rather than a space of society (RAFFLES, 2003). This representation, and the fact that studies regarding the natural sciences receive more attention, could be a consequence of the vision that the people of the forest were backward. Recent studies in the region have demonstrated, however, that the Amazonian environment has a natural and cultural history. Amazonian indigenous cultures have been influencing and disturbing the landscape diversity of the forest for long periods of time (BALÉE, 2010).

It is important to stress that the discussion on human occupation is still very much alive. Some scientists do argue that there were large human settlements in the Amazon. Others, in another hand, argue that specific interests of the actors involved, together with

[35] It is important to stress the research of Balée and Clement in the topic of cultural history and knowldge on anthropic soils. They have been conducting research on these issues for decades and have made sound countributions to the study of not only TPI, but also of the Amazon.

a lack of interaction between scientists, have led to conflicting interpretations. Meggers (2003) argues, for example, that large habitation sites are the result of multiple re-occupations within a milemium time frame by villages similar to those that exist today.

Terrra preta de índio is known for over a century, but its existence was ofuscated for many centuries. One way to try to explain that is the issue of scale (MORAN, 1996). Right up until the 1970s, most of the Amazon was put together as 'high forest'. The soil in question is not the most abundant in the forest. If at the time when the region was less explored its extension seemed not so relevant, the situation is different today. Another explanation would be the lack of economic importance associated to the soil, present in the forest in individual patches seen as without economic value (WOODS, 1995).

The rise of terra preta in academic and research centres, not only in Brazil but also in international scenarios, has had important repercussions. Studies on the soil – which involves nutrients, ceramic and carbon – had great impact for the recuperation of the history of not only the region, but for the country. The fertility of TPI is a concrete evidence of the existence of this population in the past and this fact has historical and cultural repercussions. The rise of climate change in both national and international political agenda has also triggered changes in how terra preta's carbon has been studied. In the 1980s and 1990s, the interest of terra preta de índio regarded its capacity to retain nutrients and the type of human actions that would have led to the development of TPI (ANDRADE, 1986). Already in the 1990s, climate change begins to make an impact on the research. In many places of the world the research is focused on big enterprises, on a big scale. This focus leaves, once again, the small farmer left out. Some trials, such as those carried out by Brazilian institutes, concentrate on small farmers (WOODS et al 2006). That is not, however, the dominant scenario.

History of the terra preta research

The existence terra preta de índio was already known since the nineteenth century. An expedition organised by the Swiss geologist Louis Agassiz took to the Amazon the Canadian geologist Charles Hartt. The objective of the expedition was to prove the immutability of species, consequently contesting Darwin's theory of evolution (BARRETO & MACHADO, 2001). Although the expedition did not succeed in that sense, Hartt's discoveries marked the history of archaeology in Amazonia. The scientist made

four trips to the forest between the years of 1865 and 1877 and he was the first to work with scientific methods in archaeological research. The first accounts of terra preta de índio are from the nineteenth century. How to explain the absence of TPI in the many trips made by naturalists from the sixteenth up until the eighteenth century? The focus of these trips and the incursions within the Amazon had the purpose of finding resources that would be of interest in Europe, such as metals, the *pau-brasil*, drugs of the hinterland. Another important fact that was reported on was how the natives lived. In addition, this was the period in which the view of the soil as fertile reigned[36].

The first written accounts on terra preta were made by Charles Hartt and Joseph Beal Steere in 1870, 1871 (KERN et al, 2010). Other scientists identified terra preta in the nineteenth century. James Orton was one of them[37]. Terra preta de índio was also accounted for in this period in other parts of the Amazon. Barrington Brown made observations on terra preta from the Guiana in 1876. It was one of Charles Hartt' students, Herbert Smith, who wrote extensively on terra preta in 1879[38] (PETERSEN, NEVES, HECKENBERGER, 2001). Smith wrote about the soil that he called "the best of the Amazon" near the Tapajós river and Santarém.

In the beginning of the twentieth century, the archaeologist William Farabee identified deposits of terra preta near Santarém. Curt Nimuendaju made the bridge between this soil and the archaeological artefacts in the 1920s, opening new horizons for terra preta de índio research[39].

More towards the end of the twentieth century, terra preta de índio was approached by agronomists, who many times disagreed with the cultural attribution that was given to the soil (PETERSEN, NEVES, HECKENBERGER, 2001). It is in this period that the natural-cultural dichotomy about the soil becomes more evident. Before then, Hartt argued in 1885 that TPI were the home of indigenous people, who would be attracked by the fertility of the soils (KAMPF & KERN, 2005). Later in 1944, Katzer put forward the idea that terra preta de índio was a place of old aboriginal colonisation. For the defenders of

[36] The geographer Morse, for example, said that the soils were "extremely fertile" in 1809 (KERN et al, 2010).

[37] Ortom, J. The Andes and the Amazon 1875.

[38] Smith, Herbert. The Amazons and the Coast 1879.

[39] It is important to stress that the dark horizons were only considered antropic artefacts recently.

the natural genesis, terra preta de índio would have its origins in volcanic ashes and ancient lake sediments[40]. The explanation that these scientists gave to the historical artefacts found on terra preta is that the fertility of the soil attracked indigenous people from other regions to settle there. However, the almost random distribution of terra preta de índio sites in relation to geological facts and its occurrence even in high places can, on its own, make this hypothesis disputable (HILBERT, 1955). In addition, this theory did not account for the phosphorus in the soil, which is a feature of human occupation. Gourou (1950) and Hibert (1955) believed TPI to be of archaeological origin. Up until the 1970s, it was belived that the artefacts in the soil demonstrated that the indigenous people chose those sites due to the high fertility of the soil. Sombroek in 1966 put forward the idea that the fertility of TPI was in fact a result of land occupation for long periods. Smith (1980) also stressed the key role of anthropic influence in the high fertility of the TPI. The defenders of the cultural genesis believe that human occupation generated in the soil. From then on, the anthropic orgin of TPI was confirmed thorugh several studies (KAMPF & KERN, 2005). Therefore, the beginning of a sedentary village and intense use in the long-term would be responsible for the creation of terra preta.

Although terra preta de índio was already known, which triggers changes in the conception of the Amazon as an inhospitable place, virgin and homogenous, some scientists of the twentieth century followed the line of research traced by Julian Steward. Julian represented the vision of environmental determinism. The followers of this vision stressed the infertility of the Amazonian soil in all the non-riverirne localities of Amazonia (PETERSEN, NEVES, HECKENBERGER, 2001). The areas with the largest sites of terra preta, found until now that is, are mostly located in white water rivers in the Amazon basin (FRASER, 2010)[41]. That is not to say that other soils of the region are not used at all for agriculture. Fraser's research demonstrated that *caboclos* from the middle Madeira river have developed a management strategy with a classification of 'weak' and 'strong' landraces, and therefore being suitable for more fertile soils, such as terra preta, or less fertile soils, respectively (FRASER, 2010). In the same line, Junquera et al (2011) demonstrated that secondary forest in terra preta de índio has a higher use value than the secondary forest in other soils (JUNQUERA et al 2011). In other words, secondary forests in TPI soils are an example of traditional practices that can create extremely

[40] One defender of the natural genesis would be Faria (1946).

[41] The Açutuba site, for example, is by the river Negro.

productive environments. As anthropic soils sustain a different secondary forest than other soils, they concentrate agrobiodivertiy. Therefore, these soils could be more advantageous *in situ* conservation (JUNQUERA, SHEPARD JR, CLEMENT, 2010).

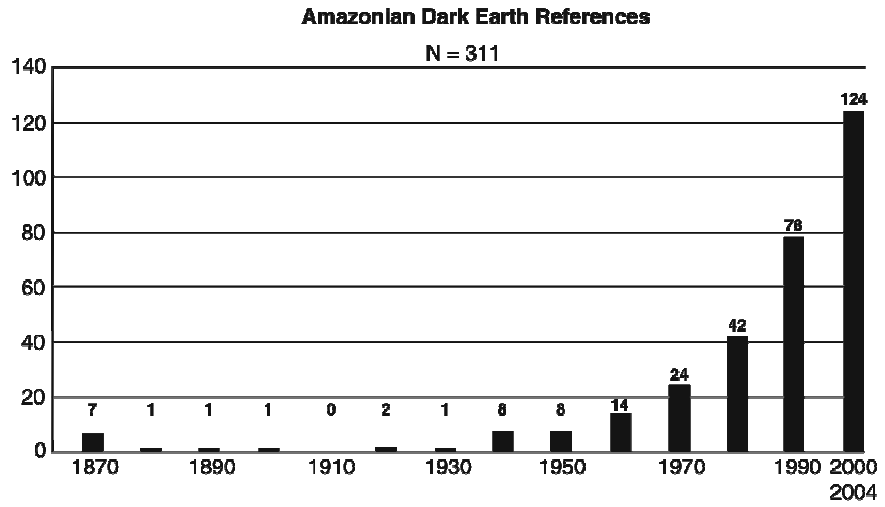
The slash and burn system is highly practiced in the Amazon and it is said to be one of the triggering forces behind the destruction of the forest. This process in itself does not prevent the re-growth of the forest and it is sustainable at the small scale. Slash and burn is a traditional method of land use in tropical countries (GREENLAND et al 1992 apud GLASER et al 2007). Small farmers burn the vegetation that would allow a crop to be planted and grow. After that, the fallow period arrives when the land, deteriorated, will recover. However, the increase in the number of people practicing slash and burn lead to greater biodiversity and nutrient loss. In addition, the intensification of the use of a soil, diminishing therefore the fallow period, would make the soil infertile. This scenario makes the slash and burn system unsustainable (GLASER et al, 2007). The sustainability of this practice lies in the availability of enough land for the small producer to rotate through, leaving the land previously used enough time to generate its organic matter (MATTOS et al, 2010), which means the fallow periods are up to 20 years (STEINER, TEIXEIRA, ZECH, 2004).

Although terra preta de índio contains large quantities of charcoal, the soil is not a product of burns. This practice produces ash, not charcoal. In addition, large part of the carbon in the process of slash and burn are liberated to the atmosphere in the form of carbon dioxide (MANN, 2005). The process used to produce terra preta was coined by Christopher Steiner as “slash-and-char”, which is the process of low intensity burn, a cold burn with incomplete combustion, or carbonisation. This process releases to the atmosphere less CO_2 than burning. Studies have demonstrated that the typical period for charcoal to realise carbon into the atmosphere is about 50000 years (OGAWA & OKIMORI, 2010)[42].

It is important to stress the fact that it was from the 1980s that terra preta started having more of an expressive space in the academy, as it is shown below by Figure 1 (WOODS & DENEVAN, 2009).

[42] It is important to notice, however, that there is little information on how the charcoal would be preserved in an agricultural field with frequent tillage.

Figure 1 - References of Terra Preta de Índio



Source: WOODS, W. & DENEVAN, W.M. 2009: 2

Researches from different areas and different countries work together in this theme. The number of entries of works almost doubled since the 1960s. This means that the attention to the theme is new.

The entries of work started from 1874. This fact can seem odd, as explorers and scientists in the region had worked in the region from the sixteenth century onwards and it would be possible, if not likely, that some of them had encountered this black soil. However, archive research conducted by a number of scientists reached the same conclusion: there is no register of this soil before 1874 (WOODS, DENEVAN, 2009).

The knowledge about terra preta is connected, although indirectly, to an event in the Unites States. With the end of the American Civil War, some southerners preferred to migrate to Latin America rather than be reunited with the North of the country. Therefore, colonies were set up in terrains with terra preta around 1867. This was the case of Panema, Diamantina and Taperinha, amongst others. A considerable number of colonies followed this format, which discards the possibility of being a coincidence that all these people decided to settle in areas that by chance had terra preta de índio. The first to make the bridge between the colonies and the soil was Charles Hartt. After his

work was published post-mortem in 1885, terra preta only went back to the academic environment around 1903 with Friedrich Katzer and his work on Amazonian geology.

After Katzer's work, there were other leaps in time and terra preta de índio only reemerged again in the 1920s. William Farabee was one of these actors. The anthropologist published a paper in 1921 in which he mentioned a black soil characterized by old indigenous settlement. Another important author was the anthropologist Curt Nimuendajú, who published his paper in 1925 and elaborated maps in which there were terra preta sites from 1923 onwards. These maps were published after his death. In 1933 Katzer's work was published in Portuguese.

The three decades that followed – 1940, 1950, 1960 – witnessed several reports of Amazonian dark earths. In 1944, a section of Katzer's books from 1903 was published in Portuguese with the title *Terra Preta*, which is the first article specifically devoted to the subject to be published. It is important to stress that these papers discussed the possibility that the soil had a natural rather than a cultural genesis. It was in 1960s that Wim Sombroek initiated his work about terra preta de índio. His dissertation about the soils of the Amazon was published in 1966 and included descriptions of terras pretas located at the Belterra Plateau (SOMBROEK, 1966). Sombroek identified some differences between terra preta and terra mulata. During the 1970s, some reports about the soils are also seen, but the publishing of another book about the region marks the decade. It was in 1971 that Betty Meggers published "Counterfeit Paradise" (MEGGERS, 1971). In this bestseller, Meggers mentioned terra preta, but leaved out its cultural genesis. The scientist defended the theory that the soil was the outcome of small reoccurring settlements for long periods. Although Meggers theory has been criticised and other theories have emerged, that is not to say that her position has been dismissed. It still an influent theory (NEVES, 2006) that no one has yet proved wrong.

The 1980s marked the beginning of the increase in number of papers on terra preta de índio. This is the decade where the research of Smith (1980), Kern and Kampf (1989), Andrade (1986), and Eden et al (1983) are published. It is in the 1980s that the tide started to change and more research and papers began to rise. This rhythm is maintained until the next decade. It is worth point out that it was in the 1990s that climate change began to gain more space in the academic and media circle. With the signature of the Climate Change Convention in 1992 and the elaboration of the Kyoto Protocol in

1997 the regime consolidated itself. Inherent in the discussions on climate change is carbon. The increase in importance of carbon – in particular the mitigation of climate change – could also have had an influence. Terra preta de índio gained the attention not due to its agronomic potential, but for its possibility to store carbon, which would reduce emissions.

Within archaeology, there were also changes that could have helped shape this new scenario. From the 1980s onwards, a shift, albeit gradual, to a problem-oriented research projects was seen (BARRETO, 1998). It is also important to remember that in 1977, the National Programme for Achaeological Research in the Amazon Basin (in Portuguese PRONAPABA)[43] was initiated. The advances made from the 1980s onwards, one of them being the rise of historical ecology, helped the questioning of the standard model.

Factors not always so clearly related to the research might have determined a focus in a given place. In Colombia for example, the existence of the Revolutionary Armed Forces of Colombia could have influenced the research in that country, as it was extremely dangerous to go out in the field. In Brazil in the mid-twentieth century, the archaerolgy discipline was not very developed and there were only a few researches being carried out, and most of them in the same place, the Marajó Island. These factors could have played a part in the obscurity of terra preta de índio.

It is important to stress the key role that Kern and her collegues from the Pará Emilio Goeldi Museum had in terra preta do índio research from the end of 1980s throughout the 1990s and from then on. They have carried out extensive research and have highly contributed to the advancement of the knowledge regarding this soil horizon[44]. Other scientists also played a key role, stimulating their students to carry out research on this topic. This was the case of Wolfgang Zech, who published in German an article on TPI

[43] The Pronapaba was created by Clifford Evans, Betty Megers and Mario Simões in cooperation with many Brazilian archaeologistis.

[44] For a list of the Museum group that researches terra preta de índio, go to http://www.museu-goeldi.br/pesquisa/ecologia/tpa/paginas_imagens/publi.htm and click on publication list.

in 1979[45] and E. Pabst, who carried out his masters and PhD research on the topic in 1985 and 1993 respectively[46].

Perceptions of Amazonians soils

Our most basic human need is food. In order to produce food, it is important to have fertile soils. Agriculture is the base for complex societies of the so-called "new world" (OLIVER, 2001). Both in the Andes and in the Amazon, the development of agriculture was crucial for societies. For a long time, agriculture was thought to be a quick invention, which led to the domestication of plants. After a while, this process would have led to the development of a civilisation. This is no longer the dominant view. Before agriculture prevailed as the main source of food production, however, there was a period in which the interaction human being-plant was not so degrading. In searching for other plant species and food, human beings started to transform the landscape way before the beginning of regular cultivation.

Agricultural production has been an issue for centuries, and it is likely to remain so. With the rapid increase in population in the nineteenth century, however, the search for arable land has become even more crucial. Not only population increase, but also the rise in the level of living standards, which triggers more consumption, is a key issue in the current and future scenarios. Together with the need to provide food for a growing population, the need to sustain natural resources and the services provided by them has became a popular topic of research. In this context, land and soil have been important issues in the development of societies. Tropical rainforests, for its vast extension, have played a role in the development debate. This is also the case of the Amazon. Its soils, however, have been through a different set of representations. These different views of the Amazon soils have had an impact on how the government elaborates its policies for that region.

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[45] ZECH, W. *et al.* Analytische Kennzeichnung vom Terra Preta do Índio. *Mitteilungen der Deutschen Bodenkundlichen Gesellschaft* [S.l.], v. 29, p. 709, 1979.

[46] PABST, E. *Terra Preta do Índio: Chemische Kennzeichnung und ökologische Bedeutung einer brasilianischen Indianerschwarzerde*. (1985). 362 f. Dissertação de mestrado - Fakultät fur Geowissenschaften, Ludwig-Maximilian Universität, München, 1985.

PABST, E. E. **Terra Preta - Ein Beitrag zur Genese-Diskussion auf der Basis von Geländearbeiten bei Tupi-Völkern Amazoniens**. 1993. 143 PhD. Gesamthochschule Universität Kassel, Kassel, Kassel.

Three views of the Amazonian soils can be identified (WINKLERPRINKS, 2002). The first view dates back to the Victorian age and it is clear in the writings of Henry Walter Bates in the mid-1800s. In his writings, Bates exalted the green and luxurious quality of the Amazon[47]. His description of the rainforest gave birth to the idea that the Amazon was then very fertile and therefore an important asset in agricultural production. His understanding originated from the European idea that, once cleared, the forest soils were fertile. Bates was not the only one. A.R. Wallace wrote in 1853 the book *Travels on the Amazon and Rio Negro* where he exalted the "richness of the vegetable productions and universal fertility of soil, it is unequalled on the globe…" (WALLACE, 1979: 247).

The exuberance of the Amazon rainforest led scientists that went into the forest and had the duty to report back their findings to believe that the forest was indeed fertile. The Western imagination was projected into the Amazon. Scientists, from Oviedo to Buffon[48], saw the forest as a conservatory, inhabited incidentally by a few humans (DESCOLA, 1996). This way of seeing the forest reduced the population that lived there to a secondary place in relation to nature, not even being worthy of a cultural approach. Since the first encounters of European travellers with the South American rainforest, the latter was seen as a place of excessive nature and therefore all that life was subject to natural logic (RAFFLES, 2002).

Accounts that the soils were not as fertile as first believed were revealed as early as 1920s. However, it was not until the second half of the twentieth century that the second view of the Amazon soils took over and became dominant. After a few non-successful attempts to colonise tropical regions and boost agricultural production, the second view – which sees the soils of the forest as infertile - took place. This new reality triggered the studies of soils in those regions. In the Amazon, Wim Sombroek's dissertation on *Soils of the Brazilian Amazon* is still a milestone in the understanding of these soils. However, both academic and government articles arrived to the same conclusion. In Brazil, the project RADAM (1976) documented the poor fertility of most of the soils of the *terra firme* in the Amazon. As late as 1991 the Planning Ministry presented a document that

[47] Bates arrived in the Amazon in 1848 with Alfred Wallace and stayed in the forest for 11 years collecting data of more than 8000 species that was sent to the British Museum.

[48] Buffon wrote that the American Indian "was in himself no more than a first-class animal and, for nature, merely an inconsequential being, a sort of impotent automaton incapable of bringing her reform or succor" (Euvres completes, VX: 443 in Descola

highlighted this characteristic. Articles by Falesi (1974[49]) and Sombroek (1984[50]) also followed these lines.

The infertility of the soil is one of the drivers of deforestation. The ashes from the burned vegetation bring a breath of fertility to the Amazonian soils for 3 to 4 years (WINKLERPRINS, 2002). Sanchez et al (1982) argued that it was possible to say that it was not feasible to harvest the acidic and infertile soils of the tropics (SANCHEZ et al 1982). Regarding the Amazon rainforest, they stated that 75% of the Amazon was covered by acid ferrasols (oxisols) and acrisols (ultisols) and only 6% of the South American rainforest did not present great restrictions to agriculture. After slash-and-burn and the small period in which the soils stay fertile, they go back to its original state and farmers move on to other plots of land.

In order to overcome the view of the upland soils as infertile, solutions based on technology were suggested. Researches conducted by Brazilian agencies in the 1980s demonstrated that, with the right amount of fertilisers, these soils could be productive over the years. These conclusions, however, trigger two criticisms. First, they were believed to be true for the whole of the Amazon basin, which is not the case. It is hard to imagine a one-size-fits-all solution for the Amazon forest as a whole. Secondly, as it was in the 1980s and as it is now, most of the fertilisers are out of the reach of most of the farmers in the region. Some authors argue that the infertility of Amazon soils was overemphasised to mine the previous idea of the soil as rich and fertile (Wagley, 1953). An example of such authors would be Goodland and Irwin (1975), when they wrote a book on the Amazon where they affirmed that the soils of the tropics were infertile and the only viable way to have agriculture in the Amazon was through slash-and-burn (GOODLAND & IRWIN, 1975).

Within this second view, the people that inhabited the Amazon before the arrival of the European were seen mainly as primitive egalitarian tribes that lived in small and impermanent villages. The hostile environment was responsible for the lack of complex socio-political institutions (PARSSINEN, SCHAAN, RANZI, 2009). As the argument

[49] Falesi states that latosols, which covered 70% of the Brazilian Amazon, have low chemical fertility (Falesi, 1974: 203). He goes on to say that the soils of the terra firme have, in general, low or average fertility (Falesi, 1974: 227).

[50] In this text, Sombroek suggests that new information on soils of the region had become available and earlier statements were being refuted (Sombroek, 1984: 521).

goes, political centralisation as well as social stratification would be more prone to develop in an environment where the stable food that was crucial for the subsistence of the society could be storable (ROOSEVELT, 1980).

It is in the timeline of the second view that the dichotomy between floodplain and upland was reinforced. Some authors, such as Petrick (1978) and Barrow (1985) argued that floodplain soils had higher agricultural use and should therefore be set aside for agricultural production, as they are. Carneiro (1970) has also argued that, in the 1500s, as too many people wanted a limited amount of productive land in the várzea, war would take over, which in turn generated subordination of villages and chiefdoms. Roosevelt also played a part on the reinforcement of the terra firme-várzea dichotomy (ROOSEVELT, 1980). The Amazon was described as being 98% of terra firme (upland) and 2% of várzea (NORNBORG, 2005; MEGGERS, 1984; MORAN, 1995). Despite the differences on how to explain the two main environments in Amazonia, scholars did use this dichotomy, which was considered a key feature of the forest for a long time, and to some extent it still is today. The persistence of the dichotomy can also be due to the fact that it is broad enough to serve the social and the natural sciences, easing the integration of findings from each area (MORAN, 1993). However, this dichotomy overlooks the particularities – and therefore the opportunities - of the forest. A research topic that has challenged the várzea-terra firme dichotomy is the bluff model (DENEVAN, 1996), which due to its location could have had a great role in semipermanent settlements and food production.

Throughout the history of the tropics, one can identify a tendency towards homogenisation, which diminishes the diversity of this forest and simplifies its ecosystems. This also applies to the soils of the region. One of the reasons for this is that the results of studies done on parts of the Amazon (in uplands, non-floodplains) were expanded to the totality of the rainforest (PIPERNO & PEARSALL, 1998). Eswaran et al argue that the maps done in the 1970s are a source of this misconception. They argued that maps are designed for a specific purpose, which might not be the same purpose of those who later see the map. Until 1990s, the soil maps that existed were very generalised. The data on tropic soils were collected mainly after the Second World War and originated from *ad hoc* observations as well as a small number of individuals. The FAO Soil Map of the World 1:5000000, published in 1970s, showed a scenario that was different from what people were used to, demonstrating variability

within the region and eliminating some of the misconceptions created about the soil. Despite the FAO Soil Map of the World, however, some of these misconceptions remained. One of the reasons for this was the terminology introduced by FAO, in both the Soil Map of the World and in the Soil Taxonomy, which was not appreciated by many scientists. In addition, there was an issue regarding the reliability of some maps (ESWARAN et al, 1992). The Project RADAM Brazil, which began in the Amazon, had a scale of 1: 250.000. The Brazilian Institute of Geography and Statistics (in Portuguese IBGE) also released Brazilian soil maps in 1982.

Geography also played an important role in the homogenised view of tropical soils, which was a key feature in the first and second views. Everything between the Tropics of Cancer and Capricorn was considered to be tropical soil. Although that is the case, no variability within tropical soils was invoked. There was even a homogenised view amongst the different tropical forests in the world (RICHTER & BABBAR, 1991). A tropical soil is generally considered to be a deep, red, acidic soil that is well-drained and with no clear horizons. This soil is linked to ferralsols. Five characteristics were associated with a tropical soil (RICHTER & BABBAR, 1991). They were: exceptionally intense weathered and leached, low soil organic matter, destructive weathering of soil alumino-silicate clay minerals, low nutrient retention capacity, ability to harden in a irreversible way once exposed to sun and air (air is valide only for plinthosols), homogeneity regarding the soil chemical and physical properties[51].

The concept of tropical soil has been oversimplified and the relationship between soil and climate has been overemphasised. Factors that play a role in soil formation are: climate, parent formation, time, biota and topography (JENNY, 1994). By downplaying the role of the other factors and putting climate on top, the variability within tropical soils would be a result of climate variability. As climate in the tropics is stable, one can jump into the conclusion that all the soil in the vast region of the tropics are the same. This view persisted for a great part of the last century (RICHTER & BABBAR, 1991). Regardless of the parent material and the topography for a location, all soils within a climatic region must present definite characteristics related to that climatic region (JENNY, 1994). That might have been taken to an extreme and helped cast a vision of soils as one, not with the same characteristics but the same soil all over the tropics. In

[51] RICHTER & BABBAR, 1991: 325.

addition, this emphasis has helped to shape how soils in the tropics are popularly represented.

The lack of reliable data for soils in the tropics was a significant issue. This absence – or shall we say flaw – was even seen in 1980s, when systematic soil surveys and maps were still missing. The lack of quantitative data about tropical soils has therefore led to misleading assumptions. Moran (1996) highlights that, although there was a research boom in Amazonia from late 1970s onwards, the ability to compare human ecologies had not been proved. This lack of data was also a feature of the anthropology of the region. So much so that the author said the forest was indeed a knowledge frontier (MORAN, 1985). Up until 1976, the knowledge about the history of the Amazon region before the arrival of the European consisted on information on a few isolated areas (MEGGERS, 1995).

Definitions about what a soil actually is and how it develops originated from researches carried out in the temperate zone. Traditional science fields, such as botany and soil science, were developed in the temperate zone, especially in Western Europe (MEGGERS, 1974). Apart from the differences between tropical and temperate zone plants – such as nutrient storage capacity, growth, reproduction, amongst others – it is important to stress that the diversity of tropical forests are the complete opposite of the uniform temperate forests. The different composition of the soils in the tropics was not taken into account and the system did not encompass such variation.

In the case of Brazil, the introduction of the Amazon region in the development plans of the Government in the 1970s triggered the need to collect accurate data on the soils of the Brazilian rainforest. Soil surveys, as well as classification of the vegetation, geomorphology and land suitability were carried out for at least a decade (RICHTER & BABBAR, 1991). The wide variability in the outcome of the occupation of the forest, which started in the 1940s, reflects the lack of knowledge on the soils of the region and their respective potential. Before the research done in the 1970s, there was a research on the soils of the region carried out in cooperation with US-AID and FAO. The maps produced then presented a wealth soil data, but they were not very reliable compared to what is known today (RICHTER & BABBAR, 1991). In the FAO-Unesco mapping project, which took place in 1971, most of the Amazon basin was assigned a soil reliability class III, which meant that only general information was used to construct and develop the

boundaries of the units. In order words, until the beginning of the 1980s, only a very slim part of the soil maps were actually done based on observations.

Within the Brazilian scenario, it is important to highlight two initiatives. First it was the RADAM Brasil project, which started in the Amazon and was later expanded to the whole country. The second initiative was the criation of the Soil Commission of the National Service of Agronomic Research. This Commission started the soil survey of Brazil and the aim was to map the entire national territory. The Soil Commission organised the first Brazilian Soil Science meeting, which led to the establishment of the Brazilian Soil Science Society. The lack of technitians and the need for soil surveys led the Commission to organised the first course on "Morfology, Classification and Soil Mapping" in 1954. The Institution went through several administrative changes and it is now Embrapa Soil, located in Rio de Janeiro, Brazil.

The soil survey conducted by EMBRAPA (1981) point out that there was an overestimation of ferralsols cover in the Amazon (RICHTER & BABBAR, 1991). The maps produced by EMBRAPA showed a cover of ferralsols of 39.1% of the Amazon region rather than the 67.4% of the FAO-Unesco maps. According to EMBRAPA 1981, acrisols covered 30% of region, not the 15% estimated by FAO-Unesco.

Although some work started to be done to demonstrate the variability amongst tropical soils, reports reinforcing the belief that the soils of the tropics were infertile were also made in 1970s. In 1972, the Economic Development Institute of the International Bank for Reconstruction and Development launched a treatise, which stated that pure laterites as well as ferralsols covered great part of the humid tropics (ESWARAN et al, 1992). The document also specified that these were poor agriculturally or of no use whatshoever[52]. This helped solidify the idea that the soils were poor. The idea that the soils of the tropics were infertile has been around since 1960s. Many publications have emphasised this (GOUROU, 1966; MCNEIL, 1964; GOODLAND & IRWIN, 1975; FRIEDMAN, 1977; IRION, 1978; REISS ET AL 1980; JORDAN, 1985). This infertility would preclude a sustained agricultural production (SANCHEZ & LOGAN, 1992).

[52] Needless to say that this is no longer the case. It is also important to highlight that Brazil is seen as an "agricultural superpower" and that in three decades the Brazilian Entrerprise for Agricultural Research became one of the leading institutions in the world when it comes to tropical agriculture (ROTHER, 2007).

Carl Sauer and Donald Lathrap played an important role in the research on agricultural origins in the tropics (PIPERNO & PEARSALL, 1998). The subject had not received much attention and most of the work done in the area came to the conclusion that the region was hostile and hampered cultural development (STEWARD 1948, 1949; MEGGERS, 1954, 1971). The Amazon rainforest was believed to have poor soils, which could not have sustained a considerable quantity of food production and, as a result, would not have allowed a high-density population. The rainforest was seen as a barrier to indigenous survival due to its lack of resources (ROOSEVELT et al, 1996).

The research conducted by Julian Steward and Betty Meggers played an important role in the history of the Amazon. The *Handbook of South American Indians* (1946-48) edited by Steward[53], together with the *Man and Culture in a Counterfeit Paradise* (1971) written by Meggers[54] were the source of fuel to feed the view that the Amazon was in fact inhabited (VIVEIROS DE CASTRO, 1996). The theory that the environment had a determining action over a society's development, defended in these papers, became embedded in the view of the South American rainforest. This model presented the indigenous that lived in the forest as occupying an intermediate evolutionary position. They were unable to generate the necessary economic surplus that would allow social stratification, political centralisation and craft specialisation. Despite the ecological differences between upland and floodplain environments, the Amazon was seen as a overall uniform forest, sparsely populated, underdeveloped socially and culturally. Many anthropologists and archaeologists – following the line of environmental determinism – adopted the view that the nature of Nature in the South American rainforest prevented further development rather than that of small villages and shifting cultivation, emphasising the separation between culture and nature (CLEARY, 2001). Steward transformed his view into a discipline: cultural ecology. The latter had great influence in the study of Amerindians from then onwards. The theory of limiting factors was dominant until – at least – 1980s (VIVEIROS DE CASTRO, 1996). The theories of Steward and his

[53] "The population density per unit area is a rough measure of the success of subsistence activities in the area, and it is correlated to some degree with cultural development". Vol. 5 pg. 655

"From a technological and ecological point of view, the basic tropical forest culture is strikingly uniform so far as present data reveal". Pg. 885 vol. 3

[54] In 1954, Meggers wrote: "*The evidence suggests that the environment exerts an insurmountable limiting effect on the cultures it supports as long as it permits only a hunting and gathering subsistence pattern, and that this limitation extends to all areas of the culture, even those that seem remotely or not at all related to the subsistence requirements*". 1954: 807.

followers opposed nature and culture. An essential part of Steward's theory is adaptation. People have to adapt themselves to resources and the opportunities of their environments. This would be the main reason for the differences between cultures (BALÉE & ERICKSON, 2006). In the Amazon this was known as the standard model.

Modern archaeological data started to arise from 1960s onwards and a new picture of the forest was being delineated. Rather than being separate from a wider continental picture, the findings in Amazonia fit the broad spectrum of research of the Americas, from Mexico and Chile, setting the date of people in South America to before 12000 B.P[55] at least. The fact it took over 30 years for that research to be recognised is related to the dates originated for Latin America, which go against the Clovis Model (CLEARY, 2001). Latin American findings that challenged the Clovis Model were ignored and suffered attack. Therefore a view that the Amazon was not important to the history of the Americas before the arrival of the Europeans was disseminated and perpetuated. Today, only a small number of archaeologists dispute the idea that there were pre-Clovis traditions in South America (BALÉE, 2010).

This – what can be called a paradigm within the study of Amazonia – began to be hit by European anthropology in 1950s, but it was not until Levi-Strauss published *Mythologiques* in 1971 that structuralism grew to be prominent within Amazonian ethnology (VIVEIROS DE CASTRO, 1996). In the late 1960s, British scholars began to show interest in the subject, from which they had abstained until then. Maybury-Lewis[56] and Riviere[57] produced milestone monographs and their work set the beginning of the contemporary phase of ethnology in Amazonia. The researches that arose in the 1970s demonstrated a combination of both influences of European and the North American schools. From then on there was a polarisation in the debate. In one side there were the followers of Steward. On the other side there were those who followed a structural-culturalist point of reference. Although there was this polarisation, it is important to stress that certain aspects of Steward's book - *Handbook of South American Indians* – were present at both sides. The Amazon rainforest was still seen as the home of a small

[55] Before Present (1950).

[56] David Maybury-Lewis wrote about his experience in the Amazon with the Sherente and the Krahó (1955-56 and a shorte visit in 1963) and with the Shavante (1958, summer of 1962 and a short visit in 1964).

[57] Marriage among the trio: a principal of social organization. 1969.

population, that was dispersed and isolated in small, egalitarian, autonomous, self-contained groups without advanced technology (VIVEIROS DE CASTRO, 1996).

A new environment for research arose as a result of elements that were happening a few years prior. New discoveries regarding the population of the Amazon led to the thinking of new theories. These researches worked on the population number in the forest before the arrival of the Europeans and attributes greater complexity to the groups and emphasise the importance of ecological characteristics and of long-distance societal impact (VIVEIROS DE CASTRO, 1996). Another reason that helps to explain the change within the discussions about the forest was the consolidation of revisited anthropological theories of social formation of indigenous tribes. The realisation that the Amazon was not as homogenous as first believed, that it in fact was extremely diverse, which in turn had an impact on the range of human activity of forests inhabitants, was one of the main changes. Although the terra firme-várzea dichotomy was present in the researches, Emílio Moran, together with other researchers, demonstrated that the forest diversity – in pedological, zoological and botanical terms - did not fit into two boxes. This simple – if not naïve – distinction of the forest does not encompass its whole complexity. This dichotomy hides the differences amongst the regions in the forest. The existence – and persistence – of this dichotomy has also led to misleading generalisations as results from one part of the terra firme would be transported to another site with completely different characteristics – population, cultural evolution (MORAN, 1995). What about, for example the tribal territory of the blackwater rivers, that until 1995 had not yet been demarcated? The terra firme-várzea dichotomy refers to white water rivers (RIBEIRO, 1995), leaving blackwater rivers out of the discussion. The culture of those from the Amazon rainforest reflects indigenous culture, from the flora architecture to natural resources management and agricultural techniques. This, in turn, varies within the forest.

Photo 3 - River in the State of Acre

Source: Taken by Carlos Alberto Bernardo de Araújo

It was the work of Anna Roosevelt that shed light to other possibilities in the region. Her research was a reaction to the Meggers theory of environmental limitations[58]. Roosevelt published the results of her research on the Amazon from 1980 onwards. The evidences of cultural complexity found by her research, together with earlier descriptions of populations in the várzea, led Meggers to propose that these people were in fact from the Andes or suffered their influence. Meggers argued that this phase of development – which would imply a more dense and complex society – appeared fully developed all of a sudden, which leads to the theory that it was an intrusion (MEGGERS & EVANS, 1973). She reinforced her previous argument that a society with high level of social stratification could not be developed under a tropical environment with slash-and-burn

[58] The perspective of environmental limitation in the Amazon rainforest focused firstly on the infertility of Amazonian soils and it shifted focus to poverty of the protein resources provided by the soils (Beckerman, 1994: 178).

agriculture and, even if such a culture penetrated that deep into the forest, it would not be able to sustain itself. This would fit the theory that the soil of the Amazon could not generate nor sustain such complexity (VIVEIROS DE CASTRO, 1996).

In her work, Roosevelt concluded that the indigenous population of today represents the remnants of the people that survived the population decline after the arrival of the Europeans. The simplicity of the Amerindians today should be not taken to represent the simplicity of the population prior-European encounter, which would reflect the limitations imposed by the environment. She, however, was not the first to oppose to the dominant view of environmental determinism. Lathrap had put forward the idea that the South American rainforest was the birthplace of complex societies (LATHRAP, 1975). Carneiro had proposed a theory of political centralisation, in direct opposition to Meggers ideas[59] (CARNEIRO, 1995[60]). Descola's research, who worked on the ecology and economics of the Achuar Jivaro, is also important. He demonstrates, among other things, that the difference between the production potential of the Achuar that lived in the riverine or the interfluvial habitats was not so relevant in political or economic terms.

Within the environmental determinism of Steward, Meggers and others, the adaptation capacity of the population is central in the explanation of how people survived[61]. It is the argument that rises from the simplification of complex social relations to propositions that fit functionalist models of human adaptation (NUGENT, 1981).

The fifth centennial birthday of the arrival of the European in the Americas may have contributed to sparkle interest in the historiography of the people that lived in the Amazon (VIVEIROS DE CASTRO, 1996; STAHL, 1996). Research carried out throughout the forest, such as the work carried out in Pedra Pintada (ROOSEVELT ET AL, 1996) demonstrated that the tropical environment, when compared to others, did not limit human development harshly. We should not be so eager as to define the

[59] To see critiques to Roosevelt's work, see Viveiros de Castro,E. 1996.

[60] In this article, Carneiro presents a critique of one of Roosevelt's articles and he goes over the main thesis of his work.

[61] Meggers wrote: "*Man is an animal and like all other animals must maintain an adaptative relationship with his surroundings in order to survive and although he achieves this adaptation principally through the medium of culture, the process is guided by the same rules of natural selection that govern biological adaptation"* Meggers, 1971:4.

inhabitants of Amazonia before the arrival of the European as environmentalists or conservationists and to describe the forest as pristine or virgin (STAHL, 1996).

From 1980 onwards

The third view derives from a set of new research directions. These investigations are called by Winklerprins as post-modern, and represent a reaction to the previous perception that was dominant, inviting plural perspectives. The research that contemplate the third view deconstructed some assumptions of the rainforest. Firstly, the homogenisation of the region that was a characteristic of the first and second view was broken, also hitting the floodplain-upland dichotomy. This dualistic view was no longer accepted to characterise the forest. Secondly, evidences of fertility, such as terra preta de índio, contested the representation of the soil as infertile. Thirdly, the idea that the soils of the Amazon precluded the development of conditions favourable to human development is being disputed. Although natural conditions do have an impact on the development of population, they are not static and over-imposing. The existence of terra preta de índio itself demonstrates that people were able to live in the region, shaping the history of the Amazon.

Throughout history, the property of soils has played an important role in determining both the cultural and economic development of a region (ESWARAN et al, 1992). The fertility of alluvial soils was the scenario where civilisations evolved. In the tropics, however, the situation was different. The highly weathered soils allowed farmers to use shifting cultivation or slash-and-burn agriculture. The misconceptions about tropical soils have had an impact that goes beyond food production, such as rural poverty, land degradation, deforestation and biodiversity. These misconceptions helped shape policies towards the use of the forest. Seeing the soil as highly leached also feeds into the theory that the region is not productive and the only way it can have a role in the development of the country is being a source of resources.

Two evidences counteract the idea that the soils in the tropics are infertile (SANCHEZ & LOGAN, 1992). Firstly, the diversity of tropical soils is now documented by numerous and accurate database, together with the World Soil Map. Secondly, experiences in Asia and Latin America demonstrate that some soils can be managed in a sustainable manner. Soil diversity in the tropics is, at least, the same as it is in the temperate zone (ESWARAN et al, 1992).

It was within the past three decades that the third view of the Amazon has flourished. During the 1970s a critique of the dominant view at that time started to emerge, prioritising cultural constructions and giving less importance to the environment (DESCOLA, 1996). Up until the 1970s the Amazon was portrayed as an illusionary paradise that received cultures originated from the Andes (GOMES, 2008). Due to limitations imposed by the environment these cultures receded into tropical society conditions.

In the 1980s, however, the forest was portrayed as the home of late-coming societies with powerful chiefdoms, complex social organisation and political hierarchy compared to those of Mesoamerica. It was in the 1980s that evidences that past human occupation was greater than initially thought when the Europeans arrived became more widely known, together with the idea that the Amazon environment had been modified. The clues were there – from large mounds close to the mouth of the river, going through anthropic soils and dikes (STOKSTAD, 2003). The Amazon, seen as a luxurious forest, impenetrable and uniform, started to be seen for the plurality of its realities, being Amazonia*s* and not just one Amazonia over all the extension of the forest. The Amazon is as diverse as an area of continental sizes can be (MORAN, 1996).

Before the emergence of this view, the indigenous population of the region was seen as being small and having had little impact. Researches conducted on the region, however, have demonstrated that that was not the case. New research led to empirical evidence that contested the theory that the Amazon could not support – and therefore allow to develop – dense population (ROOSEVELT, 1994). These changes in the understanding of the Amazon of a plural and altered environment are the result of a dynamic and complex history of human-environment interactions (HECKENBERGER et al, 2007).

Despite the fact that evidences contradicting the dominant view set up by Steward and Meggers were available before 1980s, it was only then that researchers began to voice more explicitly alternative narratives for the Amazon (RAFFLES, 2003). From the 1980s onwards, a growing number of researchers – such as Raffles, Hecht and Posey, Balée, Denevan, Roosevelt, Smith, Demerritt, Haraway, Clement - rejected the idea that the forest was pristine and that the population of the region had a passive role in their own history and in the history of the forest. In addition, rather than signing the nature-culture divide; they proposed a more hybrid conception of a natural-cultural landscape. Their

argument partially reflects the idea that nature is socially constructed as a discursive practice and that the separation of nature and culture is both historically and culturally particular to European thought post-Enlightenment (RAFFLES, 2003). The use of nature – in order words, the use of natural resources – grew, which was the result of the demand for resources for production. In charge of this demand was, what can be called the first ruthless capitalist class (WILLIAMS, 1980). The members of this class were eighteenth century agrarians, who set down the foundations of the industrial capitalism that followed.

To account for the evidences that there were in fact complex societies in the Amazon, scholars argued that these were the result of migration from the Andean highlands (PARSSINEN, SCHAAN, RANZI, 2009). Further research, however, showed that landscape management allowed human development, which in turn led to complexity. Sophisticated techniques, such as elevated terraces that would be use for agriculture and fishponds, enabled the necessary intake of protein. From 1980s onwards, scholars have discovered evidence of complex societies before the arrival of the European in upland areas. Examples of this are the earthworks looked by Porras (1987) and Salazar (1998) in the Ecuadorian Amazon and the regional integrated systems described by Heckenberger and colleagues.

Terra preta de índio soils are not the only evidence that the Amazon was the home of indigenous populations. Geogliphs found in the Amazon – which could only be identified after deforestation – are also evidence that the forest has a history greater than once believed. Within this view, more attention has been given to indigenous knowledge regarding the management of the soils, which is intrinsically related to cultural aspects of these groups that live in the Amazon (WINKLERPRINS, 2002). The biodiversity of the Amazon was a result of a cultural history through long periods of time. In contrast to what one would assume, Balée found that anthropic forests are in fact more biodiverse than undisturbed ones (VIVEIROS DE CASTRO, 1996).

Evidence of complex societies in the Amazon is growing. Three civilisations stand out: the marajoara, the tapajônica and the maracá. The marajoara is from 500-1500 AD (KAMPF & KERN, 2005) and is known for the ceramic in the Marajó island and the earthworks in the island. Dating has shown that marajoara sites were continuously occupied for 500 years up to 1000 years. The area of Santarém was probably the centre

of the chiefdoms Tapajônico. One can find evidence of a large population settlement in villages by the várzea that extend for kilometres. Dating of their ceramic reveals that the ceramic of the tapajonico cheifdoms were produced between 900 and 1200 years AD. The Maracá civilisation lived in the state of Amapá by the river Maracá in 1300-1550 AD. In the region, several urns were found. Another example is the upper Xingu region. Scientists conducted research in the region and found evidence of settlement planning and supralocal integration (HECKENBERGER et al, 2008). Road networks, pre-European towns and villages are seen across the region.

This is also a shift in the way people saw the inhabitants of the region. Before the change in the way the forest was seen, the population of the forest was seen as being small and limited by the environment, being described as passive, with no agency. After the third view was more prominent, their idea of the people of the forest as Amazonian environmental engineers, transforming the environment they lived in, emerged.

Accepting that the forest is not pristine and has been modified forces a review of the understanding of human development in the region. The landscape has a cultural history. Landscapes are legacies of past human occupation in the infrastructure of the forest and they have a social and cultural capital (STAHL, 2008; ERICKSON, 2003). The life style of the people that lived in an area is embedded in the landscape, going from their technology to rural shrines. The extensive areas of terra preta de índio found, the geogliphs, cemeteries pre-European with funeral urns and more than 300 rock art only in Brazil add up together to the fact that the Amazon was in fact largely inhabited pre-1500 (HORNBORG, 2005).

The Amazon is the most biodiverse place in the world (CLEARY, 2001). No taxonomy, be that scientific or indigenous, fully comprehends its variety. There is a lack of research regarding the Amazon and some information can therefore be misleading. For example, the earliest radiocarbon dates from sites in the Upper Xingu River are from A.D. 900. That, however, does not mean that occupation started later in that area. It can also mean that there is an absence of research there, which can lead to ill assumptions (CLEARY, 2001).

The long-term history of the region is not very well known. Looking at indigenous occupation, however, which is linked to standing forests, can reveal key information. It is estimated that one fifth of the Brazilian Amazon is indigenous land (i.e. cannot be used

for any other purpose, it belongs to the indigenous groups that live in it), and they represent an important obstacle to deforestation[62]. This means that the way that these groups manage the forest is unique and has had positive results in terms of the continuity of land-use and further research into traditional land use techniques should be looked into for future ways of preserving the forest (HECKENBERGER et al, 2007)[63].

It is in this context of looking back at the traditional knowledge of the inhabitants of the Amazon that terra preta de índio may also unravel key information. Terra preta's existence has been acknowledged since the nineteenth century but it was not until the 1980s that its importance was widely recognised (CLEARY, 2001). Although other issues also played a part in the rise of interest in terra preta, the changes referring to the soil of the tropics and the evidences of past occupation were also important in this re-discovery.

The past, the present and terra preta

When Orellana and his crew went down the Amazon River and went into the Amazon for the first time in 1542, the tropical scenario was different from the one today. Huge villages that would go as far as the eyes could see are mentioned in Carvajal's testimony. Carvajal, a priest who was part of the crew, kept a record of all that was seen when the crew went down the river (CARVAJAL, 1934). This is the first description of the Amazon river and of the tribes that lived by it (PORRO, 1995). The main tributaries of

[62] Although by Law these lands are for indegenous use, there is a history in Brazil of indigenous land being invaded, which creates conflict. One example to illustrate this point is Raposa/Serra do Sol, an indigenous land for the Macixu in Roraima, Brazil. The land was demarcated and it was approved by Lula in 2005. However, this demarcation has been contested by non-indigenous people and by the state of Roraima itself. The non-indegenous people, rice producers and cattle ranchers, disputed the demarcation and refused to leave their land – as with the demarcation of the indigenous land, all those non-indigenous people have to be re-settled. One of the problems was that most of the producers did not have land titles and therefore were not intitled to compensation. The situation reached such a level of tension that the federal government had to sent in soldiers from the National Security Force. Another key case was the invasion of the Yanomami land by miners in the 1980s. There were reports of 40 thousand people invading the reserve, which had great impact on the indigenous population. In 2011, with the high price of gold in the international market, there is fear that same situation will happen as invations are already being reported. <http://www.ipam.org.br/mais/noticiasitem?id=1389> Accessed on 04 November 2011.

[63] This is not to say that I am defending the view of the indegenous population as natural conservationists, a very romantic view. The argument is that indegenous people do have a knowledge regarding the Forest that can be less destructive than the ones pursued by those outside.

the Amazon river were only explored in the eighteenth or nineteenth century[64]. The decision to register what was seen in the trip was based on the belief that if their boss survived – the one who let them go down the river to search for food – Orellana's and his crew's act would have been understood as an act of treason.

The expedition that followed that of Orellana was of Pedro Urzua (1560-1561). He wanted to do the same route as Orellana. Urzua and his crew went down the Amazon river from Marañon until the mouth of the river (PORRO, 1995). There are four reports from this trip and they draw attention for the acounts of large villages with plenty resources. However, Urzua was killed by one of his lieutenants, Lope de Aguirre. Aguirre did not manage to fulfill the task, as he got lost in the many rivers of the Amazon (GADELHA, 2002).

The European arrival also brought diseases as well as wars and slavery (NEVES, 2006)[65]. In the following century the indigenous population in the Americas went down 90-95% of what it was before the arrival of the colonizers (CLEMENT, 1999). The difference between what was reported by Carvajal and what was found by the naturalists that went in incursions in the region two, three hundred years after Carvajal's one, added to the content of some of the priest's reports, led many people to believe that Carvajal had made those stories up.

The Amazon has been the natural habitat of population for centuries. The occupation of the region started at least at 11 thousand years ago (NEVES, 2009). And there still is the possibility that it is even older. Excavations in the cave Pedra Pintada in the municipality of Monte Alegre, Pará, date back to 9200 B.C. Excavations in a grotto in the state of Mato Grosso do Sul revealed dates from 12000 B.C.[66] Different areas of the Amazon were already inhabited in 7000 B.C., with evidence from different localities, such as from Carajás and high Orinoco.

[64] It is important to stress that the first written records are from these dates, but some people believe it started before then.

[65] Animals, as well as humans carry disease. On top of all the diseases brought by the European – smallpox, influenza, measles – there are also the diseases carried by animals. Whereas in Europe, human beings were accustumed to be by animals, such as horses and pigs, that was not the case with the indigenous population. Mann (2005) discusses an episode in the South of the United States in which it is argued that pigs were a source of contamination of zoonotic diseases, as anthrax, brucellosis, leptospirosis, trichinosis and tuberculosis (MANN, 2005: 109).

[66] It is worth point out that this site was not in a good state of preservation, which leads us to take this information with care. New excavations need to be done to confirm it.

The emergence of terra preta de índio represents a structural social and economic change in the populations. Societies that occupied TPI sites would be more sedentary with less mobility and maybe were more territorial than their ancestors (NEVES, 2006). Terra preta sites in Rondônia are even 4000 years old (NEVES, 2006). However, in other areas of the rainforest, terra preta de índio began to be formed around 2000 years ago. It is from that time that the evidences of sedentary and more populated settling emerge.

Amazonian dark earths prove that the indigenous populations that lived in the forest modified the Amazonian environment. The human occupation results in the modification of the landscape through several instruments. One of them is domestication. This is a cultural process, where the human knowledge over the consequences of environmental manipulation is acquired and enhances with time (CLEMENT, 1999). It is this knowledge that can help the elaboration of policies for a more sustainable development in the region.

Two central theories delineate the debate on human occupation and adaptation for the Amazon, a study area strongly influenced by cultural ecology (POLITIS, 2001). The first defends the thesis that foragers represent the original population that progressively moved upland during the period of the Holocene. From then on they would have lived a nomand life with few resources. The second theory defends the thesis that tropical forests in general, and the Amazon in particular, are environments so hostile and incapable of supplying the necessary nutrients for human development that human occupation of the forest depended on domestication of certain types of plants. It is important to notice, however, that it is agreed among archaeologists that the first people of the Amazon arrived without domestication (BALÉE, 2010).

The archaeological debate in the Amazon lived – and still does – a duality. Betty Meggers and Clifford Evans, researchers of the ecologic anthropolifical line, dominated, for great part of the twentieth century the discussion regarding archaeology – and therefore history – of the Amazon. They defended the idea that the Amazon watershed was inside the area of influence of the innovation centre of the Andes, where agriculture, ceramic and the state would be developed (NEVES, 2006). To explain the richeness of the ceramic from the Marajó Island, Meggers and Evans argued that the populations of the island came from the Andes and they settled there but they did not find enabling

conditions to develop[67]. This would be the reason why they went from complex to simple (NEVES, 2006). In the 1960s and 1970s, Mario Simões and Anna Rooselvet[68] conducted researches in the region and demonstrated that the thesis defended by Meggers and Evans was unsustainable, as the culture from the island lasted almost 1000 years, from the IV to the XIV century. If the culture lasted for such period, it suggests that there were ecological conditions to maintain such culture. The ceramics of the phase Marajoara are the oldest representation of the policroma tradition in the Amazon[69].

The arrival of the Europeans in the Amazon was the trigger of changes in the indigenous population (NEVES, 2006). Nowadays the majority of indigenous lands are in areas away from the Amazon river, the riverbed of the watershed, as it is in the high Negro river or in the Guianas Plateau. However, it is in the regions next to the Amazon and Solimões rivers that archaeological sites are located, some of great scale.

The pre-colonial population density is a topic that triggers heated debates. Meggers presented a discrete estimation of 1.5 to 2 million of inhabitants in the entire watershed (CLEMENT, 1999). The base for this estimation was the carrying capacity of the soil. William Devenan presented other numbers. He believed that the watershed was the home to 3 to 5 million people and that the North of South America was the home to the 5 up to 7 million people. If Meggers is one extreme, Meyers is on the other side of the spectrum. The author estimated that the high Amazon (the Peruvian, Equatorian and west of Brazil Amazonia) was home to 10 million people.

Agriculture and Soil

It is exactly because of the soils that the Amazon was said to be unproductive. Without soils capable of holding large populations, the region would be destined to have low population density (MEGGER, 1971). The várzea-terra firme dichotomy is also used as a

[67] Meggers and Evans (1957) argue that the Marajoara culture is a mixture of more advance circum-carribean and sub-andean cultures (1957: 418).

[68] Roosevelt is an important actor in Brazilian archaeology as she certified that ceramic production in the lower Amazon in the 8th millenium bp (NEVES, 1998:2). She was not the first to suggest that date, but she received wide recognition for her work, which was published in detail. The evidence acquired by her work pushed the chronology of the Amazon rainforest to the 11th millenium bp.

[69] The policroma ceramics are marked by the decoration in red, wine colour, orange and black over a white base. As the Marajoara phase, the policroma ceramic are decorated with modelated, incision, excision, etc" (NEVES, 2006: 61).

base for the argument for the environmental limitations of the forest to cultural development (GOMES, 2008)[70].

It is important to stress the diversity of the forest. The Amazon is far from being an homogenous space. There are several Amazons within the Amazon. This diversity is present, for example, in its rivers. The Amazon river is responsible for one fifth of all the fresh water that goes to oceans on the worlds. The rivers of the forest are divided according to a classical typology proposed in the nineteenth century. The rivers that are born in the Andes are called white water river as they have a muddy colour. The rivers that are born in the Guianas or the Central (in Brazil) plateaus are known as black water rivers. These do not carry rich sediments and nutrients in their flow, therefore they do not fertilse the lowlands that they flood (NEVES, 2006). The Amazon suffers great variability regarding the rain pattern. In the central Amazon, the dry period – when the rain frequency diminishes considerably – goes from July until September. In the North hemisphere high Amazon River it is a different situation, May is the dry month. The changes in the rain pattern have great impact in the life of the population. It is in the dry season that fishing is better when the space of the fish goes down, making the catch easier. That is not to propose, for example, that the floodplain-upland dichotomy should be replaced for another dichotomy, that of white and black water rivers[71].

Black water rivers were seen as 'rivers of hunger' by the first naturalist who went in the Amazon (MORAN, 1991). In fact, many generalizations on the ecological limitations of the Amazon rainforest are based on the situation of these rivers[72]. However, black water rivers are heterogeneous within themselves with a wide range of vegetation. One might expect malnutrition within the population of such systems, but that is not the case, which reveals the creative capacity of the population in this area. Ribeiro (1995) presents a detailed picture of the indigenous population of blackwater rivers, going through their social structure, exchange systems and the economic life. What is seen as a variety of cultures living in a system thought to be of less importance.

[70] Regarding this argument, one interesting question is why people do not apply this argument for civilisations from other rivers, such as the river Nile or the Yello riber, the Eufrates. Why is this only used in the context of the Amazon?

[71] One would have to include in this division clear water rivers, making that a threefold division of rivers.

[72] The vision of the Amazon with poor soils that cannot hold cultivation for more than one or two years resembles more the reality in back water rivers (MORAN, 1993: 36).

The view of the Amazon as untouched is associated to what Denevan called 'the pristine myth'. A virgin place would be a landscape in which the animal population and the vegetation have not been manipulated by humans (CLEMENT, 1999). The myth is based in the idea that the Americas – not only South America, but the entire continent – was savage, untouched by humans (MANN, 2005)[73]. Going back to the reports left by Carvajal when he went down the Amazon River with Orellana, scientists did not give any credit to the trip reports, as the forest was seen as an untouched place. If that was the case, the scenery witnessed could not have been true.

Bearing in mind the argument above it is important to rethink the vision of the Amazon as an untouched forest, debunking the myth of the savage nature. Human occupation could subtely transform the environment in countless ways. The Amazonian landscape is in great part of an anthropogenic origin. William Balée estimates that 12% of the forest originates from changes made by humans in the environment (MANN, 2002). Some believe that the whole forest is anthropogenic. The occupation of the forest took place more than 10000 years ago (NEVES, 2006). It is worth pointing out that some areas of the Amazon the population reached six digits. Studies on anthropic soils in an interdisciplinary way are crucial as they could reveal the impacts of humans in the environment in the long-term. This type of research would not be restricted to the chemistry of the soil, but there are more ample processes in which the chemistry would be one piece of the puzzle (GRAHAM, 1998).

Therefore, the Amazon was already inhabited when the Europeans arrived to colonise the Americas. This occupation was not uniform in relation to time and space and neither in relation to the diversity of the peoples – some would live in hierarchical societies and other were nomands (NEVES, 2006). It is important to stress that the people that live in the forest today are the descendents of the indigenous populations that occupied the forest before the arrival of the Europeans, although there have been great changes in demographic density and geographical location. Another point that deserves to be highlighted is the fact that human occupation before the arrival of the European still has an important role in the current human occupation. The cities of Manaus, Santarém and Tefé, and many others, were constructed in archaeological sites.

[73] Diegues makes a bridge between the vision of the Amazon as untouched and the establishment of parks with no human habitants in them (DIEGUES, 1997: 316).

Amazonia as a pristine forest

The accounts of luxurious virgin forests from the sixteenth century onwards dominated the discourse about the Amazon. The pristine view reflected the writings of romanticists and primitivists authors of the nineteenth century, such as Hudson, Thoreau and Parkman. Painters also played a part in the reinforcement of this view, such as Catlin and Church (DENEVAN, 1992). The writings of European authors of the sixteenth and seventeenth centuries described the inhabitants of the Amazon as a society of nature (RAFFLES, 2003). Although the forest was inhabited, there was what could be called an insistence in seeing the native Amazonians as an embodiment of nature (SLATER, 1996). In the nineteenth century scholars theorised about the perceived backwardness of the people, which is closely linked to the cultural ecological narratives of late twentieth century. The history of the study of the population of the Amazon reflects a persistency to label them as subordinated to nature and the forest as a space of nature rather than a space of society (NUGENT, 1993). Embedded in this view is the perception of Amazonians as passive, and as having no active role in the transformation of the landscapes in the region.

The Amazon represents a mystery that was invented by the Europeans (GONDIM, 1994). Before their arrival in the Amazon, there was exhilaration in the air that was repeatedly replaced by despair. The native man was seen as a burden and did not receive the same treatment from the travellers as did the fauna and flora of the forest. The native man is seen as the destabilising agent in the social order imposed by the white man.

In addition to the view of landscape as pristine, there was the view of the indigenous people that lived there – which was thought to be small – as benign (DENEVAN, 1992). They were the ‘good savages’, those who did not alter their environment, living in tune with nature. This is not to say that the impact that the indigenous population pre-European arrival had the same impact on the landscape as the European after 1500s. The type of transformation was different, as were the reasons for them. There are two issues to be stressed. First of all is the extent of the modifications and, secondly, the form of modifications. One example of the form of modifications would be the axe. The Europeans brought with them the metal axe. Before their arrival there were only stone axes, which are very inefficient in removing big trees, an action necessary for itinerant

agriculture. Studies have demonstrated that the clearing of a forest area with a wood axe demands 60 times more the energy and time that using a metal one. The history system of alternating short period of plow with long fallow periods only became possible with the arrival of metal axes (DENEVAN, 2010). The introduction of metal axes can be seen as a technological revolution[74].

To see the natives as ecological, 'noble savages' comes with implications. When environmentalists appeal to the ecological native it is a very powerful message to legitimise discourses and practical objectives (ULHOA, 2005). The so-called 'primitivism' of indigenous people carries with it an uneven power relationship with Europeans. The latter characterises the colonial civilising processes. Therefore these representations of indigenous people put them in a position of needing help. Representing the natives as savages – albeit noble ones – also carries implications, such as their territories need to be protected.

Redford (1991) stresses that one must be careful with the 'noble savage' and he makes a connection between the study of traditional knowledge and the myth of the noble savage (REDFORD, 1991). The 'noble savage' would be pure beings, without any sins, leaving in conformity with nature, they would be incapable of modifying nature. Evidence not only from the Amazon demonstrates that that is not the case[75]. One might even wonder if the question whether traditional people are conservationists or not is not even key to the discussion. Rather one should be asking who are we to judge and when we talk about a healthy environment, we mean a healthy environment for whom (POSEY, 1998).

The Amazon and its native population were seen as the other, different from the West. The other would be a way to refer to what is different. Western discourse of the Other would regard these differences as a tail of inferiority or weakness (ULHOA, 2005). In this context, three fictions regarding the Amazon rainforest are maintained (NUGENT, 1993). The first fiction is that there is a social vacuum in the Amazon. The second refers

[74] That is not to say that agriculture became more productive. Denevan (2010) argues that there was an involution after the introduction of metal axes, that agriculture before the Europeans was more intensive and more productive.

[75] Redford goes on to say that by seeing the indigenous population as noble savages, living in harmony with nature and therefore with a knowledge that we need to survive in the a world with an environmental crisis puts a lot of pressure on these communities. The future, he goes on, is on a mosaic of different information from different places. One of them is traditional knowledge.

to the image of the forest as rustic. The third fiction is that there are unlimited resources. There three fictions are identified in the history of the forest. The social was overpowered by the natural.

It is important to analyse how nature was seen by those who were then in a position of power. Modern thought sees nature as separate from culture and it has given nature an ontological priority (DWYER, 1996). The idea that culture is a product fits well with a tradition of thought that has been accompanied by an evolutionary perspective. The idea of nature as the western world saw it – as wilderness – is an invention. The nature and culture relationship presents a paradox. In one moment they are opposed to one another. In another moment, they appear as a continuum. This stirs discussions on what role does culture and nature play. Is nature a limiting factor or a pool of resources? Is culture a creative force or an end product (STRATHERN, 1980)?

The wilderness as we understand it today is linked to romanticism[76] (CRONON, 1995), it came to represent the sublime, the sacred. The wilderness embodied everything that was against the failings of the human world. This idea brings to the forefront another paradox. This vision of the wilderness places the human outside the natural realm. If that is the case, there is no solution for the environmental problems that we face (CRONON, 1995). In addition, the term 'wilderness' and the term 'wild resources' are unacceptable as they carry with them connotations of *terra nullius*, which excludes the indigenous population that was in that location.

The Amazon rainforest has triggered the rise of theories, both popular and scientific ones, developed by the West (HECKENBERGER, 2005). Tropical countries are seen as opposed to the West[77]. Brazil, tropical country from almost top to bottom, is the personification of the tropical. The other, that is part of this tropicality, would be nothing more than a backward person, subordinated, and also archaic and stopped in time. This vision, which obviously was extended to the Amazon, was part of the evolutionary theories of the West. The South American tropical forest illustrates the pre-civilisation conditions of society, which was understood by the Europeans as being in opposition to their condition. This idea of Amazonia as a backward environment was reinforced by the

[76] Cronon said that the wilderness was linked to romanticism and to the idea of frontier.

[77] The West, in this case, would be Europe and the United States and not the countries that are geographically in the west of Planet Earth.

theory that was dominant for decades that saw the environment of the region as a limiting factor for cultural development.

The pristine myth related to the Amazon rainforest has lasted many centuries. Sauer, as early as 1958 challenged the view of other scholars that the forest was untouched by arguing that the indigenous used burning, swidden, as well as manipulation of composition to alter the forest (DENEVAN, 1992; DENEVAN 2010). It is important to notice, however, that indigenous alterations are not restricted to burning. Landscapes were managed – the number, the distribution and the kind of species – by them.

The roots of the pristine myth cannot be lied down solely in the arrival of the European and their accounts of luxurious forests. If that was the case, the myth would not have persisted until this day. The myth originates from the accounts of eyewitnesses that were unaware of what they were seeing. The modifications that today seem clear were three, four hundred years ago not so. It is also important to notice that most of the account of wild and uninhabited land comes from more than 200 years after the arrival of the European (DENEVAN, 1992). Especially from 1750 until 1850, when lands in the interior of the Americas began to be cleared and exploited, those accounts flourished the most. By then the indigenous population had already been reduced drastically. At the time of European incursion, forests did seem thinly populated and, as there were not a great number of people managing the forest, they appeared untouched. This image was echoed even until the 1990s[78].

Another fact could have played an important role in the continuity of the myth. It has been argued that, before 1970s, there were only 50 monographs on the indigenous population of the Amazon (VIVEIROS DE CASTRO, 1996). From 1970s onwards, however, especially from 1980s, many advances were made not only on ethnological studies, but also regarding ecology, archaeology, history and ecology.

The landscape is like a text - it tells a story. However, the information provided by the landscape is not readily accessible to scientists as the text is written in subtle and physical way by behaviour, in other words, by culture (BALÉE & ERICKSON, 2006). In the study of the relationship of humans and nature, historical ecology emerges as one key theory. The landscape perspective sees human activity in a continuun, not in

[78] See, for example, Shetler, 1991. Three faces of Eden. In Seeds of Change: A quincentennial commemoration, ed. H.J. Viola and C. Margolis. Washington: Smithsonian Institution Press.

localised places. This perspective allows the link between archaeology and historical ecology (STAHL, 2008). It stands in contrast to the deterministic role of the environment that dominated the discussions on the Amazon in the second half of the 20th century. Whereas landscape ecology makes a distinction between landscape with and without human interference – the former is most cases referring to degraded landscapes - , historical ecology does not make such distinction. In addition it does not consider humans to be just another animal, it understands the human species to be a key species and as a mechanism of dynamic through disturbance (BALÉE AND ERICKSON, 2006).

Historical ecology rejects the adaptationist assumptions underlying cultural ecology, which refuses the idea that human agency can shape the environment in a positive[79] way over time. Intentional or not, human agency can produce – as well as the highly document cases of degradation - levels of environmental disturbance, which are important for guaranteeing environment resilience. In the context of the Amazonian forest, a historical ecology approach is based on the idea that historical events, rather than evolutionary ones, are responsible for the main changes in the human-environment relationship (BALÉE, 1995). It is the research programme that refers to the interactions between society and the environment through time and with the implications of these in the understanding of formation of the cultures and landscapes in the past and now (BALÉE, 2006). Historical ecology revolves around three conceptions. They are: *événement, conjoncture, and longue durée*. In other words, short-term episodes, repetitive statistical patterns over a period of time, which could be 25 or 50 years, and patterns through centuries. Historical ecology goes back to the dialectical relations between human behaviour – acts – and nature behaviour that are illustrated in the landscape (CRUMLEY, 1994). The landscape holds physical evidence of the decisions that were made, as well as cultural practices that were part of the lives of the human inhabitants of a given population[80].

To say that the South American rainforest is not pristine and untouched as once believed does not imply that its indigenous population is similar to the population of the

[79] By positive I mean increasing the richness and equitability of nature through enhancing biodiversity (Balée & Erickson 2006: 4).

[80] Balée presents four postulates for historical landscape: human activity has affected a great part of the globe; there is not a predetermination to either conservation or destruction; the pathway of landscape is historically contingent; humans and the landscape that was created by their activities cannot be seen as separate from one another.

region today. Past populations were able to organise themselves and interact with their environment instead of taming it (HECKENBERGER et al, 2007). The idea of the 'good savage' that has little or no impact in their environment has also been overturned. This, however, does not mean that a comparison between pre-Columbian groups and agri-business is possible.

The choice of words is very important in setting the context from which one stands. Conservation biologists use the term 'wild nature' to describe blocks of patches with high biodiversity that have been fairly untouched rather than 'high biodiverse' (WILLIS et al 2004). The choice of words does not come without implications. This is also true when one chooses wilderness or jungle to describe the South American rainforest. The wilderness suggests the original state, immaculate, encompassing therefore an Edenic air. The wilderness becomes something to preserve and it attracted people. The jungle, however, has a negative connotation (SLATER, 1996). When the Amazon was described as a 'green hell' the jungle was not a paradisical place. Whereas the inhabitants of wilderness are natural, the jungle inhabitants are off-putting. Seeing the Amazon as the wilderness or as the jungle oversimplifies the region and the Edenic representations of the Amazon dehumanise its inhabitants though idealisation (SLATER, 1996). Seeing the Amazon as pristine has political implications.

The view that dominated the study of the Amazon reflected an anti-historical position. The lack of archaeological data for the forest played a role in the strive of this view (NUGENT, 1980). Ecological studies also had a part in the maintenance of this view; implicitly feeding the idea that there was no proper anthropological object in the South American rainforest apart from the residual tribal fragments that remained.

Amazonian legacies and their importance

The history of a determined site is rooted in its ecosystem functions (FOSTER et al, 2003). Therefore, environmental history is a key element in the understanding of ecology. The realisation of the importance of the past in understanding ecology today gained force from the 1990s onwards. Before this date, the implications of historical use were not very much taken into account. The reasons for this change are four-fold. Firstly, ecological studies started to be more based on regional scales where current and past human impact could not be overlooked. Secondly, researchers started to realise that most of what they thought as 'natural areas' had more of human impact to it than first

thought of. Thirdly, researchers started to recognise that legacies are extremely persistent and could not, consequently, be ignored. Fourthly, there was a greater recognition that history has, and therefore adds, explanatory power to the way we understand both modern structure and function and helps diminish issues regarding management for future scenarios. Forest composition and ecosystem functioning is a result of past human land use.

History and politics began to play a greater role in research helping in the understanding of the relationship between humans and their habitat (MORAN, 1996). The individual is between the society and its habitat and it is the individual that makes decisions that affect their habitat. It is important to remember, however, that individual decisions are not made in isolation. To understand the decisions made by individuals it is necessary to understand the historical traditions of individuals in a given society. The context in which the decisions were made needs to be analysed. The importance of context – historical, cultural, environmental and political – shines a light into the floodplain and upland dichotomy, as the latter does not encompass any variation cannot therefore explain adaptive strategies (MORAN, 1991).

Seeing the forest as an anthropogenic forest, with a past of human modification can have undesired consequences. It could be argued that if in the past the Amazonian environment was able to maintain large populations, this means that the indigenous population of today is under-exploiting their resources (MEGGERS, 2001). The path would be open to agricultural producers as well as for development projects.

Soils have memories, so to say. They store information not only about past climate conditions but also about how they were formed in the first place. Land use leaves traces on soil properties that are long lasting and have important implications, be that in forests or grasslands (FOSTER et al, 2003). Agriculture, forest burning as well as grazing trigger physical, chemical and biological changes in soil property. Change in vegetation has an impact on the microbial population of soils, which in turn has an affect on the susceptibility of the soil to invasive species[81]. To sum up, legacies have a key effect on all the soil properties, demonstrating that the study of the history of land use is crucial for a more comprehensive understanding of a particular land.

[81] Research on pollen, phytoliths, for example, are carried out to help recontrct plant use in the past.

The extent and nature of the pre-Columbian human impacts in the Amazon is a topic that is in the spotlight. It has been recognised that past-human occupation did occur. However, its scale is still unclear (MCKEY et al 2010). In the Late Holocene, indigenous populations in the lowland of South America started altering the landscape intensively. Terra preta de índio is one example of these modifications.

Within 250 years of the arrival of the European in the Americas, almost all the land throughout the continent had suffered changes because of it (TURNER & BUTZER, 1992). Upon the arrival of the Europeans in the new world, however, North and South America had a variety of land types, which also varied in the extent that it had been disturbed – from less disturbed to completely transformed land. These modifications occur not only in areas of easy access, but also in lightly occupied areas. Fire was one of the methods most used. It is safe to argue that throughout the Americas, from Canada to Argentina, the landscape had been modified and it is striking that the first view was able to intrinsically remain for so long.

The population that lived in the forest prior to the European encounter had to understand the environment conditions and work with what was available to produce food. Amazonian population used a diverse set of agricultural systems, not only swidden agriculture. This was only one way in each the environment was altered. Areas of semi-intensive use in the past differ in terms of ecological parameters from the land use of indigenous groups of today (HECKENBERGER, 2008). The argument that the forest tolerated indigenous societies cannot be transferred to the contemporary forest population (NUGENT, 1980).

The Amazon has changed together with its population and economic activities. It is now confronted with urban problems. The South American rainforest followed the same patterns that were seen in Brazil and 70% of the population is now living in urban centres (HOMMA, 2005). It is important to notice that the most important cities of the region are located on archaeological sites. In other words, population settled recently were past population did.

The understanding that the forest is heterogeneous has not yet been incorporated into public policies (GARDA et al, 2010). Land occupation as well as planning projects has taken on such information. Numbers referring to endemism, forest cover loss and forest

protection vary widely within the Amazon, which needs to be addressed by different tools and different policies.

Archaeology in the Amazon can be extremely important in providing evidence regarding the history of the South American tropical forest (ROOSEVELT, 1996). Past human activities shaped the landforms and the biotic communities of the forest for one thousand years. Well-documented paleo-ecological sequences are missing (ROOSEVELT ET AL, 1996) as well as more comprehensive archaeological excavations (PIPERNO & PEARSALL, 1998; PARSSINEN, SCHAAN, RANZI, 2009).

Terra preta de índio is one evidence of past population in the Amazon. The existence of geogliphs also demonstrates that there were versatile cultures in the Amazon rainforest. (PARSSINEN, SCHAAN, RANZI, 2009). Geogliphs are found both in the uplands and in floodplains. The number of terra preta sites in the Amazon suggests that the population in the forest before the arrival of the European were in great part sedentary and large (SMITH, 1980). In addition, the Amazon also has shell monds, another feature of long time occupation in the region.

The modifications of the Amazon are not restricted to terrestrial landscape. Riverbeds were also modified to better suit the population that lived in the forest, and the effects of these changes alter the landscape in many scales (RAFFLES, 2003). Studies on botanical and ethnobotanical data allowed scholars to reach the conclusion that earlier theories about the Amazon rainforest were incomplete. The evidence brought by their research confronted the idea that the forest had no potential and that human disturbance was negligible (RIVAL, 2006). The biodiversity in the Amazon rainforest cannot be explained solely by geophysics events and environmental gradients (BALÉE, 2000).

What happened after the arrival of the European is well-known. The European encounter triggered the decrease in population the Amazon in the nineteenth century (CLEARY, 2001). Their conquest disrupted the native societies in region and the impact on the size of the population in the Amazon – and in the Americas as a whole – can be seen as the greatest demographic disaster in history (LOVELL, 1992). The diseases of the West, brought by the European, spread rapidly in a population that was not protected against them – cold, smallpox were some of these diseases that triggered the demise of the Amerindian population. In addition to the diseases brought by humans, there were the diseases brought by the animals (MANN, 2005).

Where to from Now

Today, agricultural producers want terra preta de índio, attracked by its production potential (NEVES, 2006). Registrations show that in some places the soil was used intensively without the need to add fertilizers for almost 40 years (PETERSEN, NEVES, HECKENBERGER, 2001). Moreover, the soil is also very resilient to mechanical cultivations. A research carried out by Teixeira & Martins (2003b) demonstrated that although cultivated TPI and TM areas indicate signs of deterioration, they are still more productive than the adjancet ferralsols. That is so even with recent cultivation.

Terra preta índio is a key feature in the climate change debate for two main reasons. First it is due to the reproduction of its fertility. Secondly it is because the soil found in the Amazon rainforest, which in its turn is a key feature in the reduction of emissions from deforestation and degradation debate and it is an environmental that regulates the climate in the world. Through the reproduction of its fertility terra preta is also part of the food security debate. In the centre of the international debate on the environment is the biodiversity governance. This discussion is extremely important for the Amazon.

The quality of terra preta soils led scientists both in Brazil and abroad to research the production of a new soil management system[82]. This is how the biochar was born. Biochar is produced through pirolysis, which is burning without or with low record of oxygen (MANGRICH, MAIA, NOVOTNY, 2011). The results so far have been interesting. The presence of biochar in the soil increases fertility and it can also help decrease the emission of other GHG gases, such as nitrous oxide (MANGRICH, MAIA, NOVOTNY, 2011). There is still the need, however, of conducting further researches on this matter.

It is important to stress that the amount of carbon in the soil is a key factor in the discussions on climate change (FEARNSIDE, 2010). In the legal Amazon, the soils store 138 GtC up to 8 meters, which is almost double the amount in its vegetation of 80 GtC[83].

[82] It is important to stress that biochar is a soil amendment, not a soil fertiliser.

[83] This data refers to the vegetation in 1990.

The limiting factor for sustainable agriculture in the Amazon is soil fertility (NOVOTNY, 2009)[84]. As the soil has maintained its fertility throughout the years, it has been argued that terra preta de índio holds a key to a sustainable agriculture in the tropics (GLASER et al, 2007). Its fertility is linked not only to charcoal[85], but also to the addition of organic wastes, which would provide the other elements that together would leave the soil more fertile.

Needless to say that these research are great but one should not forget the small farmers in the Amazon. Are these improvements thought for the small farmer or big producers? Are there technologies going to reach small producers or this would be one method of generating carbon credits?

The soil of the Amazon tells us a story very different from the one that was told for many decades. The three distinct perceptions of South American tropical soils demonstrate how diverse these views were, going from a region with extremely fertile soils, which was assumed by those who saw the forest, to a region described as green hell. It was on the 1980s that a third view emerged, a view that allowed for more than one reality in the forest.

It was in the 1980s that the scenario really began to change. How the Amazon was represented changed from one homogenous place with a small population to a heterogeneous forest which was capable of holding much more than initially thought. There should be an S in the end of the word Amazonia. The perceptions were not harmless to the extent that they had no further implications. Policies towards the Amazon forest reflected these representations.

The archaeological findings that helped to reshape the understanding of Amazonia demonstrate that the environment did not represent a constraint to social development. The recognition of past complex societies in the Amazon stresses the importance of recognising the cultural rights in the discussions regarding the future of the Amazon. Terra preta de índio, as one of the findings, is a key subject for the development of

[84] The world 'sustainable' is very tricky and needs to be used carefully. In this sense, 'sustainable' refers to the ability of a soil to produce harvest. That does not mean that the farmer will profit from what he/she has produced, the point here is that there will be a production and that that will be sustained through time.

[85] The fertility is not directly linked to the carbon in the form of charcoal in the soil. The charcoal can lead to the retention of other nutrients in the soil, that would, in their turn, enhance fertility.

future policies towards the forest as the existence of this soil breaks some of the misconceptions about the forest.

Many people that work in the field of anthropology and history agree that conceptions of nature are in fact socially constructed and that they differ based on both cultural and historical determinations (DESCOLA, 1996b). Because of that, a dualistic view of the world should not be imposed, as an ontological paradigm on other cultures in which the dualistic view –the western view - was not appropriate. This was the result of two events: a critique of the western metaphysics and epistemologies and ethnographic work.

The idea of nature is very vague (DESCOLA, 1996b). As a result, nature has been used in not only one set of dichotomy: nature-culture, nature-mind, nature-supernature. It is important to notice, however, that in all these distinctions, nature has been the all-encompassing totality that defines the features of that of which it opposes. The relationship between culture and nature was revised. Culture is both a creative force and the final product and nature is both a resource and a limiting feature (STRATHERN, 1980). The research that prevailed before 1980s privillege uni-focal views to explain scenarios that were multi-focal (MORAN, 1996). It is important to stress that the so-called hostility of the Amazonian environment was never proved through historical research (HECKENBERGER, 2005).

The ecological conditions of any given place are crucial for the cultural development of the population that inhabited it. This assertion, however, does not come without reservations. Three points can be made about it (HECKENBERGER, 2005). First, the ecological parameters of the Amazon are in great part still unknown. Secondly, productive environments – such as riverbeds – are more common than previously thought. Thirdly, one cannot forget that other ecological characteristics are also part of this equation.

The emphasis on equilibrium, stability and homeostasis was dominant until 1970s. From then onwards, gradually, there was a shift towards a non-equilibrium disturbance (STAHL, 2008). History and temporal dynamics began to have a more crucial role in the study. Although this shift did occur and that most scholars – as seen the literature – reject, or at least understand the difficulty in defending the idea of a wilderness, the underlying assumption that humans react to their environment is still very much present. To see the environment as a product of nature consequently means that there was such

a ‘pristine’ environment, untouched by humans. Here it is also important to notice that the pursuit of this wilderness is reflected in preservationist policies. The irony now is that we need human interference to maintain ‘wild’ ecosystems and species.

The legacies of the past are still pretty much evident and they do play a role in the present of the forest. What we may learn from the findings and how the new policies based on them will be elaborated, will shape its future.

To fully understand the history of the terra preta de índio research it is important to look at the history of the Amazon as a chapter in a broader history. In the next chapters of this thesis I will focus on the history of the Amazon in the internal scenario (chapter 2), in the international scenario (chapter 3) and how the forest appears in the current discussions on sustainable development and reduction of emissions of deforestation and degradation (chapter 4). Together, these chapters will provide a comprehensive picture of why terra preta de índio was out of the agenda, why it emerged and how it fits in in the current discussions on the South American rainforest.

Chapter 2

The Amazon in the Internal Sphere

The richness and diversity of the Amazon rainforest are widely known. Its key role in the regulation of ecological services is also notorious. For these reasons, also due to its extension, the Brazilian Amazon is an important part of Brazil. The Legal Amazon refers to 61% of the national territory[86]. All this area encompasses different realities within its borders. And despite all the size, that goes beyond the Northern states of Brazil, including parts of the states of Maranhão and Mato Grosso, the Amazon has not always been a priority in the governments, neither the region, nor its protection as a biodiversity spot. The region experienced the consequences of federal government plans. In the 1950s a new development phase began in Brazil (BECKER, 1982). This period witnessed the creation of the Superintendence of the Economic Valorisation Plan for the Amazon (In Portuguese SPVEA) and Brasília. The Amazon region started to have a distinct part in those plans. It is in 1964 that a Military Coup established a dictatorship that lasted until 1980s and throughout this period, a new policy focused on the Amazon is implemented.

Studies on the ecological characteristics of the South American rainforest have been conducted since 1800s. All the knowledge about the forest, together with centuries of incursions in the Amazon, however, have not translated into the construction of a governance architecture that efficiently protects the rainforest or creates the means for a development in the region that is more sustainable, which, at least in the discourse, is key for its future and consequently for the future of all of us. If there is a governance in place, is it a problem with the architecture itself? What is it promoting? Is it a problem with political willingness? Nature domination by humankind is, in fact, the domination of

[86] http://infoener.iee.usp.br/cenbio/brasil/amlegal/amlegal.htm Acess on 10 Jan 2010.

few humans over other humans using nature as a tool (LEWIS, 1947). It is necessary to go back to the history of the Amazon with another perspective, trying to identify key actors and their actions, going through the conservation policies for the forest and other practices that might have occurred in the region.

This chapter will analyse the place occupied by the Amazon in the national political scenario. The aim of this chapter is to identify how the region appears in the national plans in order to identify how the Amazon was seen and how that might have contributed to keep terra preta de índio out the scientific and academic agenda.

This chapter is divided into five parts. The first part is dedicated to the human-nature relationship. In this part an analyses of the different views regarding the Amazon will be presented. The representation of the Amazon to the Brazilian population is important because debates regarding archaeological, anthropological and ecological theories influence the way the public in general interprets society, nature and the relationships between them (FAIRHEAD & LEACH, 1996). This becomes a determining factor in the establishment of environment paradigms. The second part of this chapter is dedicated to the place that the Amazon occupied in the government plans in the twentieth century after the Military Coup. In the beginning of this section, however, there will be a subsection dedicated to the region before the Military Regime, as well as subsections for the 1970s, 1980s and 1990s. The third section is dedicated to unresolved issues related to the role played by the Amazon in the internal sphere. The fourth section focuses on terra preta de índio and the relation between the Amazon from the 1970s onwards and the research about this anthropic soil. The fifth section is on what to expect from the future.

Humans, Nature and the Amazon

The natural condition of mankind is one of scarcity (OPHLUS, 1973). This scarcity, however, had not been acknowledged from the eighteenth to the nineteenth centuries, creating a situation completely opposite to the one we live in now where scarcity has become an element that is always present. The abundance of resources has been a feature of the centuries of the enlightenment and the industrial revolution, hiding the natural condition of humankind and giving a false notion of unlimited resources. The history of humankind is the history of its relationship with the environment

(GUIMARAES, 1991). The impacts of human life have been – and always will be – reflected on the environment. And it is the increase of this impact, both in terms of quantity and quality, that alters the role of the environment, which was for a long time regarded as a stable factor, later to become part of the political agenda (HURRELL & KINGSBURY, 1992).

A milestone in the history of humankind is the domestication of nature (BENNETT, 1976; FiSHER, TURNER, MORLING 2008; DIAMOND, 2002). The foundation of food production, the removal of plants and animals from their natural habitats to introduce them in other places is an alteration of the environment with the purpose to quickly satisfy the needs of humankind. Other than altering the environment with direct actions, human beings also transform nature through social relations and through the forms in which their community is organised. The neolithic revolution of more than 9000 years transformed the human-nature relationship and the impact that the humans had on nature (BENNETT, 1976; GUIMARAES, 1991).

The domestication of nature, as many other events in history of humankind, can be described as the expression of the power of human beings over nature. However, the power of humans over nature is in fact the power of a few, not humanity as a whole. Nature is a tool, in other words, the power of humankind over nature is actually the power of a few people over others using nature as an instrument (LEWIS, 1947)[87]. Power is distributed in an uneven manner and this distribution is related to the means of production – money, land, technical knowledge, control over public institutions, etc.

With this argument in mind, let's go back to the Amazon. Who are these people that used nature as an instrument? Who has benefited from government plans of the 1970s onwards?

Different perspectives towards the Amazon

It is important to stress that in order to understand the reality of the region it is necessary to look at two aspects: international politics and national interests (GUIMARAES, 1991;

[87] Initially, its was thought that agriculture came about quickly and then led to the domestication of plans (OLIVER, 2008). This would then have led people to settle and consequently would have led to civilisation. This is no longer true. Now it is believed that agriculture came after domestication and a life of settlement. Before agriculture – which is domesticated crops – there was a period of human and plant interactions that were beneficial for all. Agriculture was therefore, not a revolution as people had been messing with plants for while (BALTER, 2007).

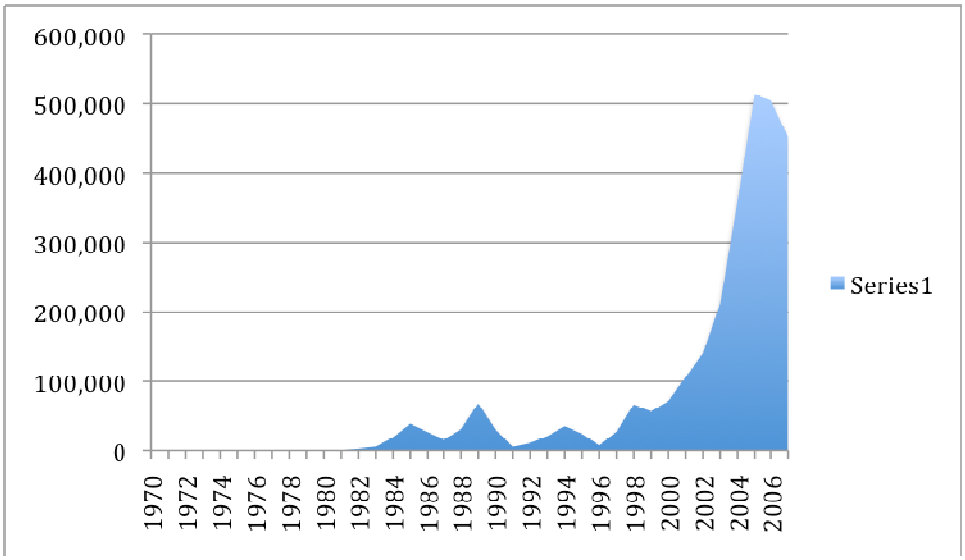
HURRELL, 1991). It is a combination of these two factors that delineate the future of the region. The importance of the forest goes beyond the national borders of Brazil. National projects are delineated both according to internal issues and to the international discourse of the moment and the role played by the Amazon in that context. One example that illustrates this last point is the Programme *Our Nature* from Sarney's administration (1985-1990), elaborated as an answer to the pressure that Brazil was under in relation to its ability – and willingness – to manage[88] the forest. It is the clash of these different forces, which is also represented by different actors, that generated conflicting projects.

The South-American rainforest is represented in different ways at different levels (BECKER, 2004). At the global level, the Amazon is seen as a space necessary for human survival, and, therefore, has to be protected. However, it is important to stress that there is a contradiction at this level. While the international community preaches the need to preserve the region, exalting its biodiversity and its importance in regulating the climate and the water regimes in the world[89], the international community also stimulates deforestation. A good example to illustrate this last point is soy. The Amazon is part of the international scenario, and one aspect that reinforces this role, besides its biodiversity, which is growing on importance with the reverberation on the discussion on governance and natural resources, is the fact that soy, meat and wood, main products in the region, are commodities in the international market (GLYCERIO, 2008). The graphs below show the increase in soy harvest in the Northern region of Brazil (figure 2) and in cattle raising (figure 3).

[88] Manage here is to protect the Forest.

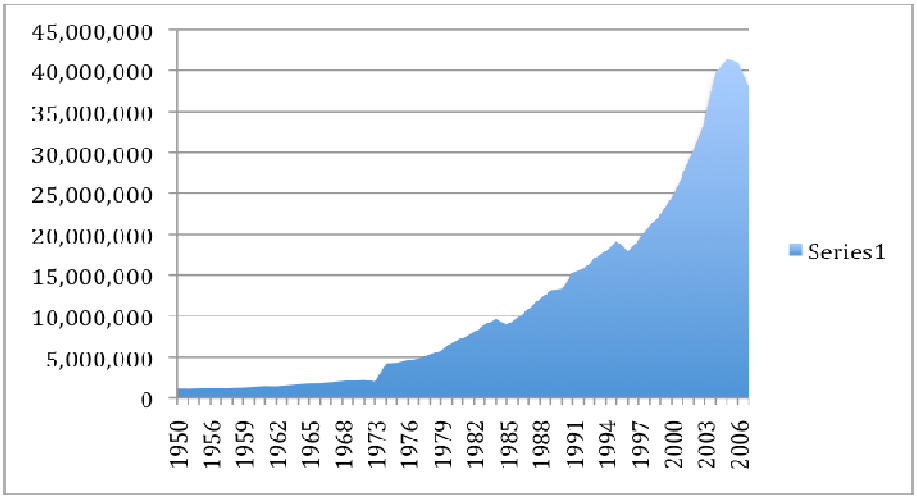
[89] In fact the Amazon is said to be a key regulator of several regimes, not just for water and climate. And a change in this system could trigger changes in several aspects that no one can forsee.

Figure 2 - Area of Soy Harvest in the North Region (1970-2007)



Total area of soy production harverst in the Northen region. IPEADATA www.ipeadata.gov.br 11 June 2011

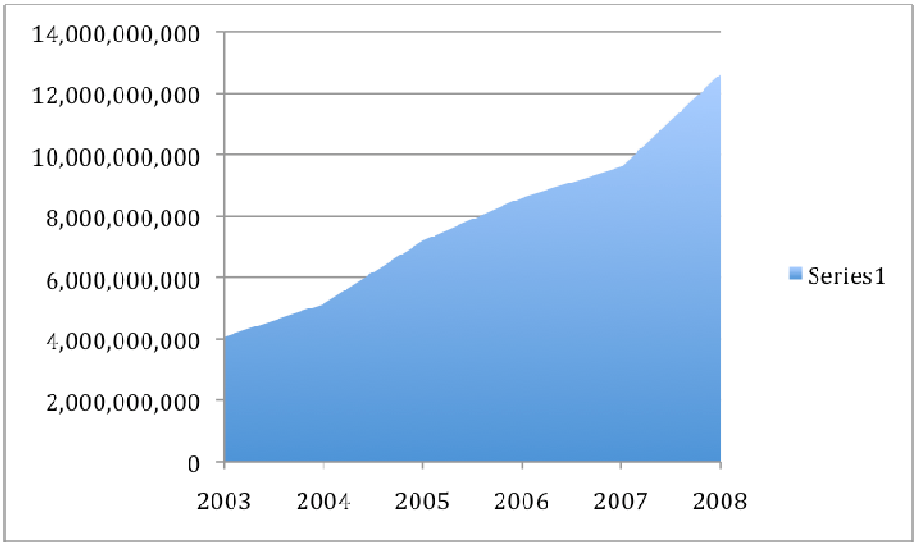
Figure 3 - Cattle Raising in the Northern Region (1950-2007)



Cattle raising in the Northen region of Brazil. IPEADATA www.ipeadata.gov.br 11 June 2011

In general, the share of the Northern region in the export sector has been increasing, as illustrated by figure 4.

Figure 4 - The Export and the Norhtern Region (2003-2008)



The participation of the Northern region in the export of Brazil. IPEADATA www.ipeadata.gov.br 11 June 2011.

This inconsistency in the international arena – at the same time that it takes on a conservation discourse and demands a firmer and more active position of Brazil in the protection of natural resources of the region, it also stimulates the exploration of its resources through the international market – generates conflicting actions.

One of the ways that the Amazon was portrayed was as the lungs of the world. The Global perception of the Amazon as the lungs of the world, responsible for the balance of the Earth, has two roots (BECKER, 2007). The first one is symbolic and is connected to the environmental challenge to save the planet. The second is economic and political, and it refers to the natural resource base of the region. The forces of globalisation have not eliminated the value of *in situ* richness. The valorisation of richness reinforces the importance of natural resources in a specific territory (BECKER, 2007). As the Amazon is one of the most biodiverse places on the Earth, the rainforest has, therefore, a strategic importance.

At the national level, the perception that dominates is the one that sees the region as a resource frontier, in order words, as a place to be explored, both as a settlement place and as a source of resources to be exploited, in a way that reinforces the sovereignty of the country in the region. In the 1930s, the region was the target of the March to the West, launched by Getulio Vargas as a guideline for national integration. In the decades that followed, immigration to the Amazon increased considerably and actions referring to the 'Fifty years in Five' of the Jucelino Kubitschek (1956-1961) government affected the region with the construction of roads. However, it was from 1966 onwards that there is indeed a regional planning for the region embedded in the national integration policy. The Amazon was then described as a demographic vacuum (LIMA & POZZOBON, 2005).

The contradiction regarding the Amazon seen in the international scenario can also be identified in the internal sphere. In the last four decades, the Amazon has been the target of conflicting public policies. On one side there is a development geared by the Federal Union. On the other side, policies focused on the protection of the environment – be that by secretariats or ministries - were elaborated. Examples of conflicting policies in Brazil are not short. The rural credit programmes, for example, that stimulated deforestation, mainly through cattle ranching is one of them. The Constitutional Fund for the North (in Portuguese FNO) alone invested between 1989 and 2007 US$3.5 billion in

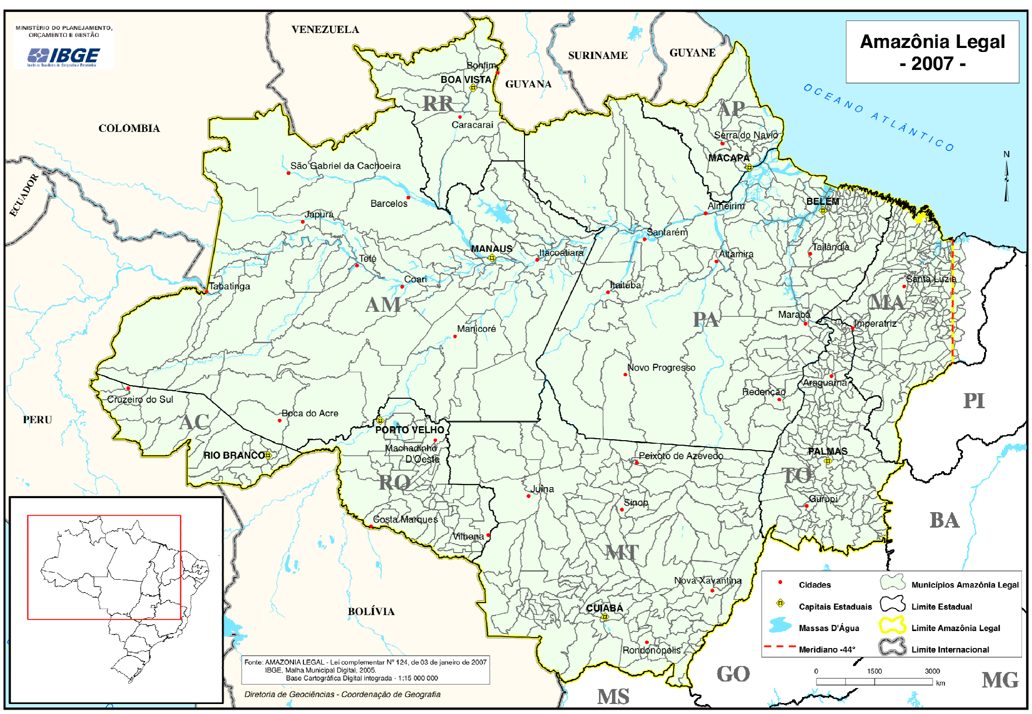
the cattle ranching sector (MAY & MILLIKAN, 2010). Although the programmes of the 1970s no longer exist, large-scale programmes are still on the agenda. The Growth Acceleration Programme (in Portuguese PAC) is a clear example for this. Such programmes carry out the construction of large dams at the Madeira, Xingu and Tapajós Rivers as well as the pavement of the highways. This Programme represented a step back in planning and socio-environmental impacts as well as dialogue with all the stakeholders involved have been set aside.

At the regional/local levels there were – and still are – the social needs of the local population, that is added to the impacts of the other representations creating a unique dynamic in the region. It is important to stress that within each representation there are always interests that can be either political or economic. Behind the March to the West, for example, there was the need to distress other regions of Brazil as the amount of land that exists in the Amazon was huge and it could generate economic gains.

The Amazon is represented both as a natural and as a resource frontier. It is, at the same time, a place to be conserved and a place to be explored. This inconsistency, a feature present at the local, national and the international arena, hampers an integrated and efficient management of the region. Businessmen have an advantage, they are the actors that benefit from the perception of the forest as a resource frontier, a vision embedded in the national government plans for the region. At the same time that it pushes for the conservation of the forest, the government stimulates the use of the region for the development of the country. The insertion of the Amazon in the international scenario reproduces this incongruence there. These discourses – that develop into policies for the region – impede a vision of integrated development for the region, that serves the needs of other actors, not just the entrepreneurs. This double-talk prevents the perception of the Amazon as a natural frontier to be dominant. The vision of the region as a resource frontier stimulates deforestation. Property rights, another important factor in the forestry management, is also a weak issue in the region, making it clear the inefficient condition of the state to deal with the issues that threaten the forest. In order to change reality, it is important that there is a change in the view of the rainforest, minimising these inconsistencies in relation to the region. Conflicting discourses and policies prevent a management of the region that has as its main objective the union between conservation and economic activity. It is also important that other actors, not only companies and big producers benefit from government plans.

The history of humankind is in fact the history of its relationship with nature. The history of the Amazon in fact the history of its role in government plans. From the 1960s until today, the history of the Amazon has been marked by projects, the imposition and implementation of a model of development that does not take into consideration the particularities of the region. In addition, it is important to remember that the nine states of the legal Amazon – Amazonas, Acre, Amapá, west do Maranhão, Mato Grosso, Rondônia, Pará, Roraima and Tocantins – are in different levels of development and of environment concern. This brings back the dicussion on the heterogeneity within Amazon, the Amazons within the political limitations of the legal Amazon. Tocantis and Maranhão, for example, do not have forest. Most of the territory of Roraima is composed of natural fields. The diversity between the states is great. See the delimitations of the legal Amazon (figure 5) and the political-admnistrative regional division (figure 6) in the maps below.

Figure 5 - Map of the Legal Amazon



Source: IBGE Maps

ftp://ftp.ibge.gov.br/Cartas_e_Mapas/Mapas_Tematicos/ Amazônia Legal 30 June 2011

Figure 6 - Political Administrative Regional Division of Brazil

Source: IBGE Maps

http://www.ibge.gov.br/mapas_ibge/pol.php 30 June 2011

The Amazon and Brazil

The Amazon encompasses a great part of Brazil, both for its size and for what it represents. In this section I will analise how the Amazon appears in government plans in order to identify how the South-American rainforest was seen nationally. I will focus on the 1970s onwards because this is when the government started the national development plans.

The process that started in the 1960s/1970s triggered structural changes in the region (BECKER, 2007). Four of these deserve further deliberation. First, there was a change in the connectivity. In the 1950 and 1960 the forest was seen as an island, independent of the rest of Brazil. The connectivity of telecommunication network had a crucial role for the national and international connection of the region. The second change regards the economy. The region was marked by extractivism, and now it is the home for an important industrial park – being in second place in mineral production in the country and third in the production of durable consumer goods. The third change refers to the demographic structure. With the construction of roads, the population that lived by rivers, started to be by roads, triggering an urbanisation process in the region. The fourth change refers to the Amazonian society. The urbanisation, together with the telecommunications and work mobility facilitated the increase of conscience by the population, with a broader and deeper political and social understanding. Consequently, social movements began to pop up in the region. This was the scenario from 1985 until 1996.

Governance

Before going over the singularities of the Brazilian environmental governance, it is important to look at what governance is. There are two issues that need to be stressed. First of all, it is important to stress that there is not only one definition that is adopted. Secondly, there has been a change in what is understood by governance. The changes brought by the events that took place in the 1980s until today have prompted a new meaning to the term. Its recent popularisation indicates that and this new connotation includes new forms of making politics as well as new actors and new themes (GOMIDES & SILVA, 2009). Governance refers to new forms of regulation that are different from the tradition state activity (BIERMANN, 2007). It entails new forms of multilevel policy and involves private-public cooperation to solve societal problems. Governance goes beyond the state as its sole actor. The term refers to a *structure that regulates agency as well as the process of regulation* (Mayntz, 2004:4 in Medina et al 2007: 3). The structure, in turn, would be the institutions. In this text we are interested in the structure of the environment governance in Brazil, more specifically in the Amazon.

Perz *et al* (2008) indicate that there is a dilemma within environmental governance. Although government projects in the Amazon have great political support, new

infrastructure without environmental governance will most likely lead to social conflicts. Most of the past projects led to environmental degradation, to unofficial road building, deforestation, etc. This would in turn damage the sustainability of the livelihoods of the regional population, which would make the forest more susceptible to climate change. This situation undermines the future of sustainable livelihoods. In other words, an environmental governance that has as its main purpose the conservation of the forest as well as the maintenance of local livelihoods and is connected to all the other government sectors in the Amazon region is crucial for the future of the Amazon forest.

Another crucial factor before going into the governance structure of the Amazon is the focus of the conservation efforts. Although it has been well publicised that the deforestation in the Amazon has been going down in the past 5 years, this improvement does not necessarily mean that the forest is not being degraded. A forest can be degraded for decades without being deforested[90]. Most of the discussion regarding the Amazon has focused on deforestation, leaving other issues related to the forest – such as degradation, the livelihoods of the people in the forest – relegated to a second realm. If we are to achieve a more sustainable use of the forest, these issues have to be addressed. Now that we have established that the governance architecture has not rendered the conservation of the forest, we can look at the origins of the biodiversity governance architecture in Brazil.

Brazil is one of the most biodiverse countries in the world (MITTERMEIER et al, 2005) and the efforts to preserve this biodiversity began in the twentieth century. The year of 1934 was key for the Brazilian legislation regarding the environment. It was then that the Government of Getulio Vargas wrote a number of Codes regulating the use of natural resources, such as the Forest and the Water code (CAVALCANTI, 2004; DEAN, 1995). Although not all of them were focused on promoting a more sustainable use of these

[90] Numbers released by the INPE (the National Institute of Spatial Research) (Agencia do Estado, 2009) have shown that although deforestation has been going down, the levels of degradation are almost double that of deforestation. This demonstrates that degradation has to be taken into account. According to the IPCC, degradation is (IPCC 2003: 14) the long-term loss of at least y% of forest carbon stocks (and forest values) since time that is directly human induced by a certain amount of time and not be deforestation (Murdiyarso et al 2008: 100). The activities that lead to degradation are: selective logging, large-scale and open forest fires, collecting non-timber forest products as well as wood for fuel, shifting cultivation, producing charcoal, grazing and sub-canopy fires. Degradation, however, is harder to pin down, as well as monitor and verify, than deforestation.

resources[91] – they focused on a more rational control by the planers and the federal bureaucracy – these documents are landmarks in the environment legislation.[92]

The progress made towards the further protection of the Amazon is less emblematic. The first efforts to create a conservation structure were made from the 1930s onwards. Nevertheless, the past 40 years witnessed great expansion in these efforts. It was only after the Stockholm Conference in 1972 that environmental concerns that involved preservation and conservation became an issue in the federal government (MELO, 2006; VIERA, 1992; BURSZTYN, BURSZTYN, ASSUNÇÃO, 2004; GUIMARÃES, 1991). The Oil Crisis of 1973 also played an important role in this phase of Amazonian occupation. Due to the crisis, Brazil was forced to change its geopolitics and the Amazon became a resource frontier[93].

The Amazon before the Military Coup

Until mid-twentieth century, the history of the Brazilian rainforest was determined by extraction cycles. The first cycle was not the rubber one; it was the 'drugs of the hinterland'[94], which lasted from the first centuries of the arrival of the Europeans until mid-nineteenth (FERREIRA & SALATI, 2005). Later, it was the time for the rubber cycle, which expanded and took control until early 1900. A curve of the economic activity of the Amazon rainforest from 1889 to 1942 would rise up until 1912 to fall afterwards and remain stationed with few variations (FERREIRA NETO & ARCHER 1945). This curve, illustrated by the figure 7, represents the Amazon rubber story. The export of rubber from Brazil increased six-fold from 1870s to early decades of the 1900 (ROSENBAUM & TYLER, 1971).

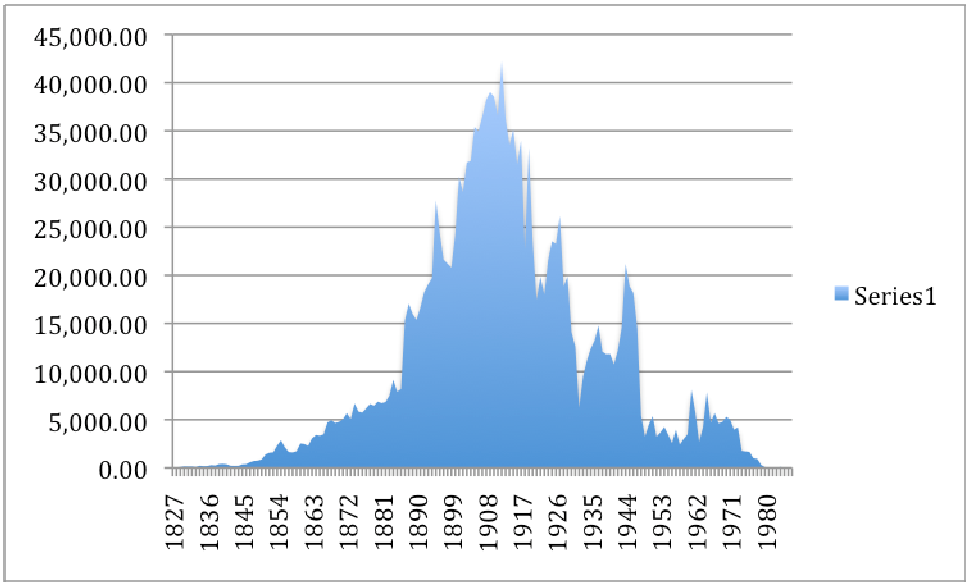
[91] The Water Code, for example, focused on the water use by the industries rather than the use of water by humans.

[92] In 1965, the Law no. 4771 implemented what was then called the New Forest Code – new because the first Forest Code was from 1934. The need for a new Forest Code came from the fact the Code from 1934 was not successful in its implementation. Since the year of 2010 a new wave of discussion started in Brazil as deputy Aldo Rebelo pushed for a change in the Forest Code of 1965.

[93] This was true until 1985 when the second oil crisis hit (MELO, 2006).

[94] The Drugs of the Hinterland – in Portuguese, *as Drogas do Sertão* – were cinnamon, cloves, indigo, cacao, timber, aromatic roots, and etc, there were used in food production, seasoning, naval construction and pharmacy in Western Europe.

Figure 7 - Rubber Export in Tonnes from the Northern Region (1827-1980)



Rubber export in tonnes from 1827 until 1980. IPEADATA www.ipeada.gov.br 09 June 2011

The impact of the rubber boom can be seen when we look at the demography of the region. The population of the Northern region was around 127 thousand people in 1823 (CARODO & MULLER, 1977). In 1872 that number had gone up to 340 thousand and in 1900 the population of the forest was of 700 thousand people. In 1920, there were 1400000 people in the Amazon. These numbers reflect the rubber cycle, which attracted thousands of people to the region to feed the international need for rubber. From the 1940s onwards there was a plan to revive the cycle. This was due to the international demand for rubber during the Second World War. The United States heavily invested in revitilising the rubber sector and once again there was migration towards the Amazon. Production was not what was expected, however, and as soon as the war ended, the Unites States cancelled the remaining contracts. In 1967 the Rubber Superintendece (in Portuguese SUDHEVEA) was created by Geisel. Three plans to estimulate rubber tree cultivation, the Programme to Stimulate Rubber (in Portuguese PROBOR) I (1972), II (1977), III (1982) were elaborated with the aim to achieve 400000 hectares of rubber tree cultivation. They only reached 133000. During the last PROBOR the Supertendence lost prestige and in 1989 it became extinct.

Until the 1930s, there were a few attempts regarding development planning in Brazil (MATOS, 2002). It was during that decade, however, that the March to the West took place. The March to the West, a movement from the South to the North of Brazil in 1938, was encouraged by the dictator of that time, Getulio Vargas. The aim of the March was to occupy the Centre-West of Brazil (GARFIELD, 1997). Vargas argued that Brazil had to look to its backyard, which had been forgotten for many centuries. It would be from these lands that the future would come, he said.

In 1953, Getulio Vargas created the Superintendence of the Amazon Valorisation Plan (in Portuguese, SPVEA). The aim of this institution was to promote agricultural and cattle raising activities in the region and to integrate it to the national economy. The SPVEA, which later turned into SUDAM, was in charge of the incentives offered to industrial and agricultural enterprises so they would settle in the Northern region (IPEA, 1978). Within the objectives of this Institution, as it was established by the law no. 1806, article 7, it is important to stress the following: the promotion of agricultural production development, the promotion of cattle raising, the promotion of the use of the mineral resources, the establishment of a credit system and the promotion and the straighten of commercial relations between consumers and providers, either in the national or the international level (BRASIL, 1955). The Amazon was described as “an empty space, economically unproductive and politically dangerous” (BRASIL, 1955: 34). This idea of being an empty land, an inhabited place has its roots in the principle of *terra nullius*. This principle dates back to colonial times, when the colonising powers saw the new world as *terra nullius*, lands that were unpopulated and therefore could be possessed by them (TRIPCONY, 2007). The representation of the Amazon as an empty land is a continuation of this principle (POSEY, 2008).

Still in the 1950s, the president Juscelino Kubitschek launched the Target Plan (in Portuguese *Plano de Metas*) from 1956-1961. This Plan is considered one of the firsts to establish targets to be met by the private sector and to promote aggregative studies of the national economy (MATOS, 2002). The priority of this Plan was to increase the exports; to manage a selection system of import goods and to replace the imports for internal production and its aim was to transform the economic structure of Brazil through the establishment of basic industry and through the reformulation of the interdependence in the world economy (IANNI, 1986). This is why the phrase that was the flag of the Plan

was '50 years in 5 years'. The Plan consisted of 30 targets[95]. Although the Plan did not focus on regional planning, it did affect the Amazon as it transformed the territorial structure of the country.

From the second half of the twentieth century onwards, the Amazon becomes an area of geopolitical apprehension and because of that the state needed to be present in the region (BONFIM, 2010). It is in this period that the National Institute for Amazon Research (in Portuguese INPA) was created. This Institution was also important in the revitalisation of another Amazonian Insitution, the Emilio Goeldi Pará Museum. Although the Museum was founded in the nineteenth century, it was not in great condition in the second half of the twentieth century. INPA and the Museum signed an accord in 1954 that stated that the Museum would be managed by INPA in the following 20 years[96]. This allowed the Museum to intensify scientific research and save its collections.

Within the context that Brazil was in – that was the time to make Brazil grow, 50 years of development in 5 years – the Amazon was to be occupied and play its role in the growth of the country. This was not so clear until the Military Regime, but the idea of there.

Military Regime

1960s

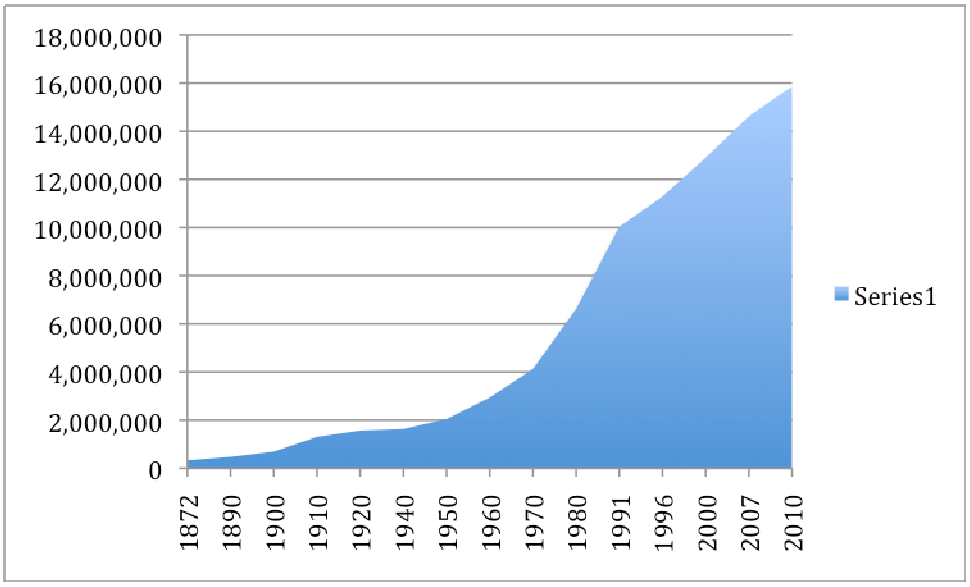
From the 1960s onwards the government started to implement a national integration policy. This policy had three national development plans that were part of the Brazilian strategy for national security. The Amazon was a key part of that strategy. Politicians saw the Brazilian Amazon as a barrier for progress (VIANA, 2001). This barrier would be overcome through three actions: penetration in the forest through roads, abandonment of the transport that was predominant in the region, sailing, and the incentive to deforest. Three lines of intervention were delineated: colonisation projects for the public and private sector, huge agricultural and cattle raising projects, and the insertion of the region in the international market. The result of national integration policy was a new pattern of territorial occupation with great social, economic and environmental impact for the region.

[95] The 31st Target was the development of Brasília.

[96] <http://www.museu-goeldi.br/institucional/linhatempo/lt_fs.htm> Accessed on the 24th October 2011.

With military take over in 1964, the model of capital expansion was accelerated (BARBOSA, 1996). The military government was also concerned about the international 'greed' over the Amazon forest. The impact of the plans and projects that became part of the history of the forest from 1970s onwards can be seen in the increase in population[97]. In 1960, 5,693,545 people lived in the Amazon region. In the year of 1991 that number jumped to 16,988,040 (VIANA, 2001). See figure eight to grasp the increase in population.

Figure 8 - Population in the Northern Region of Brazil from 1827-2010



Population in the Northern region of Brazil from 1872 until 2010. Source: IPEADATA www.ipeadata.gov.br 11 June 2011.

Already in 1967, the marshall Castelo Branco launched the Operation Amazon (in Portuguese *Operação Amazônia*). The aim of this operation was to give dynamism to the regional economy and stimulate the population to move there. Castelo Branco in the speech of the launch of the Operation said that the need to generate progress with safety in the region was evident and the actions to do so were what was called Operation Amazon (SUDAM, 1968). In 1966 the SPVEA was substituted by SUDAM –

[97] Needless to say before the 1970s the Amazon was also part of the government plans. However, it was from the 1970s onwards there this was not sporadical but a constant in the history of the forest.

The Superintendence of Development in the Amazon. SUDAM was in charge of all the duties of SPVEA. The institution was in charge of the federal action in the Amazon region and it had as it main financial agency the Bank of Amazonia (in Portuguese BASA) (CARDOSO & MULLER, 1977)[98],[99].

Also in that decade, the Military Government created the National Indian Foundation (in Portuguese FUNAI) - in 1967 - to be responsible for all the issues related to the indigenous populations. The Foundation was under the responsibility of the Interior Ministry and the National Security Council (CARVALHO, 2000)[100]. The aim of the Foundation, rather than to protect and defend the indigenous population, was to assimilate them into the Brazilian scenario. The indigenous populations were seen as primitive savages that should be prepared for a modern life. This was the view of the government of that time.

It was also in the 1960s that the Manaus Free Trade Zone (in Portuguese ZFM) gained more strength. Although it was created in 1957, in 1967 the Zone was reformulated. It is from this point onwards that the government establishes a tax incentive law for the following 30 years for the implementation of an industrial, commercial and agribusiness high-level area in Manaus. This is how the model that exists today was born, an area of 10000 km^2. The Superintendence of the Free Trade Zone of Manaus (In Portuguese SUFRAMA) was the agency responsible for managing this model. The aim of the Free Trade Zone was to leverage development in the region, neutralising with the incentives the advantages of other areas in Brazil. The creation of the ZFM is also related to the policy of occupying the Amazon, integrating it to the country.

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[98] In the year 2001, Fernando Henrique Cardoso extinguished the institution and the Agency for the Development of the Amazon was created in its place (LIRA, 2005). In 2003 President Lula formally announced the creation of the Superitendence of the Development of the Amazon (SUDAM) and in 2007 this 'new' institution was born with the Complementary Law number 124 of the 3rd of January.

[99] SPVEA and later SUDAM, together with the Bank of Amazônia (BASA), was in charge of the fiscal incentives. In an attempt to stimulate the settlement of industries in the region, there were several mechanims, such as isemptions, deductions and financial reliefs. The isemptions refered to: tax revenue, import and export tax, stamp tax, amongst others (BANCO DA AMAZÔNIA 19??: 20).

[100] FUNAI was not the first institution to be created to overlook issues related to the indigenous population. In 1910 the Service for Indigenous Protection (in Portuguese, SPI) was created. The SPI operated officially until the 1967, when it was replaced by FUNAI. The Service's first director was Cândido Rondon. Getulio Vargas put Rondon in charge of the National Council for Indigenous Protection (in Portuguese CNPI) in 1939. At that time, the Indigenous population was considered a national issue (FUNARI & PIÑON, 2011: 91). The SPI (1910-1967) was to accustom the indigenous population through the introduction of objects and demands that would eventually lead to the end of an independent indigenous community.

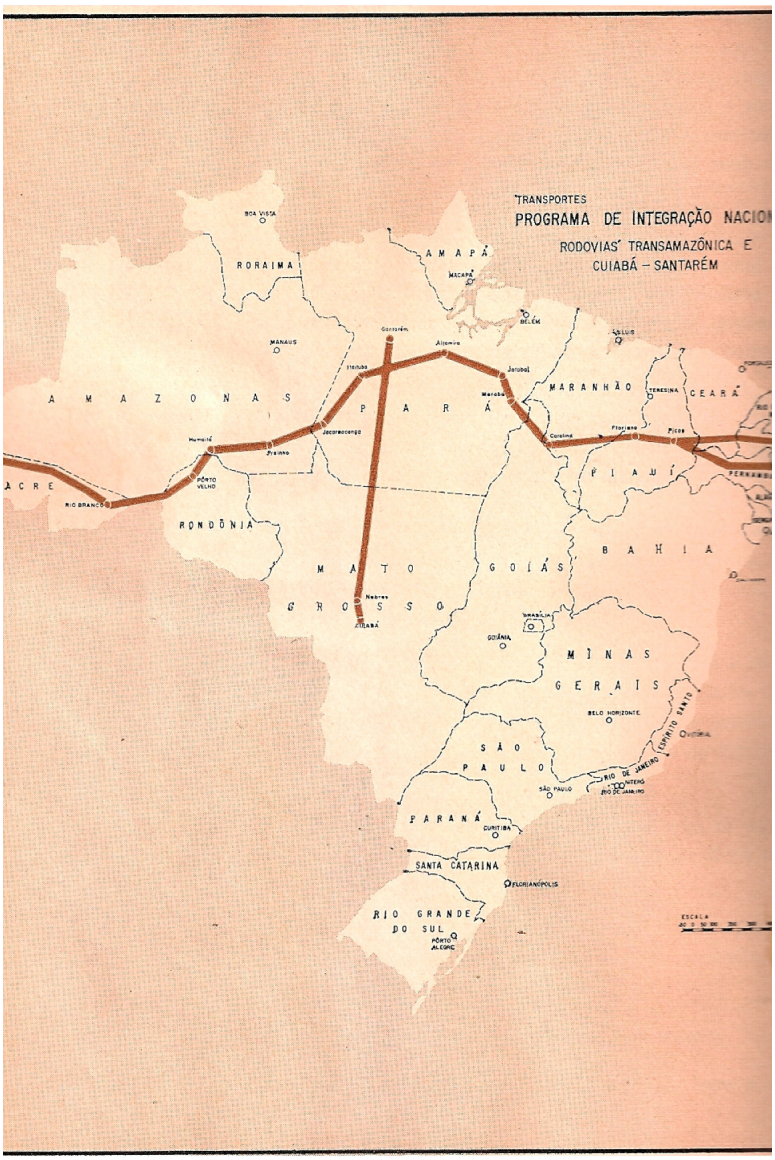
1970s

In the 1970 the government approved the National Integration Plan (in Portuguese, PIN), which was part of the First National Development Plan (in Portuguese, I PND), implemented from 1970-1974[101]. The PIN was a financial mechanism to make both the occupation and integration of the region to the country viable (MELO, 2006). The 1st PND represented the Brazilian way of development, which had three national objectives (BRASIL, 1971): raise the country to the level of a developed nation, double the income *per capita* by 1980 and lead the economy into a GDP in 1974 between 8 and 10%. The development strategy encompassed the entire country, bringing the Amazon to the centre of discussions. Apart from the North and South integration, there was also going to be a East-West integration front, which would link the non-qualified labour force in the Northeast of Brazil to land and other natural resources in the Amazon and the Central Plateau (BRASIL, 1971).

The National Integration Plan (PIN) was a direct response to the severe drought of preceding years in the Northeast. This situation forced Médici, the general in power at the time, to think about the situation of that region. In addition, the Brazilian elite and the military were worried that the Amazon would be taken over due to the lack of colonisation (SKIDMORE, 2004). Apart from the PIN, there was also a Programme to Redistribute Land and Stimulate the Agro-industry in the North and Northeast. The PIN consisted of the construction of the Transamazônica, an interstate road that would connect the Amazon to the Northeast, and the road from Cuiabá to Santarém, from North to South, which would link the Central Plateau to the Centre-South of the Country. The map below illustrates the actions of the PIN.

[101] Although the timeframe of the IPND was from 1972-1974 and the PIN was part of it, within the PIN there were plans that started before, such as the Irrigation Plan of the Northeast. The PIN itself was created in 1970 by the Decree—Law no. 1.106 of 1970.

Figure 9 - Map of the PIN and the Amazon



Source: the I PND Brasil Ministerio do Interior 1971: 32.

The implementation of the colonisation project in the Transamazonica - The PROTERRA - focused on the small producer, in particular the one without land. The state would sell land to him using credit in the long term. The PROTERRA also implemented agricultural projects with the aim to stimulate the agricultural expansion in the North and Northeast. This was also based on credits and incentives at low interest rates.

The strategy for the Amazon was based on two fronts (BRASIL, 1971): physical, economic and cultural integration into the Brazilian community, and economic occupation and development to absorb the population surplus from other regions and to expand the economic frontier. The construction of infrastructure was one of the pillars for occupation. Emphasis was given to paving roads and modernising the ports of Belém, Santarém and Manaus. The Radar for the Amazon Programme (RADAM) was key to carry out an integrated survey on the region[102]. The growth process would be based on the fiscal incentives of SUDAM and SUFRAMA, which would follow certain guidelines. They were: the selection of regions of integration and development, the definition of priorities for each sector for priority and dynamic sectors, as well as for export activities, and the favouring of colonisation programmes, particularly for the Transamazonica area. This Plan disfigured the Amazon and triggered the influx of people from other regions – especially the Northeast – attracted by major development projects. Both the first and the second PND had specific plans for the Amazon, the Amazonia Development Plans, based on the guidelines of the National Development Plans and on the information given by SUDAM.

The guidelines of the PIN and of the PND did not deliver the expected result. The towns designed did not take of, production was not what was expected. Needless to say that the colonisation carried out from 1970 to 1974 was not successful as the ecological conditions of the region were not necessarily assessed and understood (KOHLHEPP, 2002). Despite the critics, the government went through with the programme concerning the Amazon, which, as Skidmore (2004) argues, reflects the authoritarianism of the Brazilian government that did not listen to the critiques nor conducted previous studies regarding the viability of the programme. This lack of knowledge[103] of the region is actually a feature that is present throughout the history of the forest. In the colonisation programmes, for example, the government decided on all the seeds, the herbicides and the man-days of labour. However, due to the lack of knowledge of the region, production did not turn out to be what was expected. The crops selected were not the best suited

[102] It is important to stress the impact of the RADAM Project. The Project carried out an integrated survey of the natural resources aof an area of 1.500.000 km^2 near the influence area of the Transamazônica. Later, due to its sucess, the Project was gradually extended to all of the legal Amazon and then to all of Brazil.

[103] Although research had been carried out in the region in previous years – see chapter 1 – this knowledge was not enough to produce plans that reflected the reality of the Forest.

for the region (SMITH, 1981)[104]. This lack of information – and the assumption that it was the same as in other regions of the country – led Emilio Moran to say that the Amazon was in fact a knowledge frontier (MORAN, 1985). That, added to the high costs of the roads, such as the Transamazônica, were all reasons to trigger a different approach: big projects with high capital and technology. Amongst the territorial strategies, one can clearly see a change from a strategy focused on the colonist to one focused on big business (MELLO, 2006).

The Second National Development Plan (II PND) was from 1975-1979 during the Médici administration. New areas were going to be occupied, especially in the Centre-West, the humid valleys of the Northeast and in the Amazon (BRASIL, 1974). The II PND was elaborated in order to consolidate the occupation of the Amazon through a new wave of national integration efforts. The Amazon was then the largest area in the world with low agricultural or industrial development. The Project was done under a "productive occupation of the forest" flag (BRASIL, 1974: 65). Three programmes were set up: integrated use of valleys programme (Tocantins-Araguaia, Tapajós, Xingu); sectorial programmes based on enterprises, and colonisation programmes. The orientation for the activities was focus on export (BRASIL, 1974). With that in mind, three fields were identified: the farming and cattle raising and agro-minerals programme of the Amazon (in Portuguese Polamazonia), the metallurgic and mineral complex of East Amazon and the Forestry Resources Development and Rational Use of Amazonian soils Policy. In the 2nd PND, the export sector gained further importance and there was a continuous effort to stimulate export, specially in the manufactured and minerals/agricultural products.

The II PND was elaborated to create economic growth, in particular regarding the export growth of industrialized and agro-products. The colonisation of land was aimed at private companies that could have up to 500000 hectares of land (MELO, 2006). Fiscal incentives were used as mechanisms, organized by SUDAM focusing on agriculture and cattle raising projects and industries. The 2nd Plan adopted the concept of development regions (in Portuguese *Pólos de Desenvolvimento*). The Plan created 15 regional centres and it determined the type of economic activities for the empty areas of the territory. A key element of this programme was the Polamazônia and its implementation was the responsibility of the Planning Secretary, the Interior Ministry, the Amazonian

[104] The crops were chosen by INCRA and EMATER (the Enterprise for Technical Assistance and Rural Extention). Planners did not pay enough attention to the varieties of rice used by peasants.

Bank and SUDAM. The Programme originated from the concern of the government in integrating the region to the country, but there was also a concern with national security. The aim of the Programme, however, was to promote the full exploitation of the agricultural and cattle raising potential of the region (BONFIM, 2010). See the map below for an illustration of the activities of 2nd Plan.

Figure 10 - Map of the Polamazonia

Source: II PND Brasil, Ministerio do Interior 1974: 59.

SUDAM had decision power to plan where the money that was allocated to the region would be invested. The institution did not undergo a reform to redirect the logic behind the allocation of funds (FALEIRO, 2001). This is clearly represented by the fact that in the year 2000 SUDAM was still financing projects such as those denounced by the Agricultural Workers Federation (in Portuguese FETRAGRI).

Also part of the PIN was the Perimetral Norte, which would start in Acre and end in Amapá, covering 4000 km^2. The opening of the Road would take place between (1973-1976) and would be followed by colonisation projects (1978-1979) that would go through indigenous land not yet reached by FUNAI. There were confrontations with indigenous people with casualties also due to deseases. It was also during this period that the project RADAM found key mineral deposits in the region. This led to an invasion of miners, which worsened in the following decade.

1980s

The 1980s was also the stage of another development plan of the Military Government. The III PND was from 1980 to 1985. The general in power was Figueiredo and the focus was still on the colonisation of the Amazon by colonies from the South of the country. This, however, was a period of inflation and of the debt crisis. Although the efforts to make the country grow paid off – the GDP was of 6.8% - inflation doubled in only one year. At that time, there was no longer the 'development' euphoria in the air, which was present in the other two PNDs. By 1982, the III PND was declared a failure. It is important to stress that the III PND was the first Plan not to have a separate plan for the Amazon region (MORAN, 1985).

The 1980s also represent a landmark in the environmental governance front. It was in 1981 that the National Environmental Policy Law (no. 9638) was edited (CAVALCANTI, 2004; JACOBI, 2003). The Law establishes concepts, principles, tools as well as penalties and mechanisms for formulation and application of guidelines. Environment is defined as the *agglomerate of conditions, laws, influences and interactions be that physical, chemical or biological, that allows, hosts and conducts life in all its forms*[105]. It is the Law 9638/81 that establishes the foundation for an Environmental National Policy as it creates the National Environmental System (in Portuguese SISNAMA). The

[105] Translation of the author.

SISNAMA is responsible for the articulation of the entities that refer to the environment in the three spheres – federal, state and municipal[106].

The Law adopts the polluter-pays principle as a way to identify responsibility and it establishes the obligation of who causes environmental loss to be responsible for its reparation. It is also this Law that imposes the need to conduct studies regarding the environmental impact of policies and enterprises. On and all, the National Environmental Policy Law represents a step forward, leaving the approach that sees environmental problems in a narrow way based on the control of pollution and adopting a more systemic approach.

In 1988, the Programme *Our Nature* was launched by the Sarney administration (1985-1990). The latter was a direct response to the national and international pressure that the country was suffering at the time. The Programme would reduce the environmental impact in the Amazon. Our Nature was linked to the creation of conservation units as well as the increase in number of the identification and demarcation of indigenous lands (MELO, 2006). The occupation of the Amazon forest was, during the 1970s and 1980s, based on a model that prioritised big enterprises and big farms. At this time, the state had a key role, stimulating migration and creating the tributary conditions to seduce business to move to the North.

The Constitution of 1988 had a key role regarding the place the environment occupies within Brazilian politics. The Article 225 of the Constitution states that all individuals have right to a clean and safe environment[107]. The Constitution also makes compulsory the elaboration of Multi-annual Plans (in Portuguese, PPAs). Studies conducted by the National Bank of Social Development suggested that territorial divisions were important to optimise the plans; these were called National Axis for Development and Integration.

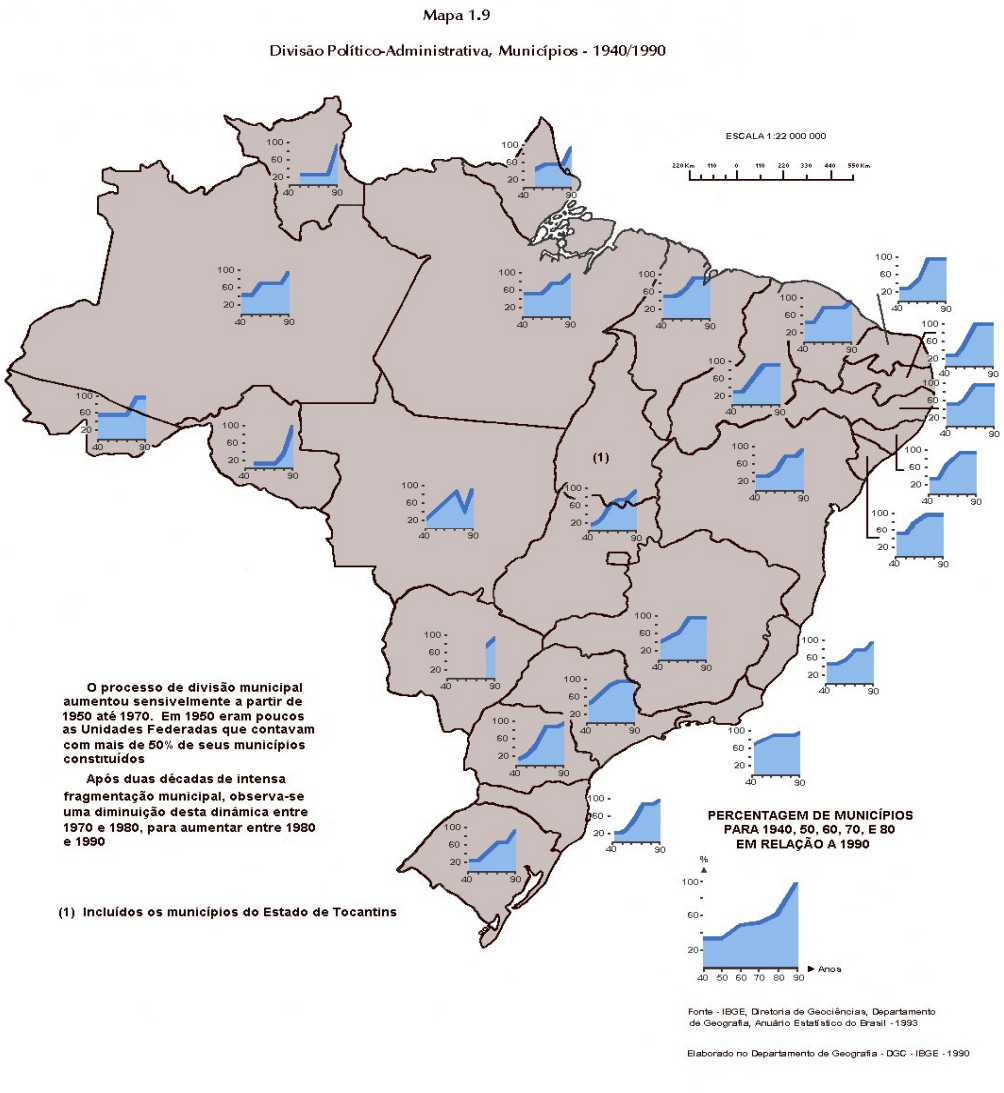
[106] Bodies and entities of the Union, states, the federal district, municipalities and foundations responsible for the protection and improvement of environmental quality, form the SISNAMA. The superior body of the SISNAMA is the Government Council. The Consultative and deliberative body is the CONAMA; the central body is the Environment Ministry and the Executor body is the IBAMA. The sectional bodies are the state bodies responsible for implementing and controlling projects/activities that are in the environment scope. The local bodies are those in the municipality sphere that are responsible for the control at that level.

[107] **Article 225.** All have the right to an ecologically balanced environment. which is an asset of common use and essential to a healthy quality of life, and both the Government and the community shall have the duty to defend and preserve it for present and future generations. http://www.v-brazil.com/government/laws/titleVIII.html 30.04.2011

The 1988 Constitution was also important regarding the status of the indigenous population. The Constitution of 1988 broke with past Constitutions, which tried to incorporate and integrate the indigenous population to the national society. Rather than push for integration, the Constitution of 1988 recognises the right of these populations to preserve their culture and identity (PLANALTO DO GOVERNO, 2011). It is important to say that during the 1970s, the people of the forest were not yet politically organised and non-governmental organisations and environmentalists were not yet as powerful and with the political power that some have now.

With the writing of the new Constitution and throughout the 1990s, a new federalism was instituted in Brazil (MELO, 2006). The new governance structure that unfolded there onwards had great impact in the Amazon, both in environmental and regional development terms. This is due to the fact that competing claims of different instances made cooperation between the federal, state and municipal powers necessary. From 1960 to 1991 the number of municipalities doubled in the Amazon region, going from 277 in 1960 to 529 in 1991 (VIANA, 2001). See the figure below the increase in municipalities in Brazil throughout the years.

Figure 11 - Increase in the Number os Municipalities



Source: IBGE Maps ftp://ftp.ibge.gov.br/Cartas_e_Mapas/Mapas_Tematicos/ Evolução Municipal 30 June 2011

The return to democracy

Decentralisation

The role of the municipal power inherent in the Federal Constitution of 1988 deserves further attention. More power to states and municipalities means that the Constitution favours decentralisation (MATHIS & FARIAS FILHO, 2004) and therefore a more

participative management approach (CAVALCANTI, 2004; JACOBI, 2003). This is not exclusive to the environment of course; it is extended to all subjects. Municipalities have the opportunity to create councils, establish funds as well as elaborate legislation that will regulate the use of a specific resource. The success of such councils depends on the political power of its members.

With the FC of 1988, the municipality, as a government body, reaches the highest importance in contrast with its role in previous constitutions. Some municipalities can also credit environmental licensing, before only a responsibility of the state. The Federal Union has private competitive competence. States have supplementary and competitive competence. Municipalities have competence to legislate on local interests to add to federal and state legislation (AYRES, 2008). According to the Constitution of 1988, the responsibility to protect the environment is common and the parts are jointly liable, so the different levels ought to both focus on what competes to them and work together to add to over-reaching rules. Therefore, regarding the environment, municipalities, states and the federal union have common administrative competences. The federal union acts in broader terms, with more general laws. States focus on regional interests and municipalities focus on local interests.

The creation of IBAMA in 1989 could be seen as a step back in the process of decentralisation as the Institution tended to concentrate the decision-making at the federal level. This process found barriers, not only from the states but also from other government bodies, as they faced restrictions to their actions due to environment regulations. There was a tendency to create a process to reach out the environment management within the country. This, added to the difficulties of the Environment Ministry and IBAMA, helped to trigger the process of decentralisation.

One step further was the inclusion of civil society participation. Within the environmental realm, civil society participation takes place in three instances: environmental councils, watershed committees and areas of environmental protection (JACOBI, 2003). However, it is important to highlight that these instances are rather formal and have little or no power to influence decision-making. In these places, representation can be contradictory and serve no one. Since the beginning of the 1990s until the 2000s, the mechanisms of participation have increased, but they are underused and have not yet made a difference.

Other laws help form the environment governance structure in the country. The Public Civil Action Law from 1985, for example, is one them. Although not strictly related to the environment, this Law refers to norms regarding damage caused in the environment, consumer, goods that have a historical, artistic and landscape value (CAVALCANTI, 2004). In the 1980s, other environmental laws were created, such as the Costal Management Law (1988), the Agro-Toxic Law (1989) and the creation of the IBAMA Law. The 1990s is also full of examples, such as the Water Resources Law (1997) and the Environmental Crimes Law (1998).

Within the environmental governance structure, the Environment Ministry has a key role. Its main purpose is to plan, coordinate, supervise and control the implementation of the federal environmental policy. It is the responsibility of the Environment Ministry to set guidelines for the balanced and sustainable use of the environment in Brazil, also respecting the independence of local governments and, by doing so, the Ministry also leaves space for further participation (CAVALCANTI, 2004).

The most important mechanisms that refer to environmental issues after the 1988 Federal Constitution and the laws that directly or indirectly had an impact on the environmental management are: the environmental impact reports, environmental councils and public hearings (AYRES, 2008; GOMIDES & SILVA 2009). This structure promotes – at least in paper – the engagement of the society, broadening the discussion.

One tool that plays an important part towards conservation is the national system of conservation units (in Portuguese SNUC). Around 1970, there were only 14 national parks, which represented a total of 27.565km^2 (MITTERMEIER et al 2005). There was only one park in the Amazon – the Araguaia National Park – with 20.000 km^2 at that time[108]. In the following years, changes were made. In 1974 the National Park of Amazonia was created with 10.000km^2. This was the direct result of the national and international concern regarding the future of the Amazon. Let's not forget that only two years before the Park was created, the Stockholm Conference shook the world and put the environment in the political agenda. This concern triggered the development of a programme that would identify priority areas for biodiversity. From 1979 until 1989, five national parks as well as four reserves were created. Together, they covered a total of

[108] In 2005 the park had 5.000km^2.

80.871 km^2. The Special Environment Secretariat (in Portuguese SEMA) of 1973 was also following these lines. The Secretariat was pushing for conservation parks as well as research and capacity stations. In 2005, there were 30 ecological federal stations covering 71.706km^2. The years between 1970 up to 1990 represents the rapid growth period of the park system in Brazil. All together, in that period, 22 national parks, 20 biological reserves and 25 ecological stations were created.

The Collor administration, that took power in 1990 as the first elected president in 27 years, was more open to environmental complains[109]. This was part of a plan to transform Brazil into one of the world's leading economies. Thus, in order to please those who demanded further action to protect the forest, Collor demarcated 14.3 million hectares for Kayapó and Yanomani reserves (BARBOSA, 1996). This was done in only one month, November of 1991. This represents more than it was demarcated in the previous 80 years.

In the year 2000, a step forward was made in the conservation front. The National System of Conservation Units became law. The System defines and regulates the different categories of conservation units at the federal, state and municipal level. It recognises the private reserves of the natural heritage (in Portuguese RPPN). Until 1989 there were no state conservation units in Amazonas. The first unit was created in 1990. Today there are 29 reserves in that state alone, protecting 155.858 km^2.

It was also in the 1980s that most of the EMBRAPA offices in the Northern region were founded. There are six Embrapas in the Northern region. The Embrapa Acre is focused on solutions for sustainable development. The Embrapa Amapá started as a Agronomic Institute of the North (in Portuguese IAN) in 1939, then turned into the Agricultural Research Institute of the North (in Portuguese IPEAN) in 1962 to become the Agricultural Research Group linked to the Eastern Amazon Embrapa. With the formation of the State of Amapá with the Constitution of 1988 the research group gained a new identity. In 1991 the group was renamed as called the Agroforestry Research Centre of Amapá. Now is called Embrapa Amapá. The Embrapa of the Western Amazon also has a history. It has been working in the state since 1974 through the State Research Excecution Unit and the National Centre of Rubber and Palm. In 1989 the Institutes were merged and the Western Amazon Agroforestry Research Centre was born. The Centre

[109] Fernando Collor was the president from 1990 until 1992.

is now called Western Amazon Embrapa. The Eastern Amazon Embrapa started as a IAN and in 1962 it was a IPEAN. With the creation of Embrapa, it was renamed and called Humid Tropic Agriculture Research Centre in 1976. Later it was again renamed to Agroforestry Research Centre for Eastern Amazon. Today it is called Eastern Amazon Embrapa. The state of Rondônia also has an Embrapra, which arrived in the state in 1975 with the establishment of the Research Execution Unit in the Porto Velho territory. When Rondônia became a state in 1981 the Unit became the Execution Unit of the State. In 1990, the Unit was renamed to Agroforestry Research Centre for Rondônia.

Roraima also has an Embrapa, which was first an eco-regional centre of the Embrapa, but the Institution worked there before this date through the Embrapa Western Amazon Embrapa. In 1980 an Execution Unit of the called Humid Tropic Agriculture Research Centre was set up in Boa Vista. In 1981 the Embrapa with execution in the region of Boa Vista was created. In 1991 the centre was renamed Agroforestry Research Centre of Roraima. It is now known as Roraima Embrapa. It is interesting to notice that the Embrapas were all renamed in the last 1980s and early 1990s to Agroforestry research centres. This illustrates a shift towards a more environmental focus in the research. It is also important to notice the dates, all happen just before the United Nations Conference in Rio de Janeiro at a time where Brazil had a negative image regarding the environment to remedy.

1990s

It was during the 1990s that a few government programmes that focused on the Amazon were born. Although a first version of the National Institute of Spacial Research was created in 1961, INPE became INPE only in 1990. In 1988 the Brazilian Forest Satellite Monitoring Programme (in Portuguese PRODES) was launched. It is also in the 1990s that the Amazon Surveillance System (in Portuguese SIVAM) was created. The Programme conception was from 1990 and 1993. It would cost a total of US$1,4billion. The project was also a way to show the competence of Brazil in protecting the forest as well as defending Brazilian sovereignty over the Brazilian Amazon.

The Programme “Brazil in Action” (in Portuguese, *Brasil em Ação*) was launched in August 1996 and its timeline was from 1996 to 1999. The aim of the Programme was the

implementation of 42 strategic ventures for sustainable development[110]. The programme of 54 billion Reais[111] was created to address the need to generate investments for the development of the country. The investments focused on the economic infrastructure and social development. With that guideline, one of the objectives was the construction of corridors to drain the grain production of the cerrado, diminishing the cost of cargo. These transport corridors would be multi-modal, with waterways, roadways and train lines (CARVALHO, 1999).

The year of 1996, the first year of the Programme *Brasil em Ação*, witnessed one more contradiction in the history of Amazonia. It was in that year that an environmentalist project proposed the establishment of ecological corridors to protect large green areas. The same year, however, also marks the beginning of a new occupation phase of the Amazon, that brings back the industrial factor, not used in the previous occupation phase, marked by alternative development projects (BECKER, 2004). With Fernando Henrique Cardoso, the federal government brings back the territorial planning policy. The multiannual plans reflect that tendency. First it was the *Brasil em Ação* of 1996-1999, which refers to the first term of Cardoso (1995-2002). The "Avança Brasil" Plan (PAB), from 2000-2003 followed the same lines of the first. The plans were based on the exogenous vision of development, in other words, a development focused on the exterior. The PAB divided the country in Development and Integration Axis, which cut the region vertically without taking into consideration the particularities of the region. This division favoured the formation of new fronts of expansion.

The ecological corridors and the government plans are endogenous and exogenous models of respectively. The clash between policies that focus on conservation and policies that focus on economic development are elements of the process of politicisation of nature, which denaturalises environmental issues and identifies several actors with different projects for the environment (BECKER, 2004).

The Programme Forward Brazil was launched in 2000 and it is a follow up of the previous programme. The Programme addresses the whole country and it estimated an investment of US$43 billion between the years of 2000 and 2007. From that amount, US$20 billion would be for infrastructure, with great impact on the environment

[110] Programa Brasil em Ação http://www.abrasil.gov.br/publicacoes/download/public.htm 12 Junho 2011

[111] http://www.terra.com.br/istoe/politica/145532.htm 27 Jan 2009

(FEARNSIDE & LAURENCE, 2002; FEARNSIDE, 2001). The background for this programme was the insertion of the country as a competitor in the international arena. Therefore, one of the key focuses of the programme was the export sector.

The second programme of the Cardoso government promoted a strong partnership between the private and the public sector (FEARNSIDE & LAURENCE, 2002; FEARNSIDE, 2001). Federal, state and municipal governments would be responsible for 66,6% of the total amount of the programme and the private sector would pay for the rest (BECKER, 2004). The PAB was designed based on the national needs regarding the national logistics without taking into consideration regional programmes for international insertion.

The programme, which had 338 projects in its portfolio, suffered gravely with the economic crisis that shook Brazil in 2001. Therefore changes were made. In the same year, 64 projects were selected to have priority (SMERALDI & CARVALHO, 2003). In the end of 2001, only 36,7% of the total amount had been executed. In the following year, the crisis was also felt, making only 24 out the 64 receive special follow up (SMERALDI & CARVALHO, 2003). A research conducted by the Agency Folha in 2002 concluded that, according to the information of the Federal Union on the 6th of August of that year, out of the 67 strategic programmes, only 8 had received finance over 50% of what is was destined to it, 12% received an amount less than 20% of the total and some had not received any funding whatsoever (SOUZA, 2002).

One of the great axis of the PAB was the Amazon. The road works in the region had as its main aim to diminish the cost of freight for crop production, especially soy. The destiny of all this production from the Centre-West of the Country was the export. The programme would pave a total of 7500km^2 of roads (PFAFF et al 2007). It is important to stress that benefits generated by an export infrastructure is felt by only a few. Those who benefit are grain producers and dams benefit mainly the aluminium industry. The local population was excluded. These operations generated few jobs and concentrated the resources that could have been used for other purposes in other regions.

Three points about the programme deserve further attention (BECKER, 2004). First, the regional development that was recovered by the government made clear that transport on its own is not development. Secondly, the regional divisions imposed by the PAB did not take into consideration the official division of the regions, dividing the country in nine

areas disrespecting the territorial management and different actors in the regions. Thirdly, the export sector and investment were the main focus of the programme, and, consequently, received more attention. The actors that benefited from the PAB were the big producers.

Another aspect that deserves attention is the environment. The PAB did not take into consideration the environmental dimension in its programmes. This dimension appears only as a range of opportunities (BECKER, 2004). This clearly illustrates the place that the environment occupied in that government. The impacts of the programmes demonstrate that the region is still internally seen as a resource frontier. The PAB is one more example of a top-down approach of the Brazilian Government, not only regarding the Amazon, but also regarding the entire country. The Programme reinforced the role of the region as a resource frontier to be exploited for the development of Brazil, focusing on the export sector.

There was a contrast between the old politics embedded in the Amazon, which privileged the regional elite, and a neoliberal globalist vision that was sovereign in the central power (VIANA, 2001). The old and new aspects of the political dynamics had to live with each other. This relationship between the old and new is reflected on the Avança Brasil programme of the President Fernando Henrique Cardoso. The programme benefited specially those economic sectors that are in dispute for the international market.

Regarding forests, it is worth pointing out that in 2003 the National Commission on Biodiversity (in Portuguese CONABIO) was established. The aim of the Commission was to promote the commitments that Brazil signed to in the Biodiversity Convention and to identify and propose priority research areas for conservation and sustainable use of biodiversity components. Also in 2003 the National Forest Commission (in Portuguese CONAFLOR), which is a consultative body formed by different actors, such as federal and state agency bodies, business, NGOs, unions and indigenous, entities was born. CONAFLOR was created to help the National Forest Programme in achiving its goals through the propositions of recommendation, programmes, activities, all related to the use and conservation of forestry resources (MMA, 2011).

One initiative that deserves further attention is the Sustainable Amazon Plan (in Portuguese PAS). The aim of the plan was to stimulate a new development model in the

region (PAS, 2004). The Programme presented five specific objetives: to enable sustainable production activities; to strengthen cirizenship and social inclusion; to implement and maintain infrastructure repair works; to stablish a new pattern of credit in the Amazon; and to promote environmental management and territorial organisation, prioritising land regularlisation. The Programme was part of the PPA 2004-2007 and was the pilot programme for protection of the tropical forests in Brazil. The Plan, however, suffered heavy critiscims, which stated that it presented together proposals difficult to put together. The PAS would be a way to commodify the use of the natural resources of the region (SOUZA & FILIPPI, 2010)[112].

International Interests

To understand the past and the present of the South American rainforest, it is necessary to analise both the national and the international arena. The international scenario also plays a key role in determining the policies that are implemented. This is also the case as there are multiple actors with multiple interests in the region. Each actor has a discourse. The private sector sees the forest as a driver of economic development, which is transparent in their discourse. The discourse of development organisations evolves around community forest management as the option that can resolve the problems in the forest (MEDINA, POKORNY, WEIGELT, 2007). This management would put together forest conservation and rural development. These discourses have created a public sense of how the forest should be managed. Both sides have used scientific papers to back up their discourses. It is important to notice, however, that both discourses relegate the voices of traditional communities to a second place, leaving them outside the main discussions of forest governance. External views and clear ideas on how to use the forest are dominant within the Amazon discussions. This hardens the chances of society to hear the position of those who are directly involved in these discussions[113].

[112] My intention here was not to dwell on the Plan nor to present an accurate analysis of it. My intention was to provide the main points of the Plan and present some of the critics that it suffered.

[113] The main discourses do not take into account what traditional populations want. They are not empowered to participate on the discussions that directly impact not only their future but the way they live now. Although it can be argued that there was a shift from the logger discourse to the development discourse – which focuses on community forest management – traditional populations still occupy the same place, relegated to a second realm. Both discourses used traditional populations as a tool to strengthen their argument.

The political scenario of up until the 1980s was of capitalism expansion (BARBOSA, 1996). Evolution, as well as expansion. This process began centuries ago (sixteenth century). European colonies were a source of resources and were exploited. Capitalism differs from other systems as its main purpose was/is self-expansion. In the aspiration to accumulate more and more capital, more social processes become commodities. The development of capitalism in history has led to the impulse to turn everything into a commodity (WALLERSTEIN, 2001). This obviously includes nature. This model was exported to less developed countries. This is reflected in the fact that products of the Amazon are important commodities, there is an internationalisation of the products from the Amazon. The soy and beef industries are commodities in the international market, as well as wood. The economy of the Amazon is responsible for a large cut of national and international markets (NEPSTAD, STICKLER, ALMEIDA, 2006). Policies encouraging cattle pastures were key drivers of deforestation from 1970s up until 1997[114]. The increasing rate of deforestation between 2002-2004 reflects the expansion of the agro-industry. Some authors, such as Nepstad, Stickler and Almeida (2006) argue that the growth in importance – both nationally and internationally – of the Amazon economy, can be used as a conservation force. In order to have access to international markets, producers have to adequate their production to international environmental standards. To a lesser extent, this is also true in the national market. Especially regarding products from the Amazon, buyers and financing institutions want to know the origin of the products as it is well-known that cattle pasture is/was a main driver of deforestation in the region, as are soy and wood.

In both the federal and state level, Brazil has an ample institutional framework to deal with the challenges embedded in environmental management (CAVALCANTI, 2004). Progress is needed to improve certain aspects – such as the independence of the environmental bodies within municipalities – but this section has demonstrated that there is a solid architecture in place. The following section is dedicated to the main problems that prevent the governance framework of the Amazon from generating a governance that would be more focus on the needs of the population of the region and on generating a more sustainable development path for the forest.

[114] Logging in the Amazon has been in most cases done through unsustainable practices, coupled with tendencies which led to spatial mobility (MAY & MILLIKAN, 2010: 10).

Unresolved Issues

Brazil has an institutional framework to deal with environmental management. This reality, however, has not translated into effective environmental management. The reasons for that are multi-fold and will be identified here. They are: the absence of the state, the instability of laws and constitutions, the issue with representation in the Northern region, the lack of internalisation of the environment and the logic behind decision-making. These issues demonstrate the priority of the government and sheds light into the reason the economic development at all costs has prevailed in the Amazon.

It can be argued that, although there is a solid governance structure in the Amazon region, the state has been absent. This would explain the environmental problems faced in the region (MACHADO, 2009). This statement may sound slightly strange as we have seen the state has put the Amazon in the centre of government plans. The state has played a central role to the extent that its plans have included and therefore affected the Amazon region, but the state has also played an irrelevant role as it was not capable of controlling the consequences of its plans (CLEARY, 1993). It is in this sense that the state has been absent. Following this logic, the success of deforestation policies would be entangled with a more active presence of the state in the region. This would be through mechanisms and regulatory tools[115].

The instability of the constitutions – be that at the Federal and at the state level – play a part in the outcome of the governance structure (MATHIS & FARIAS FILHO, 2004). These constitutions are regularly changed through amendments. Therefore, what is seen as a stable regulation, which would promote a sustainable use of the forest, with a more active participation of the population, will not necessarily be followed as actors. Rather than trying to adapt to the rules, they try to change them. The governments that came after 1988 continued the work in the constitution arena, changing the Constitutional text (COUTO & ARANTES, 2006).

The Amazon region has suffered from the effects of the distance between the national and the state spheres, as there is no integration in the political system as a whole. With the exception of the state of Pará, which elects 17 federal representatives, the other states of the North region elect 8 deputies. In terms of representation, the North has

[115] Needless to say that the involvement of the population is also a key factor for the success of such policies.

quite a privilege situation as the population is more represented[116]. However, 65 representatives come from the North region of the country as a whole. Considering the size of the region, the biggest one in terms of territory in Brazil, this number is extremely small. The number of the Northern region is small in real terms in comparison with other regions or even states. The state of São Paulo alone has 70 representatives. Looking at the regional scale, the South (Rio Grande do Sul, Santa Catarina and Paraná) has 77 representatives in total and the Southeast (São Paulo, Rio de Janeiro, Minas Gerais, Espírito Santo) has 179. The Centre-West (Mato Grosso, Mato Grosso do Sul, Goiás and the federal district) elects 41 representatives and the Northeast (Bahia, Segipe, Pernambuco, Maranhão, Piauí, Paraíba, Rio Grande do Norte, Ceará and Alagoas) elects 151 representatives.

Some states of the Northern region are overrepresented, as Tocantins, for example, which should have 4 representatives in accordance with its population, but has 8 due to our Constitution. The opposite also occurs as the population of the state of Pará, for example, would allow the state to have 19 representatives rather than the 17 that it has (OLIVEIRA, 2004). The population of the North of Brazil grows at a higher speed than the average of the whole country. The Northern region corresponds to over 45% of the Brazilian territory and it has only 65 representatives. The Southeast and Northeast, although for different reasons, have always been part of the national agenda. They are at the coast and it is where great part of the Brazilian population is located. The North and the Centre-West were seen as empty spaces. It was not until there was a tangible effort to integrate the Northern region into the country that the region started to play a role in the national agenda. The North, despite the fact that we have seen that it was part of the national agenda, was never part of the formulation of proposals but it was a region where those policies would be applied. Moreover, although the number of representatives is decided according to the population of the state, it is at least worrying that the biggest region in size is the least represented one in the political arena.

This issue of representation is also important when one looks at the share of the Amazon in some sectors and the investiment in the region. For example, the region is the origin of 40% of the meat and soy that is exported (SOUZA & FILLIPI, 2010). The Amazon is also the home of the largest mineral deposits of the country, such as iron and

[116] In São Paulo, one representative represents 10 times more the number of electorate than a representative in the state of Amapá.

bauxite. It is estimated that between 2010 and 2014, US$40 billion will be invested in that sector only in the state of Pará (SOUZA & FILLIPI, 2010).

The mechanisms used to stimulate behaviour also deserve further attention. Command-and control mechanisms, albeit important and necessary, can no longer be the only tools in the struggle for conservation. Economic mechanisms have been defended as an important way to help boost conservation in the region. In addition, other regulations, such as import regulations on the origins of the products also have great impact on environmental issues.

What becomes evident is that, although there is a governance structure in the region, the state has not yet managed to internalize the environmental issue in all the different levels of political decision-making (MACHADO, 2009; BURSZTYN, BURSZTYN, ASSUNÇÃO, 2004; GUIMARÃES, 1991). The small efficiency of the state regarding the ordering and control of natural resources are a reflection of inadequate operational structure, which still produces incoherent and disconnect policies for the Amazon. On the one hand there has been advances in the establishment of tools and mechanisms to regulate and implement an environmental management. On the other hand, environmental concerns have not yet been internalised. This incoherence is added to the divergence between political agendas in the federal, state and municipal levels (CLEARY, 1993).

In general terms, the environment only started to appear in the Amazonian states agenda due to pure pressure from both the national and the international arena (BURSTYN, BURSTYN, ASSUNÇÃO, 2004). The fragility of the SEMA (the Environment Secretary), a federal environment body with jurisdiction to act on all states, was partly responsible for this situation. This also helped shift the focus from the federal to the state and then to the municipal levels. All the states of the Amazon region attempted to organise environment bodies, although not using the same organisation structure. In the region, the state systems are in a poor condition and the councils work unsatisfactorily. The state environment bodies have, therefore, faced difficulties in the implementation of their work due to a weak institutional architecture and lack of administrative, technical and financial resources.

Another important reason to explain the failure of the governance in place to deliver further protection of the Amazon is the logic behind the decision-making. In general,

decision-making in Brazil is focused on promoting economic growth (CAVALCANTI, 2004). This was true during the 1970s and 1980s. SUDAM, in charge of fiscal incentives and the promotion of regional development, did not take into account the singularities of the region, focusing instead on the national objectives based on economic growth, determined by the federal government (KOHLHEPP, 2002). Despite the environmental discourse that became more prominent after the United Nations Conference in Rio de Janeiro in 1992, economic growth remained the main driver of policies.

It is also important to look at the situation of the municipalities regarding the environment. Although there has been a decentralisation movement, it does not necessarily mean that municipalities have the ability to deal with the environment efficiently. Municipalities are, as are the states and the federal union, part of the SISNAMA. Therefore, the establishment of organizational structures is a requirement for the action of these institutions (IBGE, 2002). In the year 2002, 6% of the Brazilian municipalities had an office dedicated only to environmental issues, in 26% of them environmental issues were based in offices not only exclusive to the environment, and in 36% of them environment issues were incorporated by pre-existent offices or administrative units[117]. In terms of personnel, the environment presents a small number of people dedicated to it. 68% of the municipalities declare that they have people dedicated exclusively to the environment, with an average of 8,3 workers for this area. Regarding municipal law, the study shows that only 17% of the municipalities had incorporated some kind of specific legislation in the environment area other than some item in the Organic Law of the municipality. Agreements between public entities of any kind or/and between private organizations are also an important tool for environmental management. In 2002, 45% of the municipalities had made an agreement concerning the environment, be that of technical cooperation or other types of partnerships. In the North region, only 38% of the municipalities had an agreement.

In terms of finance, the environment area is not very independent. The study from the Brazilian Institute of Geography and Statistics (in Portuguese IBGE) shows that, in 2001, only 18% of all the municipalities in the country received financial resources specific for the environment. The situation is even worse regarding municipal environmental funds, with only 1.5% of the municipalities with that tool. Only 7% receive money from the

[117] This document shows that the sector that is put together with the environment more frequently is agriculture (61%).

ecological ICMS (acronym in Portuguese for the state tax on the movement of goods and services) and 4% receive resources from environmental compensation. A large part of the municipalities of the Northern region is dependent on tax transfer from the Federal Union and from states. It is important to know how well structured a municipality is. About 44% of the municipalities in the Northern region were formed after the Federal Constitution of 1988 (MATHIS & FARIAS FILHO, 2004). In order words, the institutional space in the North region is still young and the environment secretaries or departments still need to become more independent, both in administrative and financial terms.

To understand the performance of the environment governance structure in place, it is important to look at other sectors. One of them would be the development of projects for the region and another would be the agrarian reform and property rights. Looking at the national programmes for the Amazon, even considering those more recent in history, such as the *Avança Brasil*[118], it is important to analyse who benefited from them. The intensification of investments to promote and create an efficient system of flow from the production to the markets (MELLO, 2006) – be that national or international – makes it clear who benefited the most from government plans. It is also clear who are the actors with the most importance to the government. The production in the Amazon, once small and with little capital, becomes focused on large scale production – agribusiness – favouring large land owners.

The fiscal incentives that began in 1970s and went through the following decades also played an important role in the determination of practices in the forest. Incentives were highly used to promote migration and the installation of business in the Amazon region. However, the result of these incentives was not what was expected. A research carried out by the Institute of Applied Economic Research (in Portuguese, IPEA) demonstrated that the incentives programme was not being successful and they had no argument to defend the continuation of such programmes (GASQUES & YOKOMIZO, 1985). The study also pointed out the fact that there was an issue with monitoring – or the lack of it.

Land Reform

[118] One of the Multi-annual plans was the Avança Brasil programme, which had activities and investments planed from 2000 to 2007 (FEARNSIDE, 2005: 116). Avança Brasil was a development package with investments of US$20 billion for infrastructure in the Amazon. Most of the infrastructure focused on attending the demands of the soy industry.

The Legal Amazon is the main region in Brazil regarding the efforts to promote agrarian reform (TOURNEAU & BURSZTYN, 2010). This is true both for the number of families that have been relocated and for the area occupied. At the national realm, discussions concerning the agrarian reform started in the end of 1950. It began to gain more consistency with the establishment of the Land Policy Superintendence (in Portuguese SUPRA) in 1962. In the following year, the government launched the Statute of the Rural Worker and during the time he was in power, President Goulart tried to dispossess land by the road and by the federal infrastructure to settle workers. Needless to say that he was confronted with great dissatisfaction of the rural elite and of some of his allies.

In 1964, with the Military Coup, a new chapter in the history of the country started. In this new context, the SUPRA became extinct. The National Institute for Colonisation and Agrarian reform (in Portuguese INCRA) was created in 1970, the same period of the PIN and the PROTERRA. This institution was in charge of the policy organisation of government land. The aim of those projects was to occupy the empty lands of Amazonia through the migration of people from the Northeast. By doing so the region would also be integrated into the country. INCRA would be the institution responsible for this.

Rather than promoting an agrarian reform – which would imply dispossessing private land that is not productive – the Institute focused on colonisation. This was the base of the slogan – a land without people for people without land. Thousands of migrants moved to the region attracted by colonisation and federal projects, which would generate employment (such as the dam of Tucuruí). This pattern was maintained throughout the 1980s with the economic crisis. Very little of what happened referred to agrarian reform (TOURNEAU & BURSZTYN 2010). Between 1970 and 1979 only 40.000 colonists were settled in the legal Amazon. In the beginning of 1980, the agrarian reform goes back to the political arena and from 1979 until 1985, 38000 families were settled. In sum, until 1990, 90000 families directly benefitted from agrarian reform[119].

The history of INCRA can be divided intro three periods (CARVALHO, 2001). The first one would be from 1970 until 1984. The second period goes from the 1985 with Sarney (1985-1990) until Itamar Franco (1992-1994) in 1994. The third period started with Cardoso (1995-2002) and is still in force today. In the beginning of the 1970s the

[119] At the same time, states took advantage of their bigger autonomy and created about the same number of plots.

colonisaiton projects focused on small producers. However, the guidelines changed from time to time. This is what happened in 1974, when INCRA started to focus on big enterprises rather than on small producers (FEARNSIDE, 1989). This, together with the incentives for big enterprises, made the competition between these enterprises and the small producers a tough one.

The colonisation projects were not able to manage all the immigration to the region and rather than being planned, people were settling in an organised manner. During the first period of the Institution's history, its accomplishments were not that impressive and the INCRA, PIN and PROTERRA performed poorly with only a few producers with land titles being regularised (CARVALHO, 2001). In the last years of Military Rule (1979-1984) all the strengths were focused at land title programmes, with the emission of 836000 documents, encompassing an area of 50,5 million hectares. In the second period of INCRA's history, the institution has had a low profile. It is with the arrival of Cardoso in power in 1995 that INCRA goes back to the agenda.

During the Collor (1990-1992) and Itamar Franco (1992-1994) administration, the agrarian reform played a secondary role. It was in the Fernando Henrique Cardoso's and Lula's administration that the theme went back to the high political agenda. During the eight years of Cardoso's government, 400000 families were settled (TOURNEAU & BURSZTYN 2010). From 2003 to 2008, 303000 families were settled under Lula's administration. Although both governments settled a large number of families, there did not break with the past dynamic. Despite the fact that it had previously identified 150 million hectares of unproductive land in all of Brazil, which would qualify the land for agrarian reform, Cardoso saw the Amazon as a land reserve. The Government installed colonists in either properties that had been dispossessed or in government land. Lula's administration was no different. Although it had established limits for the agrarian reform impact on the environment, Lula's government saw the Amazon as space to be used in the agrarian reform. The settlement of people in the Amazon is bigger than in any other region in Brazil.

It is important to recognise, however, that there has been a change in the type of settlement projects. Classic settlement projects still are the main kind, representing 72% of the total settlement projects. Nonetheless, from 2003 onwards, this type represents 52% of the implemented projects. Extractive and Agro-extractive reserves, as well as

agro-forestry settlement camps are becoming more popular (TOURNEAU & BURSZTYN 2010). This change indicates that people are more aware of sustainable use but most of the area is still used for traditional settlements. Having said that, although people might be more aware of sustainable use, it is easier to approve an authorisation for forest clearing than to get an authorisation for sustainable forest management (MAY & MILLIKAN, 2010).

The functioning of INCRA itself is highly criticised. The environmental impact of the settlement that was done from 1970 onwards was only recognised in 1990 (TOURNEAU & BURSZTYN 2010). It was only in end of that decade, however, that the Institute began to incorporate the concern with environmental issues into its practice. This delay in adjusting its conduct is the result of the little importance given to environmental issues in comparison with the agrarian reform.

The history of the settlements in the Amazon region demonstrates that the forest is in fact used as an empty land, a source of resources for the country. This was true in 1970 and it is true today[120]. The use of the Amazon as a space to settle those without land, promoting colonisation rather than agrarian reform, and taking into consideration environmental regulations, dichotomised social and environmental protection (TOURNEAU & BURSZTYN 2010). What was done in the name of social problems was put infront of environmental concerns.

Property Rights

Land grabbing is also an issue with direct impact on deforestation. This aspect is connected to property rights over a land (FEARNSIDE, 2007). Not only in the Amazon, but also in the whole country, 'ghosts' sell and even register public land. The total amount of hectares under suspicion of land grabbing is of 100 million (SAYAGO & MACHADO, 2004). The state power is weak both in the monitoring and in the control of public land. In addition, the incoherency of the public policies, that stimulates the economic development of the region and induces deforestation, and other times it focus on the biodiversity of the region, hampers an effective control.

[120] 670.000 plots of land have been given in the Amazon. In addition, the government claims it will regularise more 300.000 plots, which would be a total of almost 1 million plots. The rural population of the Amazon is of 5 million. Taking into consideration that there are, on average, 5 persons in each family, it is as if there was one plot of land for each family. This is in contradiction with the fact that the Gini coefficient for land establishments in Brazil has risen in the past 2 decades.

The legal land situation in the Amazon is also an issue of extreme relevance to the discussion of governance. Property rights system in the Amazon is complex and it is one of the most confusing aspects of the forest. Irregular occupation, together with the lack of information regarding ownership, is an obstacle to efficient management. The fact that in 2006 the Brazilian Forestry management did not have information of the titles of 40% of the priority areas for the implementation of laws regarding forestry management – a plot of land 100 km surrounding the road BR-163 in the states of Mato Grosso and Pará, illustrate this point (BARRETO et al, 2008). This issue of land title is so crucial in this region that Mangabeira Unger, responsible for the Sustainable Amazon Programme (PAS) said that land title regularisation should be a priority if another model of development is to be implemented. The land ownership was such a problem that a Parliamentary Commission of Inquiry (in Portuguese CPI) was created to investigate it. Lang grabbing occurs thoughout the country but in the Amazon this 'action' happens in a greater scale as the amount of vacant land is larger. The investigation estimates that in the state of Amazonas alone about 1/3 of the state suffers with land-grabbing. In the legal Amazon alone, only due to the application of regulation that estipulates that properties registered with more than 10 thousand hectares would have their certification cancelled added up to 40 million hectares (CARVALHO, 2001). There are also several legal issues regarding land registration that open space for the current situation in the region. This lack of accurate information on land ownership inhibits sound and long-term investments in the region (CARVALHO, 2001).

The uncertainty regarding the application of the property rights over a land is not restricted only to ownership, but also to protected areas and documented rural properties. The INCRA registration had in 2003, 302000 registrations of land ownership, which represents 42 million hectares or 23,7% of the area of properties registered (BARRETO et al 2008). These numbers mean that the government lost control over an area of the size of the states of São Paulo, Rio de Janeiro, Sergipe, Paraíba e Espírito Santo. Another important aspect is the legality of the property documents, a source of great suspicion. In 2001, the federal government disputed the legality of 2000 property documents or 70 million hectares (BARRETO et al, 2008). The protected land – indigenous land and conservation units – together with military reserves, in 2007 represented 43% of the legal Amazon (VERÍSSIMO et al, 2010). However, there was the super-position of these lands with private properties and land ownerships. Public land in

the region adds up to 21%. Part of them can be occupied informally, without registration or census. This data demonstrates that the government does not exactly know who owns the legal Amazon. The lack of institution preparedness to deal not only with the census but also with the management in a continuous manner is only one more aspect that prevents an efficient governance of the region.

Another issue regarding property rights is the representation of the Amazon as wild. The wilderness of the forest carries implicitly the idea that the forest – the land and its resources – are a result of nature alone, without any interference of humankind (POSEY, 2008). This, in another hand, means that if the forest is the result of nature there cannot be an owner nor property rights. Within this framework the resources are free and can be used by whoever feels like doing so. This is why indigenous people are against the use of 'wilderness' and 'inhabited' as to refer to their land. These terms are embedded in the principle of *terra nullius.*

It is fair to say that the projects implemented in the Amazon are not suitable for the economic and for the environment reality of the region (TOURNEAU & BURSZTYN, 2010). The diversity – be that biological and also cultural – of the Amazon suffers a process of homogenisation (POKONY et al, 2009). Projects that focus on the use of the forest by smallholders are small and they suffer from lack of funding. Community Forestry Management Initiatives have demonstrated problems and are still dependent on external investment[121]. Projects organised by government and non-governmental organisations are still based on two assumptions (POKONY et al, 2009). First, it is assumed that the Amazon is a uniform forest, in the biological and in the social realm. Secondly, it is assumed that the top-down transfer of knowledge by an expert that is rarely from the region is the best option. The Superintendence of Amazonian Development, the institution that had as its mission the role to lead a development in the region that would be endogenous, taking into consideration the singularities of the region, did not do so (KOHLHEPP, 2005).

The main problem of the environmental governance in Brazil is its implementation (AYRES, 2008; CAVALCANTI, 2004). This is because the national political system is still focused on economic growth. The decisions made in the political system in Brazil are not in sink with the aim of the SISNAMA and with the Environment Ministry. With this

[121] This is due to the high cost of production in comparison with production in enterprises.

situation, there is no way that the environment governance of the country can be effective in protecting biodiversity.

To this day, the Amazon still presents what was defined during the Military Regime in 1970 – a place to be explored due to its resources. We still see the dominance of private economic interests over collective interests (MACHADO, 2009). Whereas in the 1970s and the 1980s there was only one view over the Amazon, now there are competing views, competing claims. The traditional view of the forest as an empty space and as a natural resource reserve competes with the view that argues that a sustainable development is the only way to have development (KOHLHEPP, 2002). The latter also involves other issues and therefore reflects the absence of actions that go beyond conservation but are also crucial for the future of the forest. These would be the promotion of sustainable use of biodiversity, promotion of science and technology, stimulating the growth of other sectors of the economy. These – and of course much more – would be part of an approach to make possible other forms of economic development in the region. Science, technology and information play a crucial role in the deepening of knowledge of the natural resources in the Amazon and in the development and conception of a new form of use of such resources (BECKER, 2006).

It is important to stress that there was never a severe rupture in the political system after the Military Regime. The transition from a Military Dictatorship to democracy was gradual and did not provoke abrupt changes within institutional actors (CARVALHO, 2000). This lack of change means that the democratic period that followed was marked by the continuity in the policy process, be that regarding formation and also implementation.

The government planning that started in the 1970s has given the region a full set of ill-advised strategies (KOLHEPP, 2005). These programmes were founded on the view of the forest as an empty space with inexhaustible resources. The sustainability approach, which would be the only long-term and acceptable way of development for the future still competes with ideology of development with big projects that we saw in the 1970s. The forest is still at the crossroads with each approach at one side. This opposition is not necessarily real, but it is this opposition that defines the discussion on the Amazon.

Terra Preta de Índio

After looking at how the Amazon appeared in Brazilian National political agenda, what does that tell us about terra preta and the fact that it was sort of unknown until 1980s?

The research demonstrated that the Amazon was seen as a resource frontier, an empty land to be explored, that needed to be occupied, not only to help relieve the pressure from the Northeast region in 1970s, but also for security reasons. Rather than being seen from a strategic point of view, the Amazon was seen as a security issue. It was the fear of this vacuum being taken over that triggered the first development plan during the Military Regime. From then onwards, the South American rainforest has always been a theme in the Security Ministry. This reveals how the government chose to approach the region.

When the first National Development Plan was elaborated in 1972, there was already information on the existence of the soil and its potential, as well as studies on the agricultural potential of other soils in the Amazon region. However, despite of that, this knowledge was not used when decisions were taken regarding the seeds and the ploughing regime for farmers. The Amazon was homogenised and seen as one, a costly mistake as the farmers who took the loans, although they were not the ones that made the mistake in the first place, still had to pay back the money they owed. This demonstrates that the government chose to focus on other types of knowledge in the Amazon region; the knowledge on its soils was not seen as relevant at that time.

It is possible to say that the people of the forest have not played an important part – sometimes no part at all – in the elaboration of these programmes. When discussing the plans during the Military Regime it is somehow understandable that a Dictatorship would not necessarily listen or even create the opportunity for the citizens to voice their concerns and give their opinion on specific matters, such as government plans for their region. The knowledge of the traditional population was not seen as valuable. However, even when looking at the period after the decentralisation process that started in the 1988 and created not only opportunities for the participation of the civil society in the policy debate but made it obligatory, the actual impact of civil society has been very dim. How could scientists as well as the local population affect policy-making in the Northern region?

The environment issue has not yet been internalised by the state. This means that concerns of the state for the region and in the region have other focus. Needless to say that advances have been made in the past 20 years. However, this internalisation has not yet taken place in most of the municipalities of the Amazon, states and even the federal government as it still elaborates conflicting policies for the region. In other words, a concern over an anthropic soil would not be of much importance within that framework.

The soil itself does not fit in with the resource frontier perception of the forest. If the forest is seen as a place to be explored, there is no need to investigate further the existence of an anthropic soil. In addition, the Amazon was seen as an empty space, *terra nullius*. A land without people, therefore ready to be claimed. Terra preta de índio defeats the idea that the region had poor soils and had not been inhabited by large populations. The soil could have actually helped in the colonisation process, as a black gold soil. But this would lead to further studies and the representation of the Amazon as a place to be protected, rather than a place to be explored. This might be slightly farfetched but the logic has a certain spark.

The strategy for the Amazon never took into consideration the local aspects of the region. The March to the West was to unburden other parts of the country. The first PND was to occupy the forest and the second focused on big producers. The Government Plans that came afterwards – the III PND and the Plans in the 1990s – also followed the same guidelines: economically occupy the forest and integrate it to the country physically, economically and culturally. It is interesting to notice that there was no cultural integration to the extent that the culture of the people of the forest was respected and shared with the rest of the country. Neither was the economic activities carried out some of the traditional people. Throughout the decades there has been an imposition from the federal government to the region.

It is true that studies conducted on the Amazon rainforest in the 1800 regarding its botany and climate have prevailed through time and are an important part of the knowledge on the Amazon today, but the same cannot be said regarding its soil studies. That is not to say that there were no soil studies in late 1800 and early and mid 1900s. The argument here is that whereas the knowledge on botany did not suffer disregard or major shifts within the main essence of the study – going from a region with extremely fertile soils then to a region with extremely infertile soils – that was the case with soil

studies. Even the heterogeneity of the Amazon, which is not a new aspect of the study, was not sustained through time. What did prevail was the image of the forest as an empty land.

When we look at who benefited from the government plans from 1970s onwards, there is a clear pattern that, apart from the first National Development Plan that did have a focus on the small producer, the others favoured big producers. These people are likely to focus on the economic value of the Amazon rather than on the social and environment value that the forest and its resources have. In addition they are not part of the traditional peoples of the forest.

It was only in the 1980s that the environment began to gain more space in the political agenda with the Law 9638 and with the Constitution of the 1988. Therefore, it was only in the end of that decade, especially with the preparation for the United Nations Meeting in Rio de Janeiro in 1992 that the environment was forced upon the political agenda. This clearly shows the impact of the international arena in national politics. The important point here is that it was only in the 1980s and in 1990s that there was an environment that would allow a study on terra preta and its implications to grow more freely and have the impact that its implications deserve.

Although most of the terra preta de índio sites are usually too small to have some significant impact as fertile land, the fact that the soils stand out so much from the other soils of the region, should have risen at least more curiosity towards it. Progress has also been made regarding this soil. TPI are archaeological sites that are protected by a specific legislation from the National Institute of Artistic and Historical Heritage (in Portuguese, IPHAN).

The Amazon and Government Policy – What lies ahead?

The programmes implemented in the region, many with the promise of striving development, have focus on capital-intensive technologies. Rather than taking into account the social and ecological diversity of the South American forest, these programmes and policies have promoted homogenisation (POKONY et al, 2009). Needless to say that these projects do not have the aim to protect the biodiversity of the forest and, although it is said that they will bring development to the region, it would be a

development focused on external markets and big constructions. None of these actually promote sustainability nor have the local communities and their livelihoods in their minds.

This policy conflict expresses itself in the Amazonian territory through the clash of three ways of using the land: cycle of timber exploitation, cattle raising/deforestation; sustainable activities of forest extraction and traditional fishing activities, and large agricultural and cattle raising producers. The situation shows that there is a mosaic of actors and models of development, conflicting and diverging that are active at the same time.

The governance structure – with laws, regulations and institutions – are in place. What is missing is the enforcement of these regulations (CAVALCANTI, 2004; GUIMARAES, 1991). This discussion is in reality a discussion on the role of the state. Implementation and enforcement, both highlighted as issues that have played a part in the failure of the biodiversity governance, are done by the state. One could go as far as to say that this is part of the *dynamic conservatism* that has been a feature of the Brazilian politics, which means changing but making sure everything stays the same (GUMARÃES, 1991). Therefore, although there are laws, regulations, and institutions in place to care for biodiversity, this structure does not translate into effective actions.

Although the environment governance structure exists – with laws, regulations as well as institutions, the biodiversity of the forest has not been protected. The reasons for this failure are multi-fold. The role played by the state, with its lack of enforcement and monitoring is key. The environment issue, as a transversal theme, has not yet been internalised by the government, which produces contracting policies. Another important issue is the failure of the instability of Constitutions, easily changed through amendments. It is also important to go beyond command-and-control mechanisms.

The inclusion of traditional communities in conservation practices leaves these people in a catch-22 situation (HOLT, 2005). The conditions that some biologists associate with conservation – low population density, little use of technology, small agricultural production - are exactly those conditions in which, according to the common property framework, conservationist behaviour is not expected to take place. The voices of the local population – be that indigenous, traditional and the ever-growing urban population

– have to be heard and included in policy-making. The space for their participation is delineated in the governance architecture. What is missing is implementation.

In addition, the population of the forest is changing. The demographic dynamics in the Amazon follow the patterns in the rest of Brazil (HOMMA, 2005). In other words, the Amazon is urban with 70% of its population living in urban centres. Any governance structure that will actually be successful will have to include this reality in its structure. Social inclusion has to embrace all the activities that are done in the Amazon, and not relegate some to a second realm. It is exactly this inclusion that will make it possible to achieve a better understanding of the forest and the needs of those who live there. In other words, all the actors of the forest must participate in the discussions concerning its future.

Most importantly is the paradigm in which all the political discussions are embedded. The main objective of Brazilian politics has been since the 1970s the promotion of economic development. Within it the needs of the local population as well as the protection of the biodiversity have been relegated to a second realm. Although the other problems played a part in the failure of the environment governance and therefore have to be solved, the main aspect is this: there must be a change in the focus on the paradigm in place. Only this change will allow the biodiversity to be protected, this change will allow the people that live in the forest to have a voice in the development of policies in the region. Economic growth has been ingrained within Brazilian politics to such an extent that even those who say are against it, once in power, fail to abandon it (GUMARÃES, 1991).

More than forty years ago the Brazilian Government started an integration project for the Amazon region that prioritised the occupation of the region. The idea behind it was that the region was an empty space, underused economically. Forty years on, the government plans that address the region still make the mistakes of the past – there is no space for dialogue with the civil society to discuss the implications of the projects and the decision-making for the investments does not take into consideration the environmental costs (BARROS et al, 2001).

The place the Amazon rainforest occupied within the Brazilian history from 1970s onwards helps to understand why terra preta de índio was not in the main area of interest of the government. The focus of the federal government was the economic

growth of the Country using the forest as a supply of resources. All the considerations that would favour the study of the soil as well as the reverberation of its implications – such as a focus on traditional knowledge, the study of the heterogeneity of the Amazon - were not a priority. The view that prevailed was one of the Amazon as an empty space with plenty resources to be explored. An empty space has no culture, no legacy and it does not belong to any one.

Chapter 3

The Amazon in the International Realm

The Amazon is a reoccurring theme in the international arena. Even before the rise of an international agenda focused on the environment, the Amazon was already part of the Brazilian foreign policy, albeit in a discrete way. With the rise of an international environmental agenda, the environment gained a well-defined space for discussion. The aim of this chapter is to analyse the place that the Amazon occupied in the Brazilian foreign policy focusing on the period after the emergence of the international environmental agenda to explain the absence of certain issues in the discussions, such as terra preta de índio.

This chapter is divided into three parts. The first section is dedicated to the international environmental agenda and Brazil and it presents an analysis of how the Amazon emerged in the foreign policy of Brazil, from the time where Brazil was a colony until today, going through the participation of Brazil in the international environmental agenda in the 1970s with the Stockholm Conference. From the beginning of the 1970s onwards there was a change in the way environmental issues were dealt with and managed. Nature gained a new connotation. The environment became a global problem that demanded a global solution. This new focus on the environment has not translated into more importance to issues related to population, traditional knowledge or less degrading use of resources. All of those would have shifted the discussions on the Amazon to focus on issues that are related to terra preta. By identifying how the Amazon was portrayed and what was the Brazilian position in the international environmental arena, we can explain the appearance and the absence of certain issues.

The second section is on environmental governance; a theme that has gained momentum in the last few decades and that refers to conservation projects and biodiversity. With the emergence of an international environmental agenda, these projects gain more space for discussion. This section is divided in three subsections: globalisation, environmental governance, and climate regime, pointing out the main characteristics of these regimes and why it gains so much space.

The third section is dedicated to the connection between the themes discussed and terra preta de índio. In other words, this part presents an analysis between the foreign policy of Brazil and the Amazon soil as well as in relation to environmental governance and the themes that encompass this discussion in relation to terra preta.

The International Environment Agenda and Brazil

The internal and foreign policies of a country are interconnected. The Amazon[122], which corresponds to more than half of the Brazilian territory, has always been the target of international disputes since the colonial period. This section explores the role of that forest in the foreign policy of Brazil since the time the country was a colony until today, analysing different political moments in the country. The spatial frame is key to demonstrate that the region, in fact, has always been part of the international agenda in Brazil. This section is divided in seven subsections: from the colonial period up until 1912, from 1912 until the Military Coup and from 1960 until 2000.

From the colonial period until 1912

Since the time that Brazil was a colony, the Amazon was already part of the international political scenario. This is mainly due to two factors. The first one is historical, as the forest was the target of disputes between European colonies in the sixteenth and nineteenth centuries. The second is geographical: the South-American rainforest stretches down to eight countries and the French Guiana[123].

In the colonial period, the Portuguese policy towards other territories was based on the conquest of territories[124]. This was part of the Portuguese project for the expansion of its empire. It is important to point out, however, the crucial part played by the trailbrazers, or *bandeirantes*[125] in Portuguese. From 1750 when the Treaty of Madrid recognises the right of the land to who uses it - *uti possidetis* – until 1822 when Brazil becomes an

[122] The Legal Amazon that is.

[123] The eight countries are: Brazil, Peru, Venezuela, Colombia, Ecuador, Bolivia, Guiana, Suriname.

[124] During the colonial time, Brazil did not have a foreign policy because it was not yet an independent state. That is not to say that there was not a policy towards other territories.

[125] *Bandeirantes* were the people that went into the hinterlands of Brazil in search of minerals, indigenous populations for slavery and hidding places of slaves that escaped.

independent country, the *bandeirantes* were crucial in the expansion of the Brazilian territory. This was not different in the Amazon. According to the Portuguese perspective at that time, the Amazon was not part of the most important regions in the country. The natural characteristics of the forest made its occupation difficult. Brazil, as it happened in Latin America and in the countries of the African continent, was seen by the European powers as an economic frontier, in which progress is seen as never-ending growth and prosperity, attained through the exploitation of natural resources, which are also seen as infinite (BECKER, 2008, BECKER, 1997). Even after independence in 1822, the way the country was seen by the powerful players remained unchanged. The role of Brazil in this history chapter that lasted until the beginning of the twentieth century was to supply raw materials to the European states and the United States.

Just as Brazil was seen as a resource frontier, the Amazon was seen in the same way by the countries in which the territory of the forest spread over. The countries of South America saw the forest as a place to be exploited due to its resources. The region operated as an economic 'island' (BECKER, 1982), which had as its main purpose the supply of local raw material to other countries. The rubber cycle, an example to illustrate this point, led to the region devastating forces regarding the extraction of resources, which generated economic and social conditions of little equity. With the end of the rubber cycle, the region started to be seen as a green hell, with soils unsuitable for agricultural production and with rapid deterioration (BECKER, 1982).

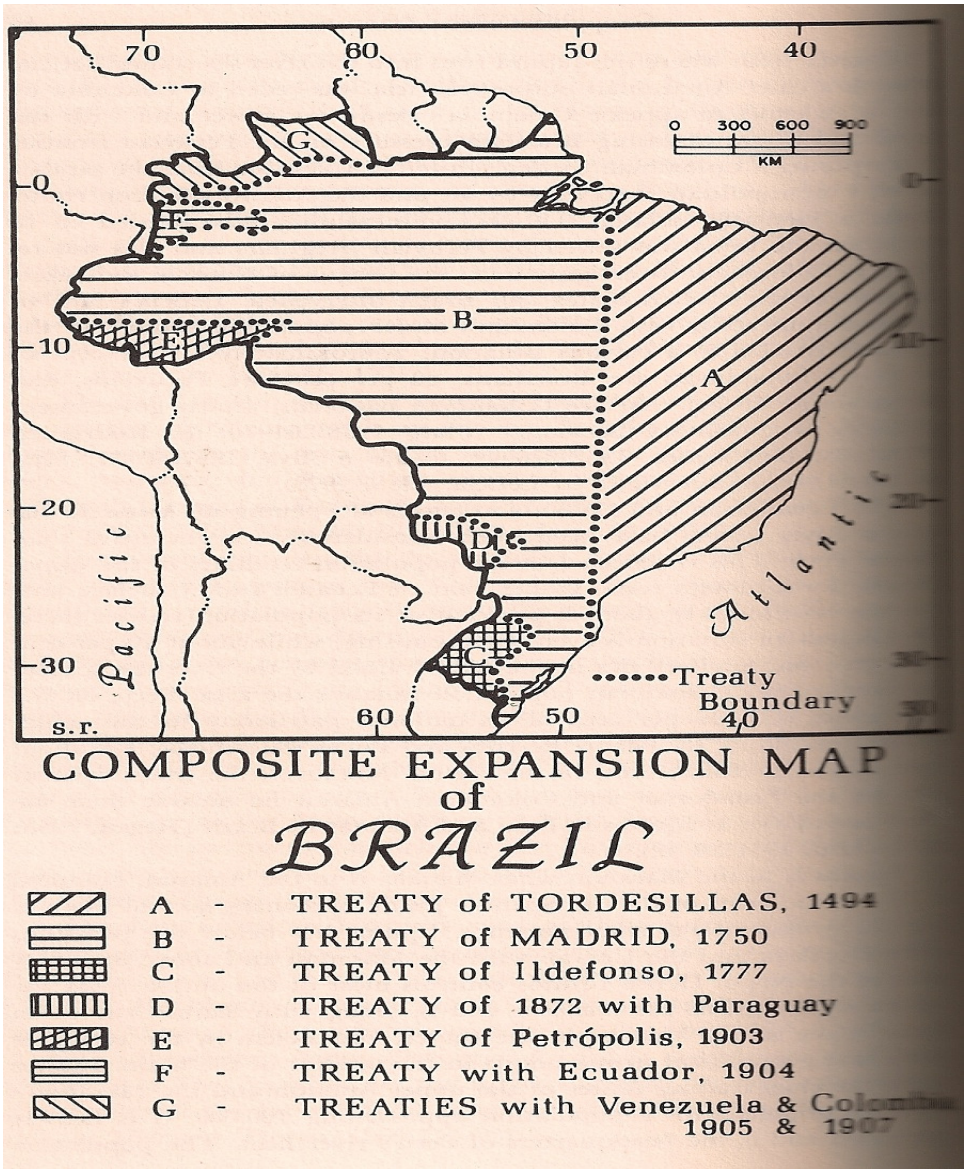
It is important to notice, however, that exploitation was not the only event. There was also a conservationist movement that started in the beginning of the nineteenth century. It was during the time of D. João VI and D. Pedro II – and also throughout the years after that – that expeditions to map out all the natural features of Brazil were carried out. Botanist Friedrich Phillip Von Martius, for example, carried out his research in Brazil from 1817 and 1820 (GUIMARAES, 1991). Auguste Saint-Hilaire and Peter William Lund were among the first explorers in the country. D. Pedro II and his order of conservation and recuperation of the Tijuca forest in the city of Rio de Janeiro in the middle of the nineteenth century is very emblematic for the city.

The role of the forest in the consolidation of the Brazilian territory exceeded the colonial time. After the proclamation of the Republic and during all the term of Rio Branco in charge of the Brazilian Foreign Office (1902-1912), the region continued to play an

important role in relation to this objective. The end of territorial disputes in Amapá, which involved France (which ended in 1900) and England (which ended in 1904), and the acquisition of the state of Acre (1903), putting an end in the dispute with Bolivia, illustrate this last point.

The map bellow shows the definition of the Brazilian territory and different treaties.

Figure 12 - Map of the Definition of Brazil



Source: Tambs, L. 1974: 60.

From 1912 until the Military Coup of 1964

The period between the end of the Rio Branco mandate in 1912 and the 1960s was marked by closer ties with the United States, which began to take the place that Europe had for Brazil. At that time, Brazilian borders were very well delineated. In this new scenario, the Amazon no longer had a prominent role in the foreign policy of the country. Besides no longer being an important region regarding border delimitation, which was for a long time a central matter, other two factors also contributed to this change in the role of the forest. The first was the end of the rubber cycle, which interrupted abruptly the flow of investments to the region, and had great impact on the population. The second was the Prata Watershed, which received special attention from the foreign policy in the first half of the twentieth century, due to the economic and military supremacy of Argentina. The fact that Argentina had a great and extensive communication network in South America, which included the Amazonian countries, was a cause for concern (ANTIQUERA, 2006).

The rubber cycle is very well known as a key event in the history of the Amazon. It was the abundacy of rubber that put the rainforest in the centre of the international arena. The Second World War triggered a growing need for rubber. The Amazon, being a natural reservartoire, drew the attention of the United States, who went to war in 1941. As the rubber cycle had already gone down and many of the workers had gone back to their original states, it was necessary to call upon Brazilians to move to the Amazon to work for the rubber. The Americans invested heavily in rubber production in the region during the period of the Second War. However, as production never reached what was expected, as soon as the War ended, the United States cancelled the contracts and stopped investing in the Amazonian rubber production.

Although the forest lost space in the political agenda, it still maintained a certain relevance for two reasons. First is the size of the forest. The Amazon extends itself throughout Brazil and the Andean countries – with the exception of Chile. This was important due to the dispute with Argentina for the hegemony in the region. The second referred to the possibility of using the Amazon watershed as springboard for its projection in the region. Only between the years of 1940s and 1970s a project for the strategic use of the Amazon watershed was put in practice.

During the same decade, the proposal for the creation of the International Institute of the Amazonian Hiléia (in Portuguese IIHA) that Brazil presented to UNESCO in 1946 deserves further attention. This proposal, which was not ratified by the Congress, was based on the idea that Brazil did not possess the financial resources, nor the qualified personnel or the infrastructure to efficiently manage the forest, which made international cooperation necessary. The other Amazonian countries also shared this 'acquilis tendon' of Brazil. The Institute would be a research centre and the following countries would be part of it: Amazonian countries, France, England – countries with colonies in the region – as well as the United Sates and Italy, which would come in with the technical and financial support. The Brazilian Congress was against the creation of the Institute and, as 80% of the Amazon rainforest is in Brazil, the project did not move forward. The failure of the IIHA removed, once again, the region from the Brazilian foreign policy agenda. In the international plan, the forest would go back to the political agenda with the military coup.

The 1960s

The Military Coup of 1964 gave rise to the military regime. The first head of government in the dictatorship was Castelo Branco (1964-1967), who took over four days after the Coup. It was during his period in power that the Sixth Constitution of the Country in 1967 entered into force. It was also in this period that the Law of National Security and the New Law of the Press were elaborated. The second military in power was Costa e Silva (1967-1969). He, at first, had security as his main focus, but then moved on to have development as a priority (GONÇALVES & MIYAMOTO, 1993). Security became a product of development. For this reason, his foreign policy was called the 'diplomacy of prosperity'. It was in the Costa e Silva government that the Institutional Act 5 was created, revealing the true essence of the regime. Between Costa e Silva and Médici, a Military Junta (31st of August, 1969 until the 22nd of October) took over for two months, reinforcing the intransigent character of the dictatorship. The third general in power was Médici. In his government, Médici (1969-1974) tried to impose a vision of Brazil as a powerful player, adopting a more individualistic posture, moving away from multilateral agreements. During this period, the Amazon appeared in a very inexpressive way in the foreign policy of Brazil. This role of the region reflected the lack of spatial conscious of the country, which meant that the territory as a whole was not used in the development of the foreign policy (ANTIQUERA, 2006).

With the Military Regime, Brazil began a period of huge projects (GUIMARÃES, 1991). Size seemed to have a very important effect. It was in the period (1964-1985) that the Transamazon was meant to be built. This is also the period of the Carajás project, between what was the largest mineral deposit on Earth. The examples go on with Itaipu and the Construction of Angra, a nuclear power plant[126].

The fact that the Amazon was in the background did not mean that concerns over the region were inexistent. The territorial integrity of the country, the sovereignty issue over the forest, the need to have a counter-balance in relation to the Argentinean influence in South America and the need to consolidate the influence in the region were reoccurring concerns (ANTIQUERA, 2006). Although the Amazon only gained space in the front stage of the foreign policy with Geisel, it was from the Coup onwards that the region started to steadily gain space. Already in 1966 the Operation Amazon was launched, and it had as its main results, in the internal sphere, the change from SPEVEA to SUDAM and from the Amazon Bank of Credit to the Bank of the Amazon, BASA. This bank had as its mission the implementation of federal government policies that referred to credits for development. The Operation Amazon had two fronts: economic and geopolitical. The actions of the operation had the aim to insert the region in the economy of the country and occupy it to deviate the eyes of the international powers, which saw the potential of the forest.

An event stimulated Brazil to search for further integration with the countries that shared the Amazon. This event was the Andean Pact of 1969. This Pact, in which Brazil was not included, involved precisely the Amazonian countries. This fact undermined the idea of Brazil consolidating its position within the South American region.

The 1970s

The 1970s were outstanding both nationally and internationally. In the internal sphere, the decade is still one of military dictatorship and it is in this period that the Amazon Treaty is signed. In the international sphere, this period indicates the beginning of the international environmental agenda.

[126] The nuclear power plants of Brazil were not extremely large but added to the other energy projects, it demonstrates how eager the military regime was to impose Brazil as a robust country.

The process that culminated with the emergence of the international environmental agenda started decades before Stockholm. The signs of environmental imbalance in the industrialised world became evident in the 1950s and 1960s (GUIMARAES, 1991). In 1952 the capital of England was taken over by a cloud of particulate matter, the famous London smog. Due to thermal inversion, this smog covered the city for 4 days, which drove thousands of people to London hospitals. In the week following the incident, four thousands deaths above average were registered. The 1960s were marked by Rachel Carson's book *Silent Spring*. The book from 1966 goes over the environmental effects of the use of chemical products and it had great impact not only in the United States but also in the world. The Torrey Canyon spill in the European coast in 1967 had great environmental impact and, consequently, economic impact in the region. In 1968 the Minamata Bay disease was diagnosed. The disease takes the name of the bay where there was contamination by mercury. The metal arrived to the human body through the ingestion of contaminated food. Doctors who realised that there was a high rate of deformed babies in the region gave the alarm. This led to medical investigation, which in turn resulted in the clear diagnosed of a disease caused by environmental factors. The metal spilling was interrupted in 1968, fifteen years after its beginning.

These events in the world culminated with the organisation of the Biosphere Conference[127] in 1968 in Paris. The Conference had a scientific focus and discussed the impact of human activities on the biosphere. During the Conference it became clear that environmental problems could not be resolved at the regional, national or local sphere, they demanded global action[128]. The need to hold a political meeting for environmental problems was also made clear. This is how the idea for the United Nations Conference on the Human Environment was born. The decision to organise the Conference reflected the concern to discuss themes that could originate international conflicts (RIBEIRO, 2001). The meeting took place in Stockholm in June 1972.

According to the resolution of 1969, the main objective of the conference was to develop guidelines for government actions to "protect and improve the human environment and to remedy and prevent its impairment, by means of international co-operation, bearing in

[127] It was this conference that gave birth to the Man and Biosphere programme (MAB), live until today.

[128] Initially, the Stockholm conference was called upon to draw attention to an issue, not necessarily to recommend action. It was only in 1970 that talks about action started to be discussed by the organising committee.

mind the particular importance of enabling developing countries to forestall the occurrence of such problems"[129]. One hundred and thirteen countries participated in Stockholm together with nineteen inter-governmental bodies and 400 other inter-governmental agencies and non-governmental organisations (McCORMICK, 1992). However, only two chief-of-states were there, the Swedish minister and Indira Gandhui, the Indian Prime Minister. This indicated that, although the meeting mobilised a great number of states as well as government and non-government organisations, the environment was still not high in the politicians agenda (RIBEIRO, 2001).

The agenda at Stockholm reflected the problems of the developed world, in other words, the environment theme was focused on the technical aspect of environmental problems. The 1972 Conference discussed atmospheric pollution, water resources and soil contamination caused by industrialisation. The impact of demographic growth on natural resources was also discussed. The debate was based on Thomas Malthus's argument that population growth is not accompanied by the increase in food production, which took place at a lower speed. The discussion of these themes led to proposals of deterring population as well as economic growth in developing countries as pollution would tend to worsen with the increase of economic growth and population growth would bring greater damage to natural resources.

The Conference was divided by two thesis – the zero growth and the development thesis – defended by the countries of the North and South respectively (RIBEIRO, 2001). The first position stated the need to stop industrial growth of countries as a way to control pollution, the consumption of natural resources to sustain the industrial production as well as establishing population control, avoiding by doing so greater degradation and natural resource exhaustion. Already in the preparatory meetings, the difference between the countries of the North and South became clear and the latter stood out in the meetings that preceded the Conference. Although the trigger of the Conference was the problems faced by developed countries, developing nations used their vote at the UN General Assembly to ensure that their concerns also made it to the Conference's agenda (MCCORMICK, 1992).

The second thesis defended not only the importance but also the need of economic industrial development, claiming the right to grow for the then called developing or third

[129] Resolution 2581, 24th General Assembly Session, 1969, Page 45.

world. It is worth pointing out that the pattern of consumption in mind when population consumption was mentioned was the Northern American one, in other words, one completely outside the reality of developing nations. The argument of the Southern countries was the winner at Stockholm. The emphasis on the incidents in the decades before the Conference encouraged the link between pollution and the evidence of industrial development. Therefore, the efforts to control pollution were seen as efforts to hamper development (MCCORMICK, 1992). The fact that the position of developing countries was victorious in the Conference imposed a revision in the developed nations way to see the environment. The principle of sovereignty, the non-control of a national territory by an external power, was reinforced at the Conference.

Brazil[130] had a crucial role in the vindication of the right to develop. The countries of the South claimed the right to develop, even if this right would consequently lead to an increase in pollution. A phrase of one of the members of the Brazilian delegation illustrates this point: “Come to Brazil, We still don’t have pollution” (RIBEIRO, 2001: 80). With the exception of the dispute between Argentina and Brazil over Itaipu, all the other issues defended by Brazil had the support of all the other developing countries (GUIMARAES, 1991). The general-secretary of the Conference, Maurice Strong, besides using his influence so that the concerns of the third world countries would reach the Conference’s agenda, also demonstrated both publicly and privately that he recognised the central role of Brazil in the meeting. The Brazilian position in Stockholm was based in three main arguments (GUIMARAES, 1991). The members of the Brazilian mission argued that development should not be sacrificed for a cleaner environment. They also argued that, as the developed nations were the big polluters, they would be the ones responsible for the ‘cleaning’ of the environment. The third argument was the defence of sovereignty, arguing that this principle should not be sacrificed to satisfy suspicious concerns of the environment.

The Stockholm Conference is a milestone for the environment (GUIMARAES, 1991; MCCORMICK, 1992) and two points illustrate this importance. First, the Conference put the environmental issue in the centre of the international political debate. The Conference also had success in triggering international actions. The second point refers to the institutionalisation of the environmental issue, both in the international sphere, with

[130] The diplomat Araújo Castro was the leader of the Brazilian delegation at the Conference.

the creation of UNEP (United Nations Environment Programme), and at the national level, with the creation of environment secretariats and ministries in a great number of countries in the world. Stockholm represents the beginning of the international environmental agenda. This fact implied the recognition that there is in fact a crisis and that it is related to the mode of production. The environment, before restricted to technical debates, gained political space. It was in Stockholm that the junction between development and the environment was first made. Another point that deserves to be stressed in the 1972 Conference is the role of Non-Governmental organisations. Stockholm gave them legitimacy to environment groups that were loosely connected. The Conference opened space for the participation of these groups and this action triggered the strengthening of civil society participation within environmental discussion (DO LAGO, 2007).

The international environment scenario presented – and it still does – a duality in the position of countries. The difference between the countries of the North and the South is a reality. In the North, environmentalism is more associated with the preservation of untouched nature, whereas in the South this movement is connected to questions related to distribution and production in society (GUHA & MARTINEZ-ALLIER, 1997). This divergence in the understanding of environment is reflected in the different positions and projects. Both in the Conference for the Human being Environment in Stockholm in 1972 and in the Environment and Development Conference in Rio de Janeiro in 1992 demonstrate the divergence of positions.

The dichotomy at Stockholm explained the emergence of environment policies during the 1970s. It was precisely after 1972 that scientific orthodoxies – positivist positions regarding the environment– were imposed in developing countries. These absolute truths about degradation generated – and still do – two problems (FORSYTH, 1998). Firstly they present a simplistic view and are very little connected to reality. Secondly, they impose a determined definition of what is degradation, without taking into consideration specific contexts. These positions are part of the dominant discourses.

An analysis not even so thorough would reveal that, behind the discourses that prevailed, there were also solutions seen as all-embracing, which would respond to all the problems (BROCK & CARPENTER, 2007). Examples of this are privatisation and central government regulation, amongst others. One-size solutions are closed, with very

little dynamics and without space for change. A policy, once its put in practice, will present variations that will be difficult to predict. This means that is necessary to do a constant evaluation of the policies and its results (ANDERIES et al, 2007).

In the internal sphere, the 1970s was the stage of the important changes in relation to the position of the Amazon. Until Geisel, the Amazon was relegated to a secondary role in the foreign policy of the country, diluted among other general environmental questions. It was during his government (1974-1979) that the Amazonian Cooperation Treaty (in Portuguese TCA) was negotiated and consequently signed. With this Treaty, the Amazon was elevated to the first stage of the Brazilian foreign policy. In the international political scenario, the East-West axis had been minimised at the same time that the North-South axis went back to being part of the foreign policy. Geisel retook the Brazilian foreign policy paradigm in search for autonomy in the international scenario (GONÇALVES & MIYAMOTO, 1993). The term 'responsible pragmatism', the flagship of Geisel, was the base for the projection of Brazil as an important actor in the international scenario. This term encompasses three factors (GUIMARAES, 1991): the commitment to developed countries, the active support to the countries of the Third world and a great aversion to automatic alignments.

Although not being absent from the foreign policy, it was only in the end of the 1970s that the Amazon gained a prominent space with the elaboration of the Amazonian Cooperation Treaty. Four factors contributed to this (ANTIQUERA, 2006). The first factor was the responsible pragmatism, which gave support to the Treaty. Secondly, the economic development reached by the country, which eased the integration of the Amazon to the rest of Brazil. The third was the signature of the Andean Pact, which pushed the discussion of a treaty that would include Brazil. The fourth was the diminishing of the East-West divide, which open space for other questions to start popping up in international discussion, such as environment and human rights.

Regarding the environment as a whole, agencies that would directly deal with environment issues were created even before SEMA in 1973 (GUIMARAES, 1991). The Brazilian Institute of Forestry Development (IBDF) in 1967 and the National Institute of Colonisation and Agrarian Reform (INCRA) in 1970 illustrate this point. However, even with such step forwards, it is important to notice the environment has never been high in the Brazilian political agenda. These institutions were created embedded in constraints

of political alliance and in a development mode that puts growth at all costs in the forefront.

It is in the 1970s that the base for the Brazilian foreign policy is delineated. Although with changes in the internal and external context, this underlying base is still present today in the international environment discussions. The growth primacy is clear from the beginning of the decade. This primacy goes uncontested until this day. It is also clear the place that the Amazon occupies, seen under the auspices of the concepts of sovereignty and security.

The 1980s

The growing importance that the environment theme started to receive from the 1970s onwards crosses the borders of the years and it kept the pace in the following decades. The meeting in the 1972 gave strength to the discussion on new ways of development. In 1987 the report *Our Common Future* – also known as the Brundtland report - was launched. The document presented the concept of sustainable development as a better path towards the future.

Internally, the military dictatorship started the decade with João Baptista Figueiredo in power. Figueiredo's government (1979-1985) maintained the responsible pragmatism as a pillar of its foreign policy, then with the name of 'universalism' and with a closer link to the countries of the third world (FERREIRA, 2006). Although the TCA was signed in the 1970s, its first years were not very significant as the major concern of Brazil in relation to the countries that signed the Treaty referred to security and to natural and energetic resources (ANTIQUERA, 2006). These topics were not part of the Treaty, which explains its little appearance in political debates in South America.

After Figueiredo, it is José Sarney's turn to take over in 1985 through indirect presidential elections[131]. At that time, the relationship with Argentina was prominent, which prepared the mood for the development of what would be the focus of the foreign policy in the following decade – the MERCOSUL. In the end of the decade, the Amazon gained international repercussion, which occurred for two reasons. First, the deforestation of the forest drew attention within the international community. Images of the forest devastated travelled around the world. The rights of the indigenous people

[131] Sarney was the vice-president of Tancredo Neves, who died before taking power.

were also a reoccurring theme at that time. The second reason was the murder of Chico Mendes in 1988. The extractivist leader was known worldwide for its work and his murder reinforced the idea that Brazil was not capable of taking care of the forest. It is in this period that the country was labelled the big villain of the environment.

It is in the end of that decade that Brazil adopted a defensive position in relation to the environment. And it is according to these lines that the Programme *Our Nature* was launched in 1989. The programme was a direct response to the international community, an attempt to demonstrate the Brazilian capacity to manage its own natural resources. The goals of the Programme, that were added to the Constitution, were the protection of complex ecosystems in the country, the organisation in a systematic way of environment protection, amongst others (KOHLHEPP, 1992). The Programme triggered changes in the bureaucratic policy of the environmental sector in Brazil (GALVAO, 1996). It is important to stress that the Programme *Our Nature* was elaborated and monitored by the National Secretary of Defence, which demonstrates how the Amazon was still treated as a matter of national security (CANIZIO, 1991).

According to the Brazilian rulers, the national interest and sovereignty in the Brazilian Amazon were at stake. In the international arena the capacity of Brazil to manage its forest was under dispute and there were proposals going around claiming that the forest was a humanity heritage and it was described as the lungs of the world [132]. For Brazil, these understandings were the base for new forms of interventions, which use the ecological issue as a way to lower the guard, but with a hidden agenda. The self-determination of Brazil was always present in the speeches of Sarney on the Amazonian Programme. The Amazon issue would open the possibility for a group of states to impose their interests on another sovereign state. The elaboration of the Programme *Our Nature* was a direct response to it. The way the Amazon was discussed internally in the late 1980s shows the strong link between the forest and concepts of sovereignty and national security.

The 1990s

[132] During the 1980s, the idea that the Amazon was the lungs of the world was heatedly defended in the international sphere. If the forest was in fact the lungs of the world the property rights over the forest would be international rather than just to the countries in which the forest extends itself.

The 1990s came with change. In the international scenario there is an end to the capitalism-socialism divide. In this new scenario, three factors stand out (CERVO & BUENO, 2009): the supremacy of the neoliberal ideology, the primacy of the market and the North-American military hegemony. The globalisation phenomenon, generating fast and large quantities of commercial transactions, dictated a new economic reality. Brazil did not easily adapt to this new context. Five ministers were head of the Foreign Affairs Ministry between 1990 and 1995. From 1995 to 2000, Luiz Felipe Lampréia took over the post in an attempt to generate coherence in the foreign policy of the country by bringing stability.

In 1989, Brazil had its first president elected democratically since the 1960s. The arrival of Collor in power coincides with the beginning of the organisation of the United Nations Conference on the Environment and Development in Rio de Janeiro in 1992. Fernando Collor de Mello took over the presidency of Brazil with the environment – with a special emphasis on the Amazon – already consolidated in the international agenda. In June 1990, the Inter-ministerial commission that would help the president in the preparation for the event was organised.

In the beginning of the Collor government the international community's distrust in relation to Brazil was very much alive. The pressure in relation to the environment position of the government was not just a feature of the international arena. Nationally, people also voiced their concern, such as Listz Viera, Fernando Gabeira and Fábio Feldman (CANZIO, 1991). In an attempt to remedy these concerns, Collor appointed José Lutzemberger, a worldwide known ecologist, as the national secretary of the environment.

The international context was more complex and the Country had a negative image to reverse. Taking this into consideration, some measures were taken, the nomination of Lutzemberger being one of them, as well as the reform of the internal environment system as an institutional answer to the external pressure and the transformation of the project Calha Norte[133] into an ecological project. The change in the Brazilian position was also clear in the government's speech. In April 1990, the Chancellor Francisco

[133] The project Calha do Norte was elaborated by the Superior School of War and it was implemented in 1985 during the Sarney Government (1985-1989). The aim of the project was to military strengthen the Amazon frontiers to protect indigenous populations, the minerals of the forest, avoid combat between guerrillas and repress illegal activities in an area from Amapá to Amazonas.

Rezek announced that Brazil would change its foreign position in relation to ecology (CANZIO, 1991). The defensive phase of Brazil as the environment villain had come to an end. The Country would promote cooperation with the negotiations of agreements that would privilege resources – financial and technological.

Brazil had five main objectives with the organisation of the Conference in Rio de Janeiro (FUNAG/IPRI 1993). First, it would be the first multilateral negotiation after the Cold War and the intent was to create a framework that would bring back the needed multilateralism. The idea was also to start up a trail of conferences that would redefine the rules of international cooperation, which was accomplished as the 1990s is known as the decades of conferences. Second, was to show the country as a great international actor, capable of holding large international events but also of being a key mediator. The third, was to demonstrate that it was possible to hold events in third world cities, which could eventually attract research centres to them. The fourth would be to give prestige to the Brazilian public opinion and citizenship and to seek recognition, as the country would show the world its democracy at full speed and its ability to receive the international community in its territory with great efficiency. Fifth – and probably the aim most related to us – would be to show that it is possible to preserve sovereignty over the national territory and resources, specially those from the Amazon, as well as demonstrate a position open to dialogue, cooperation and negotiation.

In June 1992 the United Nations Conference on the Environment and Development took place in Rio de Janeiro, Brazil. According to the UN resolution 44/228, the aim of the Conference was to “elaborate strategies and measures to halt and reverse the effects of environmental degradation in the context of increased national and international efforts to promote sustainable and environmentally sound development in all countries” (RESOLUTION 44/228 1989: 152). In other words, the aim of the meeting was to establish accords at the international level to mediate human action in the environment (RIBEIRO, 2001). Besides the technical themes of environmental pollution, such as atmospheric pollution, themes such as the external debt of developing countries were also in the agenda of the Conference.

One hundred and seventy two countries and one hundred and eight chief-of-states participated in the meeting. Non-governmental organisations arrived with 1400 participants and 7000 NGOs took part in the parallel event Global Forum (DO LAGO,

2007). The huge difference between the number in chief-of-states that were in Stockholm in which only two showed up, and Rio de Janeiro, emphasised the importance that the environmental issue gained in general. The meeting in Rio was, as well as the one in Stockholm, a milestone for the environment. Maurice Strong, the general secretariat of the 1992 Conference, said that the meeting was a historical moment for humanity (DO LAGO, 2007). The Rio-92 had as a result the *Carta da Terra*, which was already foreseen, an action programme, which is the Agenda 21. Two conventions were elaborated: the climate change and the biological diversity one. In addition, the Forest Declaration was also presented.

The inclusion of development in the agenda for the Rio-92 was a diplomatic victory for Brazil. The union of development and environment reflected the wish of developing countries. The development process, which appears qualified here as sustainable, represented a continuation of a theme that has been reoccurring throughout the twentieth century in the Brazilian foreign policy. The country stated, from the preparatory meeting onwards, that the environmental problems of developing countries were due to the lack of economic and social development. All people depend on the environment for their well-being. However, it is the poor that depend on the environment on a more fundamental way, in an immediate way (DURAIAPPAH, 2004). For example, the rich can buy clean water; afford to live in houses that are protected to natural disasters, buy air conditioner to move away for air pollution. The poor cannot do so. Consequently, one theme could not be discussed without the other. This argument was also present at Stockholm.

The insertion of the development as one of the main themes in the Rio Conference and as indispensable for environment conservation represents the non-acceptation of the freezing of the world structures of that time, which were extremely unequal and unfavourable to the countries of the third world (CANIZIO, 1991). The historical responsibility of the developed countries was reinforced. If we look carefully to the three points that defined the Brazilian position at Stockholm - development[134] would not be sacrificed, developed countries should pay for the 'cleaning' of the environment, sovereignty should not be contested – we see that all these arguments were present at the Rio Conference.

[134] It is important to qualify this so desired and defended development. This type of development is economic, in other words, the economic growth of countries.

The sovereignty concept, greatly debated at Stockholm, and in the case of Brazil also in the end of the 1980s, was also in the political agenda of the Rio-92. The discussions about the concept were not a revision; they were stressing its importance. The exercise of sovereignty of a state would not clash with the need to protect the environment. Although Brazil stimulated cooperation amongst states in the speeches, it always stressed the concept of sovereignty over natural resources.

Although the concept of sovereignty has been a part of the Brazilian position throughout the decades, the concept has appeared in different ways. What changed was the way to use it, not in a defensive, but in a positive way. In the beginning of the decade Brazil had already demonstrated to the world that it had initiative to stop deforestation and political will to insert the environment as a theme in the political agenda. Brazil needed a new international image and it was the responsibility of the diplomacy to trigger such transformation. The union between the environment and development translated into ecology not being used as a flag for other means that were not the conservation of natural resources. In the 1990s, as it was in the Conference, the discussion on development were around the concept of sustainable development. However, this did not mean that the concept was widely debated, understood and internalised by all the actors and put it to practice.

It is important to take a moment to discuss the impact of the Rio Conference. Although it can be argued that, when looking at the aims of the UN resolution that gave rise to the Conference, the meeting did not reached its goals (GUIMARAES, 1992), when looking at the political impact of the Meeting, it was a success. There was a change in how the environmental crisis was perceived from Stockholm to Rio de Janeiro. In the former, the crisis was approached solely from a technical stand. Scientific knowledge would bring the improvements needed to tackle environmental problems. This reflected the first world way to deal with environmental problems, worried about soil, air and water contamination. In the meeting in Rio de Janeiro in 1992, however, environmental problems could no longer be separated from development ones. The Rio-92 Conference is the recognition that the crisis is the result of the exhaustion of the development model that had prevailed. This development model was not only ecologically devastating, but also socially perverse and politically unfair (GUIMARAES, 1992). The link between poverty and the environmental crisis was mentioned even in the Resolution 44/228, which states that poverty and environmental degradation are intimately linked. One of

the environmental themes discussed on the Conference, as established by the Resolution 44/228 was to eradicate poverty and improve livelihoods and work conditions both the rural and urban areas (FUNAG/IPRI 1993). Although the conventions and declarations produced by the Meeting were not as strongly worded as it could have been and as it was actually discussed during the preparatory meetings, all of the five resulting documents represent milestones. In addition, despite the fact that discussions on financial resources[135] and institutional arrangements suffered with obstacles, the overall result was positive. This is mainly due to its political impact, which triggered changes within international relations in the short-term.

The Brazilian position in relation to the environment in the 1990s was responsible for the change in the vision of Brazil as a villain (CANZIO, 1991). It can be said that the beginning of the decade was in opposition to the previous decade regarding the environment. The Brazilian diplomacy achieved three successes (CERVO & BUENO, 2008). The first was the UN Conference in Rio de Janeiro in 1992, the second was the insertion of the development issue in the environment debate and the third was the overcoming of the North-South dichotomy in the international arena and the establishment of a cooperation mood. The consequences of the change in the approach are seen in the results of the Rio-92.

A more thorough analysis would allow us to notice that, although the Brazilian position was not attached to the 'questions of principle' or the defensive posture of Sarney's Government (1985-1990), the position of Collor Government (1990-1992) maintained the same line as the previous government (CANZIO, 1991). In other words, it was reactive, only responding to criticisms of the international community. In its essence, the Brazilian position was still the same, with its roots in the 1970s, which means defending the right to develop, stressing the responsibility of the developed countries in the environment situation and highlighting the principle of sovereignty.

Brazilian politicians of the 1980s saw the ideas that circulated back then about the Amazon as the lungs of the world and a humanity heritage as a threat and there were fought by the Brazilian diplomacy in the 1990s. Although the Amazon was not the target of proposals that in the eyes of the Brazilians would compromise its sovereignty, the

[135] In Stockholm it was established that developed countries would give 0.7% towards development aid. In the Conference Rio the discussions revolved around half of that amount (GUIMARES, 2001: 2).

South American rainforest was not saved from problems. The lack of research on the Amazon, an issue since the time of the development of the TAC, was not remedied. With this, the Convention of Biological Diversity was violated with patents of Amazonian products being registered outside the Country. As an answer to this scenario, which triggered discussions on the sovereignty, the Brazilian Congress approved the Law on Biosafety (1995), the Law on Patents (1996) and the Law on Cultivares (1997) (CERVO & BUENO, 2008). There were also international initiatives, such as the Pilot Programme of the Protection of Brazilian Forests – PPG7, which involved Brazil, the World Bank, the European Union and the G7. The establishment of the concept of sustainable development as a main theme in the Conference in 1992 helped to deviate international threats to the Amazon.

In the 1990s the role of development in the foreign policy of Brazil was once more transparent. The Brazilian position in Stockholm re-appears in the Rio Conference. Before and during the Conference in Rio, Brazil stimulated the cooperation between countries, which was one of its great successes. However, this did not mean that sovereignty was forgotten. This concept, specially regarding the natural resources, was discussed as a way to reinforce it.

It is also important to stress the fact that it was during the 1990s the large international cooperation projects began to populate the Amazon. In this scenario, the project Studies of the Human Impact on Forests and Flooplains in the Tropics (SHIFT) draws attention. This bilateral project between Germany and Brazil started in 1989 and expanded its reach thourghout the years, focusing in the Amazon, the Antlantic Forest and Pantanal. Other bilateral programmes followed, such as the Anglo-Brazilian Climate Observatory Study (ABRACOS) with the United Kingdom, which started in 1990. There were also projects that involved more than two countries, such as Pilot Programme for the Protection of Tropical Forests of Brazil – PPG-7, which started in 1995 and the Large Scale Bioshpehre-Atmosphere Experiment in Amazonia (LBA), which started in 1998. These programmes reflect the great international appeal that the forest has.

The 2000

The United Nations Conference on Sustainable Development in Johannesburg in 2002 was the third UN major Conference on the environment. The focus of the meeting was the Agenda 21 and the aim of the Conference was to promote the incorporation of

concrete measures and to establish targets for its implementation. In September 2002, between the 26 of August and the 4th of September 2002, 60 thousand people participated in the World Conference on Development (LUCON & COELHO, 2002). Between 2001 and 2002, four preparatory meetings took place.

In Johannesburg, as in the previous Conferences, Brazil had an important role. The Country led Latin America and the Caribbean in the negotiations in the period before the meeting, when the Latin American and Caribbean Initiative for Sustainable Development was elaborated. This Initiative included the Brazilian Proposal on Energy[136]. Brazil had an important role during the meeting. Even suffering the pressure for its new condition as a great CO_2[137] polluter, Brazil continued to defend the historical responsibility of the developed nations.

In contrast to the Stockholm Conference in 1972 and the Rio de Janeiro Conference in 1992, the Johannesburg Conference in 2002 did not leave a positive image. To understand if Johannesburg was a success or a failure, it is important to analyse one issue. The 2002 Conference took place straight after the terrorist attacks of 2001 in the United States that shook the world; there was tension in the air. Rather than moving forward, a lot of time was spent on issues that had already been taken as certain, such as the discussion on the principle of common but differentiated responsibility. The dichotomy between developed and developing nations was also there, but the dichotomy that drew more attention was between the countries willing to make commitments and those who were not. The Johannesburg Conference was marked by the reaffirmation of already discussed targets, such as poverty eradication, access to water and sanitation (DO LAGO, 2007). However, regarding moving forward in relation to the discussions on sustainable development, not much was accomplished.

In the ten years between Rio and Johannesburg, Latin America had only begun the path towards a more sustainable development. Looking back at the decade, the 1990s were eventful. In 1994, a report by the UNPD on the Human Development Index stated that no one should be condemned to a short or miserable life just because that person was

[136] The Brazilian Initiative proposed that the region adopted the target of having by the year 2010 10% of its energy from renewable sources.

[137] Between 1992 and 2002 Brazil, which in the Kyoto Protocol is part of the countries in the No-Annex I, no longer had a small role in GHG emissions and it was the 4th or 5th biggest CO_2 emitter in the world due to deforestation.

born in the wrong country, in the wrong class or with the wrong sex (GUIMARAES, 2001). During the 1990s, the countries of Latin America suffered economic reforms focused on trade liberalisation, together with a more prominent role of the private initiative in the production of good and services but also in the provision of public services – privatisation. In terms of public finances it is safe to say that progress were made. However, some key problems remained, such as the diversification of the export base as well as the trade barriers. In addition, from a social perspective, the 1990s are the years of the consolidation of the population growth and failure to create jobs for all these people as well as of the increase of inequality in several countries in the region (GUIMARAES, 2001). Therefore, Latin America and the Caribbean were not more socially and economically sustainable in the year 2000 than it was in 1990.

Although some scholars saw Johannesburg for its positive impacts, in general there was a feeling of failure. Besides the time spent reinforcing issues that had already been discussed, in other words, new problems and discussions were relegated to the second realm, it is worth pointing out that the failure became more evident when we look at the targets. The target that by the year 2010, 10% of the energy used would be from renewable resources was not approved due to a political articulation between the countries that export oil, the United States, Australia, Japan, Canada, New Zealand and even the European Union (VITAE CIVILIS, 2002).

One issue that deserves to be highlighted was the participation of non-governmental organisations. This group took part in the Rio Conference and had a significant impact, not only in the conference itself but also in parallel events. In Johannesburg, NGOs had a significant role even more relevant, consolidating the place of NGOs in environmental discussions.

The foreign policy of the new century started with the aegis of the Cardoso government (1995-2002). With the arrival of Lula in power in 2003, however, changes were set in motion and reached the foreign policy. Celso Amorim took over the Foreign Office. The foreign policy of Lula tried to insert the country in the international arena, diversifying the partners as well as the strategic options (VIGEVANI & CEPALUNI, 2007). Lula' strategy, which was characterised by the adhesion to international principles and norms through alliances between countries in the South and through the increase in agreements with non-traditional partners, such as China and East Europe, was called 'autonomy through

diversification'. Guidelines of the responsible pragmatism of Geisel were also present in Lula's foreign policy, with the affirmation of the autonomy in relation to the great powers and the increase in the networks with countries in the South.

In the first edition of the journal 'Diplomacy, Strategy and Politics' volume 1, number 1 2004, Amorin stated that foreign policy of Lula's government serves as an instrument to support a project of economic and social development in Brazil, promoting trade liberalisation with social justice (AMORIM, 2004). Once more, in a government that saw itself as different from its predecessors, economic development appears as the guiding principle of the foreign policy of Brazil.

In the last decade, especially after the IPCC report of 2007 confirming the role of anthropogenic actions in climate change, the discussion about the climate dominated the environment debate. The Amazon appears in this debate because of deforestation and the discussions on REDD[138]. The discussions on deforestation started to be crossed by issues of sovereignty and security. In the discussions about the climate, as in the UN conferences about the environment, the Brazilian position reflected the position in 1972. This was clear in the Copenhagen Conference of the Parties in 2009. Dilma Rousseff, then the chief of the Brazilian delegation in the Conference, for example, made the mistake of saying in an interview that the environment was an obstacle to sustainable development[139]. At the same time, it was during the COP-15 that Brazil became the first country to set voluntary targets, establishing a reduction of CO_2 emissions from 36.1% to 38,9% by 2020. During the meeting, Dilma revealed that this commitment would cost US$166 billion in the following 10 years[140].

It is not the first time that during the Conference of the Parties of the Climate Convention, while Brazil strove to pass a positive and active image in relation to climate change, in the internal sphere bills with a negative impact on those issues were being voted on in the national arena. Also in the COP in 2009, while Brazil presented its targets to reduce emissions – without explaining how they would be met – bill number 12

[138] For more information on climate regime check the section on the climate regime and chapter four.

[139] http://www.oc.org.br/blog/?p=1065 Accessed on 28th December 2009

[140] http://www.ipam.org.br/especial?sessao=Noticia Accessed on 23th October 2011. *COP 15 - Corte brasileiro deve custar US$ 166 bi ao País* published on the 18th of December 2009.

of 2003 was being discussed in Brasilia, which would empty IBAMA and would be an incentive to deforestation and degradation[141]. In the Conference of the Parties in Bali, 2007, one week after announcing the reduction target of 40% of irregular deforestation in the Amazon, President Lula conceded amnesty to all people that deforested for a year, period in which IBAMA could not issue fines[142]. In 2008 Brazil presented its voluntary targets, which divided the opinion in Poznan at the COP-14. Although the country made a huge step by setting targets, there was a lack of information regarding how that would be achieved, amongst other criticisms. In 2010, the big discussion regarding Brazil was how the country would reach the targets that it set in 2009 with the alteration of the Forest Code. This discussion is likely to go on this year as well.

Regarding terra preta de índio, it is important to analyse if and how biochar is taking part in the international discussions. Biochar has been in the climate change convention discussions since 2007 in the Confenrence of the Paties in Bali. Scientists organised a side event to introduce biochar to Conference. The meeting focused on the United Nations Convention to Combat Desertification and sustainable land management for adptation to climate change[143]. There were three presentations. Wolfgang Zech from Bayreuth University presented an overall view of the carbon that occurs natually in the soil and its depletion, terra preta de índio and how the replication of this soil would impact on the targets set up by the World Food Summit. Christph Steiner from the University of Georgia focused his presentation on soil carbon amendments. Goodspeed Kopolo, Senior Programme Officer at the UNCCD, had a presentation on the harnessing the results in a sustainable manner that would increase both adaptation and mitiagation of climate change in sink with efforts to achieve the Millennium Development Goals.

In the COP14 in Poznan, Poland, represented a step forward with Micronesia submitting at the UNFCC a proposal to introduce biochar as a technology to be considered as a 'fast-track' strategy for climate change mitigation in the immediate term[144]. This

[141] Jornal O Globo 18th of December 2009 pg. 39.

[142] http://www.greenpeace.org/brasil/amazonia/noticias/lula-cede-as-press-es-da-banca Access on 29th of December 2009

[143] Bali Side Event Proposal Document <http://biochar.bioenergylists.org/taxonomy/term/342> Accessed on the 24th of October 2011. The fourth presenter Alejandro Kilpatrick is not confirmed in the document and he would speak on the possibilities of funding for soil charcoal amendment programmes.

[144] <http://biochar-international.org/policy/international> Accessed on the 19th October 2011.

submission was responsible for the inclusion of biochar on the draft agenda for the following COP in Copenhagen in 2009. During the prepatory meetings for the UNFCCC COP15, biochar was on the draft agenda and those in favour of it worked in those meetings to further biochar within COP15. The overall negative result of COP15, however, put a cold blanket in most of the discussions. REDD discussions have been making progress throughtout years, even if the overall result of COP15 was one of disappointment to say the least.

Biochar is also a theme within the United Nations Convention to Combat Desetification. Biochar supporters have been present in the UNCCD conference of the parties. Until May 2009, 13 countries and the UNCCD made submissions to the UNFCCC to include biochar as a high-potential climate mitigation and adaptation tool. This illustrates the international pressure to further biochar within the UNFCCC framework.

At the UNFCCC COP16 in Cancún, Mexico, biochar was also a topic of interest. Although biochar was not included in the draft agenda of the COP, as was the case in Copenhagen, the international pressure to include the subject in the discussions was clear. Professor Johannes Lehmann and Thea Whitman from Cornell University spoke at two side events. Biochar refers to agriculture, a theme that has not a separate track at the UNFCCC. There was an agricultural text being negotiated at the UNFCCC, but it was dropped. It is also important to stress that agriculture was excluded from REDD+ (REED, 2011).

As the Kyoto Protocol comes to an end in 2012 and the Parties of the UNFCCC do not seem any closer in reaching a post-Kyoto accord, all the actors involved are focusing their efforts in the in discussion in Durban.

In this section it was clear that the Amazon was a reoccurring theme in the foreign policy of Brazil, even before the emergence of an international environment agenda. However, the forest appeared with other focus rather than the environmental. It is from 1980 that the South American rainforest comes in to the political agenda as an environment issue, which was an answer to the international pressures that the country was under due to the murder of Chico Mendes and deforestation. From them onwards, the Amazon always appeared in the international discussions. However, although preaching a policy that takes into consideration the environment and taking to the international meetings this discourse, contradictory, internal policies demonstrated that a development vision

prevails in relation to the Amazon. It is important to stress that, at the international arena, Brazil still defends the right to develop, praises sovereignty and defends the relevant role of developed nations.

Environmental Governance

The search for sustainable development triggers a debate on the structure of existing policies and its role in this venture. The 1980s was of great transformations in the international realm, which had great impact on the environment. This section is dedicated to environment governance, a theme that is gaining more and more space in the international arena. It is in this scenario that the Amazon, the most biodiverse place in the world, gains another context. This section is divided in three parts. The first is dedicated to the phenomenon of globalisation and its impact on the environment. The second presents an analysis of governance in the environment context. The third focus on the climate regime, which is greatly discussed today.

Globalisation

The globalisation phenomenon marked the end of last century. It was mainly from the 1990s onwards that its characteristics – specially the commercial ones – became more present in the world. This phenomenon also reverberated in biodiversity. This section is dedicated to globalisation and its impact on biodiversity.

Before discussing globalisation as an important theme for the environment, it is important to understand its meaning. As the word sustainability, globalisation gained the media and became part of people's daily lives without having a consensus on its meaning. There is not a definition accepted by all (HELD & MCGREW, 2001). There is, however, a consensus regarding the intensity of global connections, in other words, globalisation is understood as the deepening and increase of connections around the world in all aspects of contemporary life (HELD et al 1999). Regarding the conceptualisation of globalisation and its dynamics, the disagreement becomes the norm.

In general there are three schools of thinking on globalisation (HELD et al, 1999): the globalists, the sceptics and the transformalists. For the globalists[145], globalisation represents a new era for the world. This unique moment in history of humanity is marked by the change in the traditional meaning of the nation-state, which looses space with the new global economy. The authors also praise the single global market; defending the idea that economic globalisation triggers the denationalisation of economies. And, in the world without borders, national governments stay in a second plan. For the thinkers of this school, the economic side of globalisation is the main one.

The sceptics[146], in another hand, do not see anything new with the flux of commerce, investment and labour, pointing out the nineteenth century as a period of intense exchange, considered the heyday of globalisation. Therefore, the current levels of integration, seen as unprecedented, have in fact, a history. For them, globalisation as the globalists sees it, is a myth. To describe it as such, the sceptics make a comparison with the levels of economic integration. As these are far from being the desired levels and are less important than the integration in the Gold Standard era, the defenders of this position argue that the term globalisation is overrated. What we see today, according to them, is the increase in internationalisation, which means the interaction between national economies (HELD et al, 1999). The role of the state in the scenario is also an issue of divergence between globalists and sceptics, which believe that the nation-state did not loose space; on the contrary, its existence makes possible the increase in integration due to its role in regulation and the promotion of economic activities outside the national borders. The current scenario would not bring greater equity amongst countries nor would it reconfigure in a significant way the global economy, as the globalists believe. The inequalities of the Northern and Southern countries, for example, were not lessened by globalisation.

The third school of thought is the transformalists school[147]. The authors of this school believe that globalisation is the central strength behind social, political and economic changes that are sweeping societies, but also the international world order (HELD et al 1999). For them, globalisation is without precedent and, therefore, societies and

[145] Some authors from this school are: Ohmae, Wriston, Guéhenno.

[146] The main defenders of this positon are Hirst & Thompson.

[147] Authors from this school are: Giddens, Scholte, Castells.

governments are adapting to this process, in which distinction between international and national are becoming less clear. This new reality is the result of globalisation, understood as strength with power of transformation, which generates change in all the levels: societies, economies, governments, institutions. However, the future of this change is unclear. Globalisation in understood as a historical process full of contradictions. A new world configuration is emerging and the North-South division would give place to a new international labour division. In relation to the nation-state, the transformalisits defend the emergence of a new regime of sovereignty, disagreeing with both the globalists and the sceptics. The traditional concepts of sovereignty, territoriality, nation, would be changing. Globalisation would be linked to a new regime of sovereignty and with the emergence of new forms of political and non-territorial economic power, such as for example the emergence of transnational social movements. However, the international order would be dominated by nation-states.

One could argue that in fact there are four schools. The fourth school would be the one of the environmentalists. Starting from an ecopolitical approach, globalisation would be analysed through the lenses of sustainable development (GUIMARAES, 2003). This framework questions the economic rationale of globalisation in face of the logic and the time frame of natural processes. These authors question the premise of economic growth without limit, and point out the impact that this has on natural resources, which affect the functioning of ecosystem from which our lives depend on. The social untenability of this current development model is also stressed.

In the discussions on globalisation, three aspects are always a source of intense debate. First is the emphasis given to the economic side of globalisation. The second, which is directly linked to the first, is the role of the phenomenon in the diminishing or increase of inequality amongst countries. The third is the role of the nation-state in the globalisation scenario. Indeed, the economic dimension of globalisation was praised. To put it simply, economic globalisation is the phenomenon that allows economic agents anywhere in the world to be more affected by events in other places than before[148] (WOLF 2004). Economic globalisation means greater economic integration through the fluxes of products, services, capital and work (STIGLITZ, 2007). For many, this change in the international scenario would trigger an increase in the level of life throughout the world,

[148] Definition that Anne Krueger presented for the term in Australia in 2000.

in other words, the benefits of this commercial opening would benefit all. This was one of the stronger arguments to stress the importance, even the need for globalisation[149]. However, as it has been demonstrated, globalisation has more than one side. The first side is marked by the beginning of the 1990s, when the flux of capital in developing countries was multiplied by six in only six years. It is worth pointing out that the icon of commercial liberalism, which had as a regular aim the international trade, the World Trade Organisation, was created in 1995.

The result of trade liberalisation, however, did not meet the expectations. A research done by the World Commission on Social Dimensions of Globalisation in 73 countries revealed that, with the exception of Asia, United States and the European Union, unemployment had increased between 1990 and 2002 (STIGLITZ, 2007). The same research showed that 59% of the population lived in countries where inequality was increasing. Only 5% of the world population lived in countries where inequality rates were decreasing. Therefore, prosperity and the benefits of globalisation do not amount to all individuals, neither to all countries, even if their economic indicators, such as the GDP, were improving. Those who received the benefits were individuals in some countries. Policies to enable market and capital opening in the 1990s were a theme of great divergences. When it became clear that economic liberalism had not delivered the expected result, many started to question where developing countries had gone wrong rather than what was wrong with the model itself.

The policies for market opening were part of the Washington Consensus of 1990, political structure developed by the International Monetary Fund, the World Bank and the American Treasure. The Consensus represented the policies better aimed at promoting development. The Washington Consensus had ten elements (FISCHER, 2003): tax discipline, prioritisation of public expenditure with education and health, tax reform, interest rates based on the market, competitive exchange rate, import liberalisation, opening to direct foreign investment, privatisation, deregulation, and protection of property rights[150].

The economic dimension of globalisation monopolises the debate on the phenomenon. However, it is important to remember that globalisation is multidimensional, the

[149] Here its economic globalisation.

[150] John Williamson identified the components of the Washington Consensus in 1990.

phenomenon is much more than merely economic (FISCHER, 2003; STIGLITZ, 2007). Globalisation has a cultural dimension, with the intense exchange between different cultures, it has a political dimension, with the diffusion of policies for trade liberalisation, and it has a technological dimension. As a result of all these, there is also an information component, which arrives instantly to all the corners of the world, giving meaning to the global village.

Globalisation – mainly its economic side, as this would be the one to bring real benefits to all – is defended by many. The high level of communication and transactions between states is coordinated by a regime of rules embedded in the market, the free market doctrine (KALU, 2007). The latter is characterised by the opening of borders, free trade, anti-protectionism, and son on. What holds this together is the belief that the market is absolute in producing and distributing wealth. However, the critique is not far behind. A thorough analysis demonstrates that the benefits of globalisation do exist, but they are far from reaching all. The global village, for example, with fast exchange of information and the shortening of time and space is a reality. The relevant point here is that this is in fact a reality for a small part of the world population that has access to this information and for those who can travel freely around the world (SANTOS, 2000). The free market, which would trigger the economic growth in all countries, increased inequality. Financial aid to developing countries, rather than increase, diminished. Between the years of 1990 and 2000, the percentage of the GDP of developed countries destined to financial aid to the developing countries went from 0.33% to 0.22% (FISCHER, 2003), a lot lower than the 0.7% established by the United Nations.

Another important point that is always present in the discussions on globalisation is the role of the state. This is closely linked to the environment. The loss of control on environmental problems is not just related to environmental global problems. With the emergence of supra-national institutions and regulatory bodies, the autonomy of the state in relation to national environment problems – for example export restrictions – were also affected. The state lost the original control it had on many aspects, one of them is environmental protection. This institution, which for a long time had almost monopoly on the provision and protection on environmental goods, suffered criticism regarding territorial protection (SPAARGAREN & MOL, 2008).

However, it is important to stress that the state is still essential for three factors. First the state is unique because it is the only institution that does not work in accordance to the logic of the market (GUIMARAES, 1991). The state is necessary because to accumulate capital, it is important to produce goods that cannot be produced by market actors. States allow globalised activities to be carried out inside a determined territory (SANTOS, 2000). The state is indispensable for it is the only actor to think in the variables such as biodiversity and climate change and for having the obligation to care for future generations (GUIMARAES, 1999). In addition, it is important to stress that although global problems demand global actions, these actions will be implemented at the national and local levels, which would be carried out by the state (RONIT, 2001). Therefore, the state continues to exercise a central role in the current structure. However, globalisation brought new problems and new demands – the flux of foreign capital and inequalities – to other states. The crucial issue is that, indeed, the power of the state to deal with such problems has become limited with the globalisation scenario (STIGLITZ, 2007). In a globalised world the frontiers become blurry. This so-called weakening is selective, once it is only seen in relation to the flux of capital. The flux of goods and services, such as the flux of people were not blessed with such freedom and were subjected to specifications of each state[151].

Changes in the use of land frequently coincide with the entry of a determined region in the global economy (LAMBIN, 2001). Global forces are reinforced and with greater power due to globalisation, reorganised and substituted local factors that determine the use of land by factors connected to the global. Therefore, global markets are not only a matter of import/export, it is also an issue of production – producing what and how.

The great challenge of the globalisation era is not one of economic origins or technological, it is environmental. To guarantee the capacity of the environment to keep its production of environmental services from which we depend on is a great issue (FOLKE et al 1996). The globalisation phenomenon does not take place only in the social sphere, but also in the natural sciences, in other words, globalisation has a biophysical dimension (PERRINGS, 2007). The social side is more spread over, with the increase in commerce and the weakening of frontiers regarding the circulation of people. One example of the biophysical side is the increase in the dispersion of species rate, or

[151] In some states, for example, the states of the European Union, the flux of people and good takes place differently. Even international trade suffers with subsidies that harm developing nations.

the increase in the patterns of land use around the world. Globalisation triggered an harmonisation effect, which together with the specialisation of the providers of seeds and the intensification of agricultural systems, translated itself in the diminishing of the genetic diversity of plants and the domestication of plans and animals (BLEDZKI, 2008: 4). The globalisation phenomenon unfolds processes. Some of them increased the strengths of change in environmental services and diminish others.

Commercial liberalism, one of the processes of globalisation, increased the rate of environmental services use. The ecological footprint of several developed countries is bigger than their carrying capacity (DURAIAPPAH, et al 2005). The maintenance of the state in these conditions is only possible due to the increase in commerce. Liberalism unleashed a wave of privatisations. Despite the increase in the provision of efficiency of environmental services, privatisations increased relative poverty. One example to illustrate this point is land privatisation in developing countries. The lack of an institutional apparatus translated into poor people loosing the land they had worked on for generations. However, it is not just an institutional issue. The essence of liberalism does not encompass poverty or inequality reduction, therefore these are not priorities.

Globalisation greatly impacted the debate on governance. The increase of networks, the new dimension of the nation-state in the international arena, the emergence of new actors, all of these have an environmental side. The next section is dedicated to governance.

Environmental Governance

The debate on international environmental governance is the result of the environmental crisis as well as the need for global solutions. However, there was/is a crisis on the global sphere, disrupting the scenario established with the Westphalia peace (1648) which had states as sovereign (MILANI, 1999). Themes, problems and actors that were not part of the system emerged from the 1980 and 1990 as key players in the international arena. This new reality requires new forms to deal with problems and themes – one of them the environment – and, therefore, generates a new debate on the definition of such forms. It is precisely in the 1980s that there was the need to redefine a relation between the state and the market. The decade is marked by the crisis in the countries of Latin America and Africa, which had adopted the state-development model

(CAMARGO, 1999). Many colonies became independent in the decades previous to the 1980s, delineating a new international conjuncture in this period.

The definition of the term governance does not have only one version and, as globalisation, is multifaceted. In general lines, despite the ambiguities, governance is associated with ways to control, direct and coordinate both individuals as well as organisations (LYNN Jr. at al, 2000). The concept of governance could be defined by many legislative regimes, administrative rules, legal norms and practices that delineated the activities of a government. It is worth pointing out, however, that the term is employed both in the public and in the private sector, therefore one can discuss governance in the European market and in a public school. Governance can also be defined by processes and institutions, both formal and informal, which guide and limit the collective activities of a group (KEOHANE & NYE JR, 2000). Therefore, there is a common line: apparatus with an aim to guide organisations.

Governance can be at the local, regional or even global level. There are two key aspects of global governance that deserve a closer look (RONIT, 2001). The first is that some problems cannot be solved by national or even regional efforts, they demand a global action, in other words, a coordinated action amongst states. The second is that the solution to these problems does not lay in a more effective and interconnected cooperation between nation-states or in exchanges in the marketplace. The crucial factor is the cooperation of multiple actors in the current international scenario. The international scenario of today is different from the reality in the Second World War. The number of nation-states increased and these are no longer the only actors. International organisations and civil society are also part of this reality, which marks the twenty-first century. Therefore, the main objective of public administration in the twenty-first century is to integrate the different aims of actors of the international community (KALU, 2007). It is important to stress the importance of cooperation between governmental and non-governmental organisations. In the global sphere, the great question is that there are no mechanisms of top-down control that are legitimate enough to manage global problems (MILANI, 1999).

The emergence of an environment agenda in the international sphere, with global problems that require global solutions – which implies that local actions are carried out across the world – gave origin to the need of an international structure to coordinate

actions. Environmental global governance is the sum of organisations, political instruments, financial mechanisms, rules, proceedings and norms that regulate the process of environmental international protection (NAJAM et al, 2006). The international environmental governance system is the result of discussions and negotiations that occurred in 1972 until today. Its essential aim is to improve the environment, which would lead to sustainable development.

Biogeochemical cycles are influenced, either directly or indirectly, by human activities (BIERMANN et al, 2009). The environment issue triggers a discussion on global governance due to the essence of the problems that translate the need of negotiation between public and private actors (YOUNG, 1997 apud MILANI, 1999). Governance, although there is no consensus on its definition, can be seen as “new forms of regulation that go beyond the traditional hierarchical state activity” (BIERMANN et al 2009: 21). The singularity of the environment question as a theme is important for the debate about environment governance, not just to go beyond national frontiers, but also because the theme makes it necessary to revise the ways to think and act (MILANI, 1999). Another aspect refers to the legitimacy of the actors, which goes through the representation of society, and the definition of an agenda to be discussed. The complexity of networks is also another important aspect that deserves further attention, as they become key actors in this new scenario. The precautionary principle is another aspect that makes the environment so relevant to the global governance. Uncertainty exists and it is important to take into consideration in decision-making. The environment problem is evolutionary, both in the physical and in the political level, even in the ideas. Another important issue is the impact of environment fluxes, which have not only physical impacts but also social and cultural ones. The division of responsibility draws attention. The externality of environmental problems and the cost of internationalisation bring to the surface the debate on who is responsible for the problem.

The Convention of Biological Diversity, signed in 1992 in the United Nations Conference on the Environment and Development is the central pillar of the biodiversity governance. The convention is a landmark, both in the international arena and in the protection of biodiversity. The Convention defines biodiversity as “the variability of living organisms from all origins, going from, amongst others, terrestrial ecosystems, marine and others aquatic ecosystems and ecological complexes that belong to it, going through also the diversity within species and ecosystems” (JOLY, 2002: 1). The text of the Convention is

innovative as it is a pioneer in considering biodiversity in its totality; in other words, it encompasses all the levels of variability among them. The document also refers to all forms of biodiversity management and it considers measures for monitoring. The access to genetic resources and issues related therewith are also present in the text [152]. The Convention also innovates when it establishes for the first time parameters for the negotiations between countries that gave origin to biological resources and to the owners of the methods and techniques to explore them. It is important to understand that, when we talk about the environment, we are talking about biological diversity.

From 1972 until today, environmental international governance grew in size. A historical revision of it reveals that its increase happened in three fronts (NAJAM et al, 2006). First there was a significant increase in actors participating in governance. The number of international environmental institutions inside the UN grew. International institutions, such as the World Bank, started to have an environmental branch. Civil society organisations, especially NGOs, started to have a more prominent role in international environmental governance and they also considerably increased in number. There was a proliferation of environmental multilateral agreements with more than 500 accords existing at the moment. The second factor is monetary. International environmental governance started to have more financing. Funds were established, such as the Global environmental facility (GEF)[153]. Despite the fact that the amount of money for these funds are far from what is needed to make significant impact in the environmental crisis, the number draws attention (NAJAM et al, 2006). The third front of change was the number of rules and norms. The amount of multilateral environmental accords by itself indicates that. In addition, there is the fact that the environment is part of regimes that are not only environmental, such as the WTO and the International Financial Corporation of large private banks.

The United Nations Conference – Stockholm, Rio de Janeiro and Johannesburg – were important meetings on the development of the global environment governance, but they were not the only events. Other meetings not necessarily focused on the environment

[152] The pioneering character of the Convention does not stop there, these are just some examples.

[153] GEF has financed a total of 46 projects in Brazil (in total, including projects that have already finished) and 33 projects that are regional or global but include Brazil (http://www.gefonline.org/projectListSQL.cfm 22.10.2011). Out of the total 46, 20 are under the biodiversity type and at least 3 of the them are based in the Amazon.

also had an impact on the formation of the global environment governance. Decisions of the conferences of the 1990s, known as the decade of Conferences (Copenhagen, Vienna, among others) gave origin to treaties and in some cases even to new institutions forming the environment governance in the international sphere. It is important to stress that the majority of the international environmental accords are declarations rather than regulations. This means that, even when signed, the accords are not legally-binding, are not compulsory and there is no punishment for the state that does not achieve them. This is not the only critique that can be made to the international environmental governance.

Another important aspect of this discussion is how multilateral agreements work. Each agreement has its on secretariat. In the national level, the responsibility to check if the agreement is being followed is, in the majority of cases, of more than one Ministry[154]. It is in this moment that inter-ministerial fights and even different understandings on a given issue disturb the implementation of what was agreed. It is important that there is integration between the different national policies that, on the other hand, have to be coherent to local policies[155]. The need for coherence is not restricted to the vertical level; it is also necessary at the horizontal level. In the national level, for example, it is imperative that the agreements are complementary rather than excludent and contradictory. Therefore, the dialogue and working together are important to meet this aim.

Despite the fact that environmental governance has significantly evolved since 1972, the environment crisis did not retrocede. It can even be said that the crisis has worsened. The existence and the increase in size of the environment governance has not translated in improvements for environmental problems. With all the critiques that can be made to the structure of the current international environmental governance, it cannot be argued that it is inexistent or fairly insignificant. With more than 500 accords, many which established international bodies to accompany and the signing countries, the framework – which could be limited and insufficient – exists. Therefore, it is not due to

[154] For example, in the case of climate change, it was established an inter-ministerial group to deal with this issue.

[155] In June/July 2010, the issue of coherence between international agreements and national policies was of great importance in Brazil with the signing of the decree that modifies the Forest Code, which would give amnesty to deforesters, going against the position of the government in the Climate Convention COP.

lack of agreements and treaties that the environment governance has not reached its goals.

The environment structure developed throughout the last decades deserves a closer look. By doing so it is possible to notice that supranational institutions are an international version of the national structures that inspired them (SONNENFELD & MOL, 2002). Environment problems left the national and became part of the international arena, which would trigger the change in the level of institutions. Three aspects of this issue deserve further deliberation. First, it is important to stress that the dynamic of the current environment issues are different than those from the 1970s and the 1980s. It was precisely from the 1980s onwards, and specially after the 1990s that the globalisation phenomenon intensified. Environment questions are connected to local and global processes. The simple increase in scale of environmental institutions would not take this particularity into consideration. The second aspect refers to the relevance of these institutions, which would be relevant in different ways to different states. The differences in economic, political and environmental development of states is also felt in the development of supra or transnational institutions. Therefore, states get involved in different ways and they react in different ways. The third aspect is the involvement of new actors.

Another feature that deserves attention is the nature of the environmental crisis. The environment issue is essentially political and it is intimately related to the actions of specific actors (GUIMARAES, 1991). Although there is an environmental governance structure, without political will to follow the rules to achieve the established targets, nothing can in fact be reached. The actions of the actors involved, in the case of environmental governance not only the state, are determinants for the success or failure of governance of a given problem.

Science has a fundamental role in determining actions and in delineating policies, which are part of the structure of environmental governance. Everyone knows that, for example, anthropogenic actions are responsible for climate change. Science is part of environmental governance. Maybe not in an independent manner, because it is subjected to transformation of scientific data in policies, but it is not due to lack of scientific knowledge that the environmental crisis has exponentially worsen. It is important to highlight that there is space for a science that exercises a more active role

in the elaboration of policies, which is very inexpressive today. Therefore, the difficulty is not in the structure or in science, but in both present aspects. The great question is in the transformation into action, in other words, political will.

Science not always occupies a prominent place in the formulation of policies or even in the information of a community. Scientific work could be more valued (ALVES, 2004). The out of tune relation between scientific work and its effective participation in the elaboration of a new model of development in the region puts science into isolation, as if it was enough on its own. Science is left without any practical results. This is the part of the relationship that has to change. Science must be part of policy formulation, which is essentially in the context of the social sciences.

With the valorisation of nature, science takes over a new role in this international order (JASANOFF & WYNNE 1997). The production of knowledge on tropical forests and the attempts to govern them were internationalised. In the last two decades, the number of political and scientific international organisations – or those who claim to have international reach – grew exponentially (FAIRHEAD & LEACH, 2003). This internationalisation has decisively influenced what we know and what we don't know about the environment and tropical forests, and how debates emerge and are known. The great majority of organisations, networks and rivalry in this area end up creating an unique dynamic. This reality makes the relationship between science and politics close in several paths of science. The delineation of relations between national institutions though scientific practices is much more intertwined with scientific process and transnational politics.

There was also a change in the way ecology was studied. During the greatest part of the twentieth century, scientists focused their research on systems very little disturbed, which would lead to a vision of humans as a being outside of the system; the human being would be the disturber. Recently, ecology began to understand the human being as one of the many components of an ecosystem (PALMER et al, 2005). This change in perception of the role of human being in the ecosystem is accompanied by the need to change how science is made: rather than being about something, science must be for something, in other words, an active and fundamental component of the public agenda. The inclusion of science in politics is not a new argument. However, when sustainability comes to the scene, carrying in its concept another type of human-nature relationship,

the role of science in politics becomes clearer. Science delivers knowledge, giving base for action. Nonetheless, information, the act of making science, is not sufficient. What is important is that the information transforms itself into action.

A key concept in ecology is resilience. It refers to the resistance to disturbance and the speed to get back to balance, in other words, the capacity of a system to protect itself from disturbances (PIMM 1984 apud FOLKE, et al 1996). It is important to notice that the definition of the concept of resilience has two parts: the capacity to absorb disturbances and the opportunities that are created from a specific disturbance (FOLKE, 2006). Originally in ecology, the term is applied to other spheres, such as politics. One issue that deserves to be highlighted is the fact that resilience is the capacity of one system, be that ecological or social, of maintaining its main characteristics despite perturbations. The question that follows is who chooses which characteristics are important? Important for what? The answer is the human being. Therefore what is an important characteristic in a given ecosystem is determined by the importance that that characteristic has for human beings to satisfy their needs. The importance of a determined characteristic can be not so clear. One function that, at first site seems redundant and insignificant can be essential for another period. Redundancy is important.

The difficulty to develop a strategy for biodiversity conservation lays on the fact that the institutions responsible for its development – political institutions, NGOS, enterprises – do not work based on environmental information (FOLKE, et al 1996). This means that these actors are not in tune with the rhythm of environmental cycles. The current rhythm is dictated by the economy, which classifies environmental impacts as externalities. Governments fail for not fixing – and even stimulating in certain moments – this vision of the environment. This out of tune relationship between the rhythms that dictate the environment and the rhythms of the human world reveals the lack of integration between the natural sciences and the human sciences[156]. There are rare cases of success of conservation based on communities (BERKES, 2007). This is the result of different visions on conservation. The priority of international agencies is not the same as of the communities and the vice-versa. Besides, in many projects seen as the union between conservation and development, the objectives of each end do not appear in the same

[156] It is worth point out that economics is seen as a human science.

way. Therefore, the activities reflect one of the objectives, not fulfilling the idea of conservation and development.

Human beings are an integral par of almost all ecosystems (REDMAN et al, 2004). Human activities are extremely relevant to the environment and environmental conditions play a key role in the choice of activities that will be done. This relationship was not discovered recently, on the contrary. Texts from the nineteenth century already discussed the interconnectivity between humans and nature[157]. However, one needs to understand new approaches that will reinforce the integrative quality of the structure of the study. Research programmes, departments and even pos-graduate courses work with interdisciplinary on the environment. However, despite the fact that in the discourse the human and the natural sciences are integrated, in practice the same integration has not been reproduced.

One integration proposal of ecology and social sciences is the study of socio-ecological systems (REDMAN et al, 2004). A social-ecological system is a system with biophysical and social factors that interact in a constant and resilient manner. The system is defined in different scales in relation to time and space and the flux of key resources are not just natural, such as water, but also cultural, and is regulated by social and ecological systems. Although social themes are part of socio-ecological systems, this incorporation does not take place in an effective manner. Three issues about social systems have to change. Human beings alone do not transform social systems, social institutions need to be part of the study system. Social cycles, temporal patterns of allocation, just like in social order, cultural patterns of integration between people and groups, are also themes that are indispensable for the study of socio-ecological systems. In addition, it is important to recognise that the human factor cannot be treated as an organism that responds in a coherent manner to external stimulations. To fully comprehend the answer of the human being it is necessary to look at the social context: political economy, inequalities, access to services such as education and health, and so on. History, politics and culture will determine the success or failure of the management of a resource. Each case is conditioned by the context in which it is developed (BERKES, 2007). Therefore, ready-made solutions, even if they had worked in a given place, will most likely fail in

[157] One example of this would be the text of Marsh GP (1864) Man and Nature, re-edited in 1965. Cambridge (MA): Belknap Press of Havard University Press.

different contexts. This is important because it reveals the difficulties to do research that are in fact interdisciplinary.

Another important issue in the study of social-ecological systems is the recognition that both ecological systems and human beings have the same characteristics, such as resilience and complexity, which are related through processes of retro-information. Ecological systems are complex. They are organised in a hierarchical way and each sub-system is part of a bigger system (BERKES, 2007). According to the theory of complex system, the levels are intertwined, but each has principles and concepts that are different. Social systems are also complex, with institutions at the local and international level. Each level is different; therefore each level presents different expectations. This means that knowledge about a determined resource is not the same. A socio-ecological system that is vulnerable has lost its resilience and without it, the system looses its capacity to adapt (FOLKE, 2006). The great challenge in this context is to develop knowledge, and incentives to institutions that focus on adaptive management of local, regional and global ecosystems.

This discussion takes us back to the answers to environmental problems, which started to be produced after the Stockholm Conference. The panaceas travelled the world. Regarding conservation, the model seen as the solution to all the problems was the creation of national parks controlled by central governments (BERKES, 2007). The status of this proposal lasted for most of the last century. This approach started to be questioned, mainly in developing countries. This top-down approach, that did not include people that lived in the places that should be protected, evolved – and in many places it is still ongoing – to a collaborative process, flexible and focused on actors (STOLL-KLEEMANN, 2005).

The argument that conservation models that excluded the population of the parks and of protected areas were inefficient started to emerge in 1980 in several areas, even inside the organisations of the parks itself (FERREIRA, 2004). This position was defended by almost two decades, being always present in international meetings. However, this vision did not remain sovereign in the international arena. Already in the end of 1990, the defence of conservation in mosaic [158] gained momentum.

[158] Conservation mosaic are protected areas connected by spaces that have its use controlled.

The managers responsible for biodiversity conservation did not give the needed importance to political institutions (STOLL-KLEEMANN, 2005). As the natural sciences need to be an active part of the formulation of policies, managers responsible for biodiversity need to include questions regarding the social in their management. Therefore, there is a flaw in the working together of natural sciences and human sciences. This flaw generates great impacts in the conservation management of the environment.

The populations that were more affected, in other words, those who lived in critical places, also started to be included in conservation projects. This is where the human dimensions come in, which means culture and traditional use of biodiversity (STOLL-KLEEMANN, 2005). Traditional knowledge of local populations is different than scientific knowledge. It is also, many times, practical and localised, taking into consideration the specificities of the local biodiversity. Therefore, communication between local population and scientists are an important step for a greater understanding.

Biological diversity is part of the global commons. Because of that, its conservation can be seen as an issue of the commons. However, this is a problem of many scales. It is global because it is important for humanity, it is regional due to its importance to ecotourism for example, and it is a problem of the commons in the local sphere because ecosystems are responsible for environmental services that are indispensable for the well-being of local community.

The evaluation of the poverty – well-being – ecosystem connection demonstrates that it is managed by a complex system of organisations, institutions and instruments (DURAIAPPAH et al, 2005). And this goes from the international to the local therefore, in all scales. Besides that, in each scale, there are new instruments, organisations and institutions working. At the international level there are more than 500 multilateral environmental agreements. Besides these agreements, the number of plans to reduce poverty and development strategies has increased (DURAIAPPAH, 2004). It is worth to point out that they both deal with the environment. With all these elements – different multilateral agreements, institutions and organisations in each scale, plans and strategies that deal with the environment – the outcome is a complex system to formulate policies with a great potential to divergences between aims and targets. The

scale, therefore, is important for complex systems that, for being divided in different scales, should be managed in different scales (BERKES et al, 2003).

Biodiversity governance is a global need. However, it needs to be adaptated to global characterisitcs (STOLL-KLEEMANN, 2005). In order to reach biodiversity conservation, it is necessary to incorporate biodiversity in the different sectors of society in accordance with other principles of sustainability.

Inserted in environmental governance is the climate regime, which is the focus of the next section.

Climate Regime

International regimes and negotiations have become more present in the way countries deal with the environment. These regimes are of great importance to the framing of national policies. Certain global actors – or coalitions – position themselves in a way to stimulate other countries to sign certain regimes. International environmental regimes imply different definitions of the traditional terms of sovereignty and governance (HURRELL & KINGSBURY, 1992).

One of the sides of the environmental crisis that has a governance system, is climate change, which has gained space in the media and in the international political scenario. In this context the international climate regime emerges, which has as a key-element the United Nations Convention of Climate Change and the Kyoto Protocol. The process, that culminated with the elaboration of the Convention, started in the 1980s, when the evidences that climate change was occurring due to anthropogenic activities increased. The concern with the increase in temperature of the Earth led the World Meteorological Organisation and the United Nations Programme for the Environment to form the Intergovernmental Panel on Climate Change (IPCC) in 1988. The Panel had the aim to evaluate the information regarding climate change as well as evaluate the socio-economic impacts of these changes and formulate answers to the management of this global problem (IISD, 1995).

In December 1990 a resolution that established the Intergovernmental Negotiation Committee for the Convention on Climate Change was adopted. After five meetings with representatives from more than 150 countries, in May 1992 the Convention was adopted in the UN meeting in Rio. At the meeting, the Convention received 155 signatures and

came into power in March 1994, ninety days after being ratified by the 50th country. The main objective of the Convention, and of any other instrument that the Conference of the Parties may come to adopt, is to reach stabilisation of the concentration of greenhouse gases in the atmosphere to levels that would avoid serious anthropogenic interference in the climate system. The Convention also establishes levels that have to be reached in sufficient time to allow the natural adaptation of ecosystems to climate change and the production of food is not affected to allow the economic development in a sustainable way (UNITED NATIONS, 1992).

The Kyoto Protocol, an international accord related to the Climate Change Convention, was signed in 1997 and came into power in 2005 after Russia's signature. The more significant characteristic of the Protocol is the establishment of reduction targets for greenhouse gases for 37 developed countries and for the European Union[159]. The average reduction is of 5% based on the levels of the year 1990. The reduction should occur between the years of 2008 and 2012. Different from the Convention, which encourages developed countries to stabilise their GHG emissions, the Protocol represents a commitment.

The document presents four elements that characterise its skeleton (BARRET & STAVINS, 2003). First, the Protocol in question predicts the reduction of greenhouse gases emission in the short-term without targets for the long-term, covering only the period until 2012. The second element is the responsibility only of the industrialised countries, those who are part of the Annex I. Developing countries do not have targets as they are considered to be countries with low GHG emissions. This means that the Protocol applies the principle of common but differentiated responsibility. However, it is important to stress that it reflected the reality in the period of the elaboration of the Protocol. Countries such as China, Brazil and India, all without targets according to the Protocol, are no great emitters. This subject is always present in the agenda of the discussions about the Pos-Kyoto agreement.

The third characteristic is flexibility, which is only possible due to the establishment of mechanisms. According to the Protocol, countries should diminish their emissions through internal initiatives. However, to help those countries with targets to reach them, the document establishes three market mechanisms: emissions trading, joint

[159] http://unfccc.int/kyoto_protocol/items/2830.php 21Jun2010

implementation and clean development mechanism. It is through the latter that those countries that do not have targets, such as Brazil, can participate in the Protocol. Carbon markets are an important characteristic of the climate regime. The Kyoto Protocol establishes a market for certified emission reductions (CERs). There are also the informal carbon markets, in other words, markets that work outside the Kyoto Protocol structure and that are private initiatives. One example to illustrate this point would be the Chicago Carbon Exchange (CCX).

The fourth is the lack of instruments that stimulate the participation and following of what was established. Article 18 of the Protocol forbids the adoption of compliance mechanisms, unless it is adopted by amendment (BARRET & STAVINS, 2003). Therefore, the Kyoto Protocol demands significant emission reductions from the countries of the Annex I without establishing means to make those countries comply with what was agreed on. In 2001 it was established that the country that does not comply with the targets in the first period of commitment should do it in the second period with 30% of fine. In addition, the country will not be able to sell credits in the emissions market. However, the uncertainty in the formulation of a second period pos-Kyoto, has left this possibility up in the air.

The promotion of sustainable development is mentioned in the Protocol. According to article 2, developed countries should stimulate sustainable development while reaching their targets (KYOTO PROTOCOL, 1998). Agricultural and agroforestry sustainable practices would be important measures to maintain and enhance the sink of greenhouse gases. A forest with sustainable management works with a functional system, removing carbon from the atmosphere, keeping part of it in the trees, passing another part to the soil and exporting another part in the form of forest products (READ & MAY, 2001). The performance as a carbon sink in the soil is strengthened when the soil is less disturbed.

The second IPCC report published in 2007 (IPCC, 2007) strongly suggested that human activities are responsible for the climate change witnessed in the last years. Human activities influence the stability of the climate through the alteration of ecosystem distribution and its energy fluxes (DALE, 1997). The Panel, created in 1988, with the aim to evaluate scientific, economic and technical information about the impact of climate change induced by human actions (CLAUSEN & GHOLZ, 2001), published its first report

in 1990. This document was the base for the development of the United Nations Convention on Climate Change.

The climate regime is relevant to this work for two reasons. First because deforestation, such as the expansion of agriculture and livestock, events that are many times associated, are responsible for the liberation of CO_2 in the atmosphere through soil disturbance and vegetation loss. The activity responsible for the bigger change in CO_2 storage is the deforestation of tropical forests (DALE, 1997), extensively done in the Amazon – region where terra preta de índio is found – a forest of extreme importance to the stability of the climate (MALHI et al, 2008). Deforestation in the Brazilian Amazon corresponds to 80% of the total deforestation (MALHI et al, 2008). The second reason is because the reproduction of the large stock of carbon in the terra preta de índio horizon is reached through the reduction of emissions of carbon in the atmosphere. Therefore, this mechanism is very much an integral part of the discussions of the future of the Kyoto Protocol.

And What About Terra Preta de Índio?

After analysing the role of Brazil in the international environmental agenda, the role of the Amazon in the international environmental agenda, environmental governance and the climate regime, one question remains: what is the importance of this discussion to terra preta? This section is dedicated to answering this question.

Since the time of the Europeans arrival in the South American rainforest up until the time of the naturalists expeditions within the forest, the focus of the explorers was very specific. The Europeans that ventured into the Amazon searched for gold and spices that would bring money. They were looking for what they knew would generate fortune. The naturalists endeavour had a more explorartory character. Not only in the sense of exploitation, but also in an attempt to gain some knowledge from this different scenario. The focus of the naturalists was not the soils of the Amazons. The exuberance of the forest's flora led them to believe that the soil was fertile, which would be the first view of the soils of the Amazon. This was a great assumption, but nonetheless, once it was made, the soils were then classified as such.

The Amazon has always had a place in the foreign policy of Brazil. However, this role did not focus on the environmental importance of the forest. When Brazil was a colony, the forest appeared in the context of frontier delimitation. Even after Independence, the Amazon continued to have a role in the foreign policy[160]. From 1912 until the military coup the forest was dormant in the international political agenda. It is worth pointing out, however, from this time onwards the forest was already high in the national political agenda and was part of government plans. These programmes reflected the way the government was thinking. With the birth of the development project in Brazil, economic development became the main objective. The insertion of the Amazon in the plans had the aim to generate economic development for the country. Therefore, the focus in relation to the Amazon was the economic development of Brazil. This vision of the forest did not take into consideration local issues and put in a second place the issues related to history and culture, of which terra preta is part. Studies on the history of the region were developed at the time, of course, but these did not have many reverberations within academia.

In the 1970s, when the Amazonian Cooperation Treaty was signed, the scenario changed. Despite being signed in 1978, the first years of the Treaty were of little action. This was because the focus of that time was security, energy and natural resources (ANTIQUERA, 2006). These topics were not part of the Treaty. This fact demonstrates that, once more, the richness of the Amazon, just like its history, was blurred by issues related to the national development project.

Internationally, the beginning of the international environmental agenda marked the 1970s. The issues that were the focus on the Stockholm meeting reflected the pollution problems faced by developed countries. The topics for discussions were environmental pollution – soil, water and air – which created an atmosphere not likely to lead to the inclusion of studies on the diversity of the Amazon and anthropic soils in the agenda. The dichotomy between the position of the developed countries and the developing ones provided more fuel to the development project. The environment appeared under the light of the principles of sovereignty and security. The emergence of the international environmental agenda opened the doors to environmental issues, which could gain

[160] Lets not forget the fact that the state of Pará did not recognised the independence of Brazil when it happened. So much so that today there are two Independence bank holidays in that state: the date of Independence (the 7th of September) and the day that the state recognised it (the 15th of August).

space both within national borders but also in the international arena. However, the focus of the environmental question did not go through the discussions on local knowledge, environmental history, culture, etc. With that, terra preta de índio was also out of the scene. The Amazon was seen under sovereignty and security.

During the 1980s history repeated itself. In the end of the decade, the Amazon forest gained the limelight due to deforestation and the murder of Chico Mendes. The murder of the extractivist, who was known worldwide for his work in the defense of the forest, had great repercussion. Together with the images of deforestation, the environment issue and forest conservation gained great media cover. The International reaction was so intense that the Amazon went into the political agenda. The programme *Our Nature* is a direct response to the pressure the country was under. However, the programme approached the environment as an issue of sovereignty. The fact that the Defense Ministry was responsible for the execution of the Programme reflects this point. Therefore, the issues related to the population remained in the second plan, not favouring the rise of terra preta de índio.

It was during the 1980s that one could identify the beginning of an increase in the papers on terra preta de índio. It is also at this time that climate change became an issue in the academic and even political debate, in a stronger way. With the establishment of the Convention in 1992, the Kyoto Protocol in 1997 and the establishment of the carbon market, the discussion of carbon gained another dimension. The role of carbon in the fertility of TPI makes the soil an excellent topic to be explored. The research on the forms of capture and sequestration of carbon put more emphasis on the study of terra preta de índio. And it is precisely after the ascension of the theme in the international sphere that the number of papers on TPI increased. Although some researchers did focus on small farmers, the main reach of terra preta de índio refers to the carbon capture that would generate credits.

In the 1990s we see that the Brazilian position in relation to the environment changed, leaving the defensive phase of the previous decade behind. The results of the Rio de Janeiro Conference in 1992 were promising. However, the focus was still on economic development, therefore the Amazon was still seen through these lenses.

It is also in the 1990s that the globalisation phenomenon gained more strength. The stronger character of globalisation is economic liberalisation. With that, the economic

vision of the forest prevailed. This phenomenon grew precisely during the 1990s. The forest went into the international market and its products became important commodities. The development programmes of Cardoso did not respect the particularities of the region. It is also in the 1990s that international cooperation projects began to pop up in the Amazon. This new scenario broadens the research spectrum, opening space for other topics.

The emergence of a specific governance for the environment, despite having opened space for discussion, did not diminish the environmental crisis. In addition, it is important to stress that science is not an integral part of policy formulation. The information on natural science stand out, but even so, the majority of the cases the information that are most important are those that can somehow generate an economic gain.

Internationally, the globalisation phenomenon still generates debate. The great challenge is not one of economic or technological origins, but it is an environmental challenge. To guarantee the capacity of the environment to produce its ecosystem services from which we depend on is a key issue (FOLKE et al, 1996). However, the loss of resilience of a system due to the impact of a vision that sees environment damage as a necessary consequence for a greater good – which would be the economic growth – reflects on the ecosystem services, that are no longer produced in the same way. This, on its turn, has an impact on the economic activities and even on human survival. Although globalisation has a biological side, it is its economic dimension that has dominated. This scenario would not favour research on TPI.

Biological diversity is responsible for several functions that sustain all the activities that we know, our survival and economic production (FOLKE et al, 1996). Examples of these functions are photosynthesis, polinisation, food provision, regeneration of soils, absorption of carbon through plants and nutrient recycling, amongst many others. These functions are also known as ecosystem or environmental services. These services are the base for the discussion on biodiversity governance and climate regime. The revalorisation of nature puts this subject in the centre of discussions. It is from these services that emerge the proposals for the valorisation of the standing forest. The storage of carbon in the soil – a process that is the essence of the reproduction of terra preta de índio in another soils – is, for example, an ecosystem service.

The capture and storage of carbon is a central theme in the discussions on climate change. Because of that, the discussions on the payment of ecosystem services reverberate on the discussions on TPI. Many studies on the reproduction of the fertility of the soil, which implies the storage of carbon, were developed with the improvement of techniques, already focusing on the implementation of this process in the period after Kyoto. However, it is important to make some reservations to this method. It is important to remember that this dynamic follows the logic of the market. This perspective gives more value to natural sciences in the process, in other words, what about the cultural value of terra preta? And what about the people that own the land or that are producers, what will happen with them? And the relationship between land use and property rights, how is that going to take place after this change? All these questions – and many more – are important to prevent the failure of process.

The productivity of an ecossytem does not depend only on the biological diversity of an ecosystem. It also depends on the political choices that are made in relation to investment, commerce, subsidy, taxes, regulation and others (STOLL-KLEEMANN, 2005). Another important issue that is not explored is the fact that ecosystems are different (DURAIAPPAH et al, 2005). The number of hectares in a land that have to be preserved in conservation programmes, for example, does not take into consideration the heterogeneity of each ecosystem.

There are five indirect forces of change within ecosystem services. They are: demography, economy, sociopolitics, culture and technology (BLEDZKI, 2008). Of course biodiversity and ecosystem services suffer natural changes, but the changes that have been occurring in the last few years are the outcome of anthropic modifications. These five items are similar to the Guimaraes's POET, which is related to the sustainability of a territory (GUIMARÃES, 1998): Population, Social Organisation, Environment and Technology. It becomes clear that the socio-cultural aspects of a given place are crucial to the definition and in the performance of a given system. Therefore, for both parties, be that the life of an ecosystem or the sustainability of a community, social and natural factors play a key role. In the case of the Amazon, we have seen that the role that the forest has in the development process of Brazil favoured a more pragmatic vision of the region, one that focused on the commercial value of the forest, leaving the cultural, historical and social value aside. These are also important in

understanding how specific populations reached certain situations, such as those that led to terra preta. All these components are significant.

Despite all the difficulties encountered to emerge as a theme, terra preta de índio has reached the international arena. There have been national and international meetings on the subject. The first meeting dedicated to TPI was in 2001 in Spain, during the Conference of Latin Americanist Geographers. Within that meeting there was a Terra Preta Symposium. Since then, at least once year every year, there has been a meeting on terra preta do Índio, either exclusively on TPI or with an event within a meeting. The second event dedicated to anthropic soils was in 2002 and was held in Manaus by INPA. The meeting was the first International Workshop on Anthopogenic Soils. In 2003 there was a Working Group on the state of the art of the Amazonian archaeological terras pretas during the 11th Archaeological Society Congress in Rio de Janeiro, Brazil. In 2004 there was a meeting on carbon utilisation at Georgia University, in the United States. In 2005 at the Brazilian Congress of Soil Science held in Recife there was a workshop on TPI and its relevance for agriculture. In 2006 during the World Soil Congress in Kansas, United States, there was workshop on Amazonian Dark Earths – a tribute to Wim Sombroek. In 2007 there were three events that contemplated the theme, all held in Brazil. One was a workshop in Manaus, organised by Embrapa and focused on the state of the art and research characterisation. The other was organised by Embrapa and Wageningen University, which was a workshop on TPI, also in Manaus. The third event that year was the 11th Congress of the Brazilian Society of Quaternary Studies, held in Belém.

The year 2008 also had three events that had meetings on TPI. One was a Symposium on TPI in Londrina organised by Embrapa Soy. The other was a symposium on TPI and human occupation in the Amazon during the Fifth Congress of Archaeology in Colombia and the third event that year was in Dublin on terras pretas. In 2009 there was a meeting of the Terra Preta Nova Working Group during the 61st meeting of the SBPC in Manaus. In 2010 there was a Workshop on archaeological terra preta in Belém, organised by the MPEG. In 2011, Wageningen University started a research programme in cooperation with universities in Brazil, Colombia and Bolivia and it organised two events: a Symposium on TPI and how it can revolutionise agriculture and the first international workshop on the terra preta programme.

Apart from the articles published in scientific journals and chapters in books, there are four books exclusively dedicated to terra preta de índio. The first was published in 2003 and edited by Lehmann et al. The book title was *Amazonian Dark Earths: Origins, Properties, Management*. This first book, like all the others, encompasses articles by scientists from many countries that work in Amazon.The second book *Amazonian Dark Earths: Explorations in Space and Time* was published in 2004 and edited by Glaser and Woods. The third book was published in 2009 and it was edited by Woods et al, *Amazonian Dark Earths – Wim Sombroek's Vision*. The fourth book was published in 2010, organised by Teixeira et al. in Portuguese. The title of the book is *The Terras Pretas de Índio of the Amazon: Its characterisation and the Use of this knowledge in the Creation of New Areas*[161].

There are two scientists that have greatly contributed to the study of terra preta de índio. One is Dutch, Wim Sombroek, from Wageningen University. The other is German, Wolfgang Zech, from Bayreuth University. Sombroek wrote his PhD thesis on Amazonian soils in 1966 and he wrote about terra preta de índio. He is a key figure is the research dynamic of this soil horizon, as incentivator of other researchers, as a researcher himself and as one of the founders of the Terra Preta Nova Group. His role in the Soil Science is also of great importance. Zech is also a key player. He gave space to scientists from his University to study TPI. The fact that Lehmann, Glaser and Steiner were all supervised by him says enough.

Terra preta de índio became an international issue due to the rise of international climate regime. Other factors were also important, such as the anniversary of 500 years of the arrival of Columbus in the Americas, which triggered research on the Americas before the arrival of the Europeans. However, the international focus on TPI refers to its role in the climate regime, leaving the other issues related to this soil in the background.

[161] Translation of the Author. In Portuguese the title is: As Terras Pretas de Índio da Amazônia: Sua Caracterização e Uso deste Conhecimento na Criação de Novas Áreas.

Chapter 4

The Sustainability Paradigm and the Future of the Amazon

The current environmental crisis is the result of actions and inactions of humans. The root of the crisis is political and social, rather than merely ecological (GUIMARÃES, 2001). The signs of vulnerability in the decades of 1950s/60s and the crisis in the 1980s triggered a discussion on the existing paradigms (JACOBI, 2003). The emergence of a new development model reflects the fact that the current model – one that prioritises material progress – leaves preservation and harmony in the society-nature relationship in the background (DA VEIGA, 2006). In addition, when this model is projected to the future, it produces impossible situations in biophysical terms (GOODLAND, 1995).

Sustainable development indicates a process, not an end in itself, and it presents a proposal to redifine the human-nature relationship. This concept is part of the current international reality. The paradigm of a new development model is a global proposal that has to be applied locally. This subject has been widely debated regarding the Amazon. The South-American forest is a theme that has been present in the environmental agenda since it's beginning. The Amazon started to receive more international attention in the last decades of the twentieth century, which reflected the high rates of deforestation, which, in its turn, are the result of the development model in the region. Today, the discussion on a sustainable development model is more than ever in the agenda. It is important to point out that development takes place in a given region, and because of that regional components are essential for it to happen. A sustainable development model is intimately related to local characteristics, therefore there cannot be one recipe to achieve this model (RIGOTTO & AUGUSTO, 2007). Discussions on the climate regime and biodiversity governance come to the forefront of the international arena. These two themes are intimately connected to terra preta, the future of the Amazon and the construction of a new development model for the region.

This chapter is dedicated to the future of the Amazon and the discussions that will overcast the delineation of its future – the sustainability paradigm and the forest in the climate regime. The chapter is dived in six parts. The first presents a discussion on the

concept of sustainable development. This discussion will be the base for the second part of the chapter, which is dedicated to sustainable development and terra preta de índio, in other words, what we can learn from terra preta in this new context. The third section is dedicated to climate change and tropical forests and it will focus on the reason why tropical forests[162] are such a hot topic when it comes to climate change. This section will also highlight the links between climate change, the storage of carbon in the Amazon and how this is related to terra preta. The fourth section covers the main aspects of payment of ecosystem services and the reduction of emissions from deforestation and degradation (REDD), which is being put forward[163] as a key element within the climate regime that addresses deforestation. This section will go over the roots of ecosystem services and the reduction of emissions through deforestation and degradation, and the implications of it. The fifth section presents a discussion on key issues that need to be addressed before such schemes are implemented, with a special focus on the Brazilian Amazon. The last section is dedicated to what to expect in the future.

Sustainable Development

The meaning of the expression 'sustainable development' hit the spotlight for the first time with the report *Our Common Future*, also known as the Brundtland report, in 1987. However, its roots go back to the beginning of the 1970s. It was in a meeting in Founex, Switzerland, where the implications of the model that had growth as its primacy were discussed, that the signs that a new development model was about to emerge were first seen (RIBEIRO, 2001). The debate gained scope with the work of Ignacy Sachs, who defined the term 'ecodevelopment' – a term used by Marurice Strong in 1973 in a United Nations Environment Programme (UNEP) meeting. Ecodevelopment was "a style of development particularly adapted to the rural regions of the third world, funded in its natural capacity of photosynthesis" (SACHS 1974 apud RIBEIRO, 2001: 110). In 1975 the report '*Que Faire'*, the outcome of a partnership between UNEP and the Dag-Hammaskjold, uses the term 'sustained development'.

[162] I will focus on the Amazon rainforest rather than all rainforests.

[163] Payment for sequestrating carbon into the soil would be one of these services.

In 1980, IUCN, UNEP and WWF came together to elaborate the report *World Conservation Strategy*. The aim of the report was to advance the reaching of sustainable development through conservation (IUCN-UNEP-WWF, 1980). The report defines development as "the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy the human needs and improve the quality of human life (IUCN-UNEP-WWF, 1980). For development to be sustainable it had to incorporate the social, ecological and economic factors of the living and non-living resource base and take into consideration the long and short-term positive and negative implications of alternative activities. In 1987 the Brundtland report was published[164]. The United Nations Environment and Development Commission, which had the prime minister of Norway, Gro Brundtland, as its president at that time, defined sustainable development as: "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987 http://www.un-documents.net/ocf-02.htm#I)[165]. There is today a wide variety of definitions for this term, but all of them have the definition of the *Our Common Future* as their base.

The idea to make the cake grow to later divide it, the trickle down effect – so seductive to the eyes of those who defend progress at all costs – revealed itself to be a trap and a failure. Economic growth, when and if it happened, did not translate into more equity in developing countries.

It was the need to search for new development models that gave rise to sustainable development – going beyond economic development, taking poverty and over-consumption as problems to be tackled at the same time. From the Brundtland report onwards there was room for a development model that reflected the complexity of the roots of the socio-economic and environmental problems of society (JACOBI, 2003). The definition of a new model represents a milestone in the history of the discussion of development. The emergency of an expression with an adjective directs the spotlights to the need for another model of environmental conservation and economic growth. The

[164] There is a discussion on the relationship between ecodevelopment and sustainable development. My idea here is not to enter in this debate but to talk about the events that took place and the definition of sustainable development.

[165] http://www.un-documents.net/ocf-02.htm#I Our Common Future seen 28th July 2011

term ‘sustainable development’ means that that this need is in fact real, and it carries in its definition the challenge of finding a new path for humanity.

The concept of sustainable development is not static. It indicates, in fact, a process, not an end. In addition, as the concept indicates a proposal for redefining the human-nature relationship, it has, by definition, a complex and multi-dimensional character (JACOBI, 2003). This characteristic is not contested, but there is no agreement in relation to how many and which would be these dimensions. Some actors identify five dimensions: social, economic, ecological, geographic and cultural (SACHS 1997 apud VAN BELLEN 2006). Others also include ethics. In general there are three dimensions that are always present: social, economic and environmental.

Despite the general divergence about the definition of the term that became trendy, its definition has elements that are always present. The first element would be the intergenerational relation. Concerns about the future generations are, at least in the rhetoric, real[166]. Another element is the carrying capacity of a territory. It is worth pointing out that this element – the population with a determined life-style that can live in a given territory without compromising its functions – depends on several and intrinsic factors unique to each region. Another important issue is that the concept represents a union between environment and economic growth.

Although the Brundtland’s definition is the most recognised one, it does not come without critiques. In the Report there is no discussion on the reasons for poverty and inequality (WACKERNAGEL & REES, 1996). In fact, although *Our Common Future* stresses the need for a productive system that respects the obligation to preserve the environment (WECD 1987 http://www.un-documents.net/ocf-02.htm)[167], the report did not actually break with the current pattern of growth. The report sees sustainable development in terms of rapid growth for both industrialised and developing countries. In reality, this hesitation - or in fact ambiguity - has not been resolved in the current debate. Sustainable development emerges as a junction between growth and environment conservation. For some authors, such as Herman Daily, a compatibility between economic growth and conservation is not possible. In other words, sustainable growth is

[166] However, some argue that the attention is turned to future generations, leaving the debate about the present scarce and empty (GOODLAND & DAILY, 1996).

[167] http://www.un-documents.net/ocf-02.htm Seen on the 29th of July 2011

simply not feasible. To understand the union of these two themes, it is important to analyse three issues (DA VEIGA, 2006): human behaviour - social and economic-, nature's evolution and the configuration of a territory. It is important to stress that these three elements alone cannot lead to sustainable development, it is the way they articulate with one another that makes a difference.

Naredo (1996) goes on to say that the ambiguity of 'sustainable development' explains its wide acceptance. Other proposals were put forward, but none had the widespread acceptance of 'sustainable development'. This is due to two factors. The term, as defined by *Our Common Future* carries a concern with the state of ecosystems. However, as the term is very vague, it can easily lead to empty gestures. Naredo argues that sustainable development, in opposition to ecodevelopment for example, represents a bridge between economists and environmentalists. It is precisely the apparent simplistic nature of the definition that casts a shadow in its ambiguity. Sustainable development is then a concept that has allowed developed countries to maintain their faith in growth without actually taking into consideration ecological problems and the ethical connotations of growth. Sen (2004) stresses the role of citizens in the achievement of sustainability. Rather than being mere spectators, citizens must be seen as agents who have the freedom to make decisions. Human beings have needs, but they also have values. Sen argues that the question is whether environmental priorities could be seen as sustaining our freedoms (SEN, 2004).

There are four ways to deal with the ambiguity of the concept (CONNELLY, 2007). The first way to deal with it would be to simply ignore the intrinsic complexity of the concept[168]. The second way would be to acknowledge the ambiguity and try to solve it by choosing one specific interpretation, which would put an end to this characteristic[169]. The third way is more analytical and it attempts to make this feature explicit and to characterise it, adopting a single analytical axis. Writings that adopt this approach go over what sustainable development could and should be. The fourth way of dealing with this ambiguity is to understand how the concept is developed and used, acknowledging

[168] One example of this way of dealing with the concept would be the UK Sustainable Development Strategy (CONNECELLY, 2007).

[169] Examples of this approach are many, such as the different interpretation of sustainable development in the disciplines that are concerned with it. Some authors focus on the poverty and environment link, others focus on industrial capitalism.

that there is not only one sustainability. It is even argued that 'sustainable development', rather than being ambiguous, it is in fact a contested concept (CONNELLY, 2007). As the concept gained media attention and its ambiguity allows for multiple interpretations, many have appropriated the concept and it can even be said that the concept has been abused, being part of almost every enterprise[170]. This is not to say that the concept should be dismissed, rather, that it has to be carefully analysed taking into consideration its ambiguity and how easily it can be appropriate.

In fact, the term sustainable development is far from being consensually accepted and it is in fact the target of hard criticisms. However, even being an expression that generates heated debate, it is important to stress that the idea that it carries represents a step forward (JACOBI, 2003). It was from this idea that the Agenda 21 emerged from – a plan elaborated to implement measures that would put the idea into reality, widely known and, in some places, put in practice.

The model proposed by 'sustainable development' is one of development rather than growth. This emphasises the difference between these two terms. Humanity witnesses in a paradox that also highlights this difference (BOISIER, 1997): economic acceleration is accompanied by the slow down of development. In other words, while macroeconomic indicators improve, socio-environmental ones deteriorate. Growth is understood as a process of quantitative dimensions, the increase by material acquisition (WACKERNAGEL & REES, 1996). Development, in another hand, is a process of qualitative dimensions, linked to the improvement of conditions and the quality of life (GOODLAND, 1995). This is why there is the need to emphasise sustainable development rather than growth.

The emergence of the concept of sustainable development and its rapid – albeit superficial – international diffusion triggers another need. This development model focuses on issues that are not reflected by the GNP (Gross National Product). The need to measure the distance between the current situation of a given place and the situation they want to reach (GUIMARAES, 2001) generates the need to elaborate other indicators, which are important tools in the search for sustainability. Socio-environmental indicators attempt to measure dimensions other than the economic one, which has dominated the indicators domain with the GNP supremacy as the sovereign indicator of

[170] Even Monsanto uses the concept sustainable development.

a country's reality. In this new wave of indicators, the most known initiatives are the *Human Development Index*, *the Ecological Footprint* and, in the case of Brazil, the *Sustainable Development Indicators* from IBGE.

It is not the existence of the components for development of a given community that determines its development; it is the articulation between them that is the key factor (BOISIER, 1997 & GUIMARAES, 2001)[171]. A badly organised articulation without a purpose will not lead to development. Development is a complex political process, with many actors and a wide range of articulated actions amongst them.

The regional base for development is linked to the characteristics that each community presents – cultural, economic, ecological, social, financial. The singularity of each region means that each one presents different needs and opportunities. In other words, each community has a different potential. There is not a recipe that will lead to sustainable development as this development is based on local differences and therefore cannot be replicated in other places (RIGOTTO & AUGUSTO, 2007).

Boisier identified six development determining factors in a given place (BOISIER 1996). The first factor refers to the actors. Development is a process of decision and it is linked to the people that have power. The second factor is institutions. It is important to map out the institutions, both public and private, of a given territory. This 'map' and the evaluation of speed, flexibility, virtuality and intelligence of these institutions have a central role in the development process. The third factor is culture. In this point there are visions of the world, the way of understanding reality, as well as the group of norms present in social relations. It is here that the cultural identity of people towards a territory is at stake, as well as their position in relation to issues that refer to the development of a certain place, such as investments and innovations. The fourth factor cited by Boisier refers to the procedures used by institutions, and the author stresses three of those: development management, management and information administration. The fifth factor responsible for development is the resources of a territory, both material and natural.

[171] I do not disregard Brundtland's definition of the concept, but I do think this definition is all-embracing, leaving the concept open to all that wish to take it on. I believe that the development should be stressed more enfatically and its oposition to growth. The concept does necessary imply a revision in the current development model and goes beyond the economic dimension. It refers to the development of a territory taking into consideration its specificities, re-orgasing the functioning of society within itself and with what surrounds it.

The sixth factor is the surrounding, in other words, the external, where the organisms are and where the relations that cannot be controlled take place.

The concept of territory has changed as the state power hegemony was giving way to other sources and forms of power (RIGOTTO & AUGUSTO, 2007). Two external changes pushed this transformation. First is the technical-scientific revolution, and the development of a source of production that has information as its base. The second transformation was the environmental crisis that imposed a limit to industrial production and to consumption of society. In the internal sphere, there were two tendencies that draw attention. The first one refers to the productive advantages of a territory, stressing the importance of the local natural resources. The second refers to the new strategic value of a territory, intimately linked to its own natural resources, which starts to be seen as capital. Another important factor is the return of the search of an identity and social and cultural values of a territory. Which means more autonomy for certain regions in relation to the units that they belong to. This tendency opens the opportunity to local territories to revise their role before globalisation.

The role of science in the sustainable development paradigm is still an issue that generates a lot of discussion. Part of the scientists defends the idea that, in fact, sustainability does not change anything regarding the label of old research questions (PERRINGS, 2007). The sustainable use of renewable resources has been studied in the economic discipline since the 1950s. Sustainable development based on the use of non-renewable resources is also a reoccurring theme in the same discipline since 1970s. From the other side of the spectrum, scientists argue that we are in fact witnessing a drastic change in the way science for the human use is being carried out, as well as the impact that it has on the environment.

The debate about science and sustainability is heated. There are three points that deserve to be highlighted (PERRINGS, 2007). First it is the connection between sustainability science and the existing disciplines. Interdisciplinary approaches are hindered by researches that still focus on only one discipline. Although the need to search multi-disciplinary solutions has been urged for a long time, most of the solutions for the problems are still uni-disciplinary. The second is the link between the components of globalisation. This phenomenon brings implications to the scales of the problems. The third is the growth of uncertainty in a system that evolves rapidly.

The Millennium Ecosystem Assessment, published in 2005 revealed that although we understand the connections between biological diversities, ecosystem services and human well-being, we are far from being able to foresee the consequences of strategic alternatives to manage change in biodiversity (PERRINGS, 2007). Mitigation and adaptation are words that are ever growing in use. However, mitigation implies that to act now to protect the interest of the future generations, which characterises a situation of a public good. Adaptation, in another hand, implies that the advantages of those who adapt, characterising a situation of private good. Different from adaptation, mitigation is sustained in probabilistic scenarios. Therefore, a key point in the search of sustainability is the challenge to improve the human capacity to elaborate models of change in the system that present foreseeing capacities. The development of science for sustainability refers to the construction of capacities, methods and protocols to analyse the problems that originate in complex dynamics of social environmental systems (PERRINGS, 2007).

Therefore, the answer to problems should be integrated, in other words, the answers should serve more than one goal (BERKES, 2007). Integrated answers for questions that involve conservation and which refer to the science of sustainability would represent an evolution from the simple answers to simple and common problems to solutions to complex commons. This change would imply governance in different scales. There was a resistance to deal with conservation objectives and livelihoods at the same time. The argument evoked to defend this position was that the social objectives would hide conservation objectives. This resistance can, partially, be the consequence of different research agendas. However, it can also be caused by the inability and discomfort of conventional science of resource management to deal with several objectives (BERKES, 2007). The lack of a common language between conservation and development managers is also an issue. The literature about conservation does not share many common elements with the literature on livelihoods and development, which is an obstacle in the search for common objectives.

In the international arena, the word biodiversity is of extremely importance. This word is the starting point for the definition of another type of economic development (JOLY, 2002). In this context, Brazil occupies a prominent place. It is the most biodiverse country in the planet, both in terms of numbers and in terms of abundance relative to species, but also in the “local variability, biological complementarities of the habitats and the diversity of ecosystems and biomes” (JOLY, 2002: 2). Besides being the home of

the biggest tropical forest in the world, the Amazon forest, Brazil also hosts the tropical forest with the highest biodiversity per area, the Atlantic forest.

Sustainable development is part of the international reality. The paradigm of a new model of development, which is a global proposal that has to be implemented and engendered in the local sphere, is one of the most discussed themes about development in the Amazon. The South-American tropical forest has been a subject of the environmental agenda since its formation. In the last decades of the twentieth century, the Amazon started to receive more national and international attention due to high levels of deforestation as a consequence of the development in the region. Today, more than ever, the debate on a model of sustainable development for the forest is in the agenda. It is in this context that terra preta emerges.

Sustainable Development and Terra Preta de Índio

The idea of a sustainable development for the Amazon region becomes a concern more present due to the union of three processes (COSTA, 2001): the crisis of the national development model, the re-establishment of democracy and the political impact of the international environmental crisis. These factors stimulated the discussion on a new model of development for the region. The crisis of the current development model presents itself in Brazil mainly through two realities: social inequality and technological dependency. Both are present in Amazonia. An alternative development proposal for the forest, for it to be sustainable from the point of view of the different dimensions of the term, would imply a project that stimulates biodiversity conservation in the region and would offer production alternatives. It is worth pointing out that development projects, specially those that go in the direct opposition to the economic interests entrenched in a given region and that would imprint a different pattern of local development, do not come out of nothing. It is imperative to have actors that stimulate and implement such processes that would lead to sustainable development.

The current environmental crisis also affects agriculture and food production. Technological innovations originated from the green revolution did not reach small producers. It is worth pointing out that the revolution took place without an agrarian reform (ALTIERI, 2004). Big agricultural enterprises focused on export. This, together with migration to the urban centres, deteriorated the quality of life in rural areas. The

attempt to implement a sustainable development in the Amazon region would have to consider agriculture, an important factor not only to the local population but also for the big producers.

For a long time the dominant discourse in the Amazon was of environmental determinism (GERMAN, 2003). If, according to environmental determinism the environment is the dominant actor in the human-nature relationship, in the opposite perspective is the idea of human agency as capable of freely imposing its choices and decisions in the natural world. Terra preta represents the middle path, in which a human-nature relationship without a dominant force comes through, being a relationship where interaction and influence is reciprocal.

Sustainable development is understood as a new human-nature relationship. If that is going to be achieved, terra preta could help in this search. It was through intervention in nature that the soil was modified. This intervention – that was neither destruction nor preservation *strictu sensu* – is significant even if the soil was not used for agricultural means, which has not yet been proved. There was a time when the relationship between humans and nature was beneficial for both parts (OLIVER, 2008).

To achieve sustainable agriculture in the tropics, it is important to improve the fertility of the soils in the region (GLASER et al, 2007). This is how terra preta can hold a key in the search for sustainable development, as it is seen as a sustainable agricultural model. There are trials being carried out in Brazil concerning terra preta that are focus on smallholder farmers. The value of terra preta de índio is recognised by the people of the forest. The flora in terra preta areas are also seen as with high use value (JUNQUEIRA, 2011; CLEMENT et al, 2010).

The high amount of carbon and high fertility of this soil horizon is singular and it is one of its most intriguing characteristics. In addition, this gains a new importance today as any project of sustainable development for the region cannot leave agriculture out. A great part of deforestation is caused by the agribusiness, both the plantations and animal grazing. However, when used for agriculture, the soil cannot be used for a very long time. The soil is saturated and the farmer moves on in the search for a new territory. The fertility of the soil is intriguing, as is the fact that the soil stays fertile throughout the years – centuries in fact. In addition, when used, the time that a terra preta de índio plot needs to recover is considerably smaller than other soils. The time for recuperation can be of

six months, while the time for the same process in a ferralsol is of 8 to 10 years[172]. There are reports that the soil does not necessarily need to rest, one could simply change to a 'less demanding' crop. The soil chemistry is important so we can understand how the soil maintained this characteristic.

Terra preta de índio is also important for the small producers that, without large plots suffer with the low fertility of the soil. TPI allows intense use in small areas of land for agricultural production of food. There are already projects in the region that aim to reproduce terra preta (MADARI et al, 2004; MONTEIRO et al, 2010). It is important to make a clear distinction between the reproduction of terra preta and the reproduction of its fertility. Until today, scientists have not agreed on how this soil was created. The high carbon content of the soil has a strong impact on its fertility. In order to reproduce the fertility of the soil – rather than the soil itself – there are also several research programmes being carried out all over the world to incorporate carbon in the soil. Therefore, although scientists are not uncertain how the soil was created, there are studies to reproduce its fertility.

The international environmental agenda is socio-environmental. The division between the social and the environmental characteristics is an impossible mission (GUIMARAES, 2001), as environmental degradation is the result of social inequality engendered in the primacy of economic growth. The quality of life of the people in a region is a crucial matter in the search of sustainable development. The existence of terra preta de índio is important because it represents an alternative for food production in the region, enhancing, consequently, the quality of life. It is important to notice that the fertile soils of the region already do so. Terra preta de Índio is also a new way to manage residues, which is also related to a more sustainable path.

When sustainable development is the topic of debate, the environmental – or ecological dimension - is always present[173]. This dimension approaches the sustainability of life cycles of one ecosystem, without unbalancing the dynamic of these cycles. It is respecting this limit that these cycles can reach a celling for the use of natural resources

[172] It is important to notice that fallow period is motivated by the dificulty in managing weed and also due to a likely degradation in soil structure (TEIXEIRA et al 2010).

[173] I am not suggesting that environmental and ecological dimensions are the same. I am referring to the dimension that encompasses the ecological dimensions of the environment.

– development without degrading the natural cycles of the environment – intimately linked to the concept of carrying capacity. Despite the observations that can be made here[174], there is one that deserves further attention. The use of the soil with so singular characteristics implies, on its own, a reinforcement of environmental sustainability, being part of the Amazonian environment with such a high fertility. The use of terra preta de índio implies the respect of local biodiversity conservation.

When facing the environmental crisis, great part of the hope of 'salvation' comes from technological promises. The technological advances bring elements that would solve environmental degradation without humanity needing to make sacrifices. Despite the advances already witnessed, the Amazon is still a question mark regarding technology. With all the systems, production machines and computer softwares, very little is known about the region[175], there is still al lot of uncertainty (LEWINSOHN, 2006). All this technology was incapable of arriving at terra preta de índio. More than two thousand years ago, the peoples of the Amazon were capable of producing a soil that transformed their lives. This point stresses the importance of local knowledge. TPI is an example that local resource of extreme richness has to be studied, understood and used within the horizon of sustainable development in a region.

When we focus on the factors that determine local development – actors, institutions, culture, procedures, resources, and environment – it is easy to realise the relevance of TPI to the region. Terra preta was created from the soils of the region, extremely acidic and with poor reserve of nutrients. Soils, together with solar energy, water and plants, are important resources for the population, being therefore crucial for the sustainability discourse. Rather than being mere spectators, the population that lived in the forest became agents, and made decisions to improve the quality of their lives taking into considerations ecological factors.

The richness of terra preta de índio goes beyond its historical and cultural value. This Amazonian treasure is the evidence that there was a pacific coexistence – without

[174] Some of these observations refer to the fact that the concept of carrying capacity is formed by several elements, not being an static concept; other observations refer to the fact that all activities have an impact on the environment and the uncertainty regarding the point of no return.

[175] There are two issues regarding knowledge in the region. One would the institutional structure to stimulate it. The other would the be increase in communication between policy-makers and advisors There is the need for a technic-scientific revolution in the region (CGEE, 2009: 40; COSTA, 2009: 38).

degradation – between man and nature in this singular region of the planet. Terra preta de índio, which is extremely important to agriculture and for the populations of the region, demonstrates that another type of development is possible in the region. The social value of TPI is yet to be totally comprehended. The important message is that, in a moment in which the Amazon is still the target of debates on sustainability and development in a globalised world, a way between preservation and destruction is possible.

Climate Change and the Amazon rainforest

Forests, especially tropical ones, play a key role in the climate change debate. They have large quantities of biomass and they are an important element in regional climate regulation. Forest loss due to deforestation has huge impacts that go beyond the local sphere. Deterring deforestation can have positive impacts on biodiversity conservation and regional climate regulation as well as maintaining the cultural value of the forests (BORNER et al, 2010).

Deforestation in the tropics is the second major source of greenhouse gas emissions (KINDERMANN et al, 2008). In the 1990s, deforestation caused roughly 1.5 billion metric tons per year of carbon to be released to the atmosphere (GULLISON et al, 2007), accounting for 20% of the anthropogenic greenhouse gases. Tropical deforestation in the world took place at a rate of 10.4 million hectares per year between 2000 and 2005 (DAVIET, 2007). The carbon concentration of the soil is also affected. It was estimated that, during the 1980s, deforestation was responsible for a net release of 0.1 to 0.3 Gt of soil carbon per year (SOMBROEK, NACHTERGAELE, HEBEL, 1993). The South American rainforest stands out for two main reasons. The Amazon is the largest tropical forest in the world, which means that it holds a lot of carbon, and it has the highest rates of deforestation in absolute amounts (BORNER et al, 2010).

Forests are a very important carbon pool, representing 50% of the terrestrial pool (CORBERA, ESTRADA, BROWN, 2010). Tropical forests differ quantitatively in carbon storage from other forests. They store, on average, 50% more carbon than forests in other regions[176]. Due to their high carbon storage as well as its productivity, tropical

[176] That is not including boreal forests.

forests are a key subject in reducing CO_2 emissions and have great potential in the generation of carbon credits. Thus tropical forests in general, and the Amazon in particular, receive a lot of attention within the climate change debate.

These numbers, together with the fact that the current international governance structure is not reaching the expected result in terms of reducing deforestation and degradation and the fact that there is a need to create other forms of income as well as the opportunity that exists in mitigation, have stimulated the search for new ways to mitigate climate change within forests. The effects of deforestation, however, go beyond the emission of carbon during the burning and is related to the socioeconomic implications that drive this act and its consequent implications, such as the impact on the biodiversity of the forest, to name one. Moreover, although not always taken into account, climate change is not just about greenhouse gases emissions. The key issue is in fact the consequences of those changes and how we are all going to cope with those new circumstances. The change in the climate will have consequences that we do not have the capacity to predict. The provision of food, water, and fibber, for example, will be affected, which will have social and economic impacts. A great part of the climate change debate is about adaptation by the population, specially the most vulnerable ones, to these changes, as well as the capacity of the institutions in place to deal with problems that will arise.

Within the current framework of the Kyoto Protocol that runs until 2012, emission reductions due to avoided deforestation are not eligible for carbon credits, as embedded in the Clean Development Mechanism. As a tool to provide incentives for the conservation of the forest, more people have defended the inclusion of Reduction Emission of Deforestation and Degradation (REDD) in the international climate regime. In the past three years, many reports, as well as pilot programmes, have been set up to assess the benefits and problems of such a scheme[177] [178].

[177] One aspect that draws attention to REDD is the fact that it does not require new technology to be applied. It does require, however, technology for the monitoring. Monitoring of REDD activities call for the ability to see how the land in question is being maintained as it was agreed. This implies the use of satellite imagery of high resolution. In addition the biomass loss due to land use change as well as the price of this change would have to be assessed. This is also related to what is understood as a forest – how much cover is needed, if it has to be secondary growth. How forests are defined depend on each country and this definition will be crucial in determining which forest is eligible to take part in REDD programmes.

[178] Reports such as Peskett, L. et al **Making REDD work for the Poor**. A Poverty Environment Partnership (PEP) Report. September 2008; Angelsen, A. (ed.) **Moving Ahead with REDD: Issues, Options and**

The Kyoto Protocol does not allow developed countries to use sequestered carbon in the land as a sink to reach their targets (READ & MAY, 2001). Emissions could only be mitigated through carbon sinks in land that were directly created from 1990, such as aforestation. Sinks created indirectly through change in atmosphere, such as fertilisers with CO_2 or through previous changes in land use, are not valid as mitigation measures.

Initiatives to keep the forest standing do not go in the carbon market. These measures would avoid carbon emission through degradation and deforestation. However, with the discussions of the Kyoto Protocol in full speed, this subject is gaining space. Conservation of standing forests would go in the Protocol pos-Kyoto, opening a big space for countries like Brazil and Indonesia to gain more importance and participate more actively in the carbon market.

The entry of REDD in what will follow the Kyoto Protocol depends on political coalition (O'CONNOR, 2008). With the participation of actors that are not only the state in the environmental arena, both nationally and internationally, a coalition must be forged to open the path for REDD. Non-governmental organisations are active since the 1970s. Private enterprises began to engage when they realised that they could win a competitive advantage in relation to technological advances to fulfil the emission of GHG regulations and could influence the elaboration of rules that would better serve them. The engagement with environmental issues – not only climate change – also brings benefits to the enterprises image.

The pressure for REDD to be included in the system that will come after 2012 has grown internationally. In case that it is put in practice, a new range of opportunities is opened. One of them would be the fertilisation of the soil with carbon. It is important to stress that the carbon in the forest is not only found aboveground. On a global scale, soils hold three times the amount of carbon in vegetation and double the amount in the atmosphere (SMITH, 2008). Tropical forest soils have more carbon than the vegetation itself. With terra preta de índio this is even more evident. One hectare of terra preta de índio 1 meter deep contains 250 tonnes of carbon, 150 more than the neighbouring soils (MARRIS, 2006). This difference is bigger than the carbon retained in one hectare of plants. The soils of the Amazon store the same quantity of carbon or more than the

Implications. CIFOR-CGIAR, 2008; Bond, I. et al. **Incentives to Sustain Forest Ecosystem Services** – A Review and Lessons for REDD. International Institute for Environment and Development IIED, London, UK, with CIFOR, Bogor, Indonesia, and World Resource Institute, Washington D.C., USA, 2009

forest itself (MALHI et al, 2008). The table below illustrates this point, showing that, not just tropical forests, but also in other biomes, soils contain more carbon than the vegetation.

Figure 13 - Global Carbon Stocks (GtC)

Biome	Area (10^6 km^2)	Global Carbon Stocks (Gt C)		
		Vegetation	Soils	Total
Tropical forests	17.6	212	216	428
Temperate forests	10.4	59	100	159
Boreal forests	13.7	88	471	559
Tropical savannas	22.5	66	264	330
Temperate grassland	12.5	9	295	304
Deserts and semiarid areas	30.0	8	191	199
Tundra	9.5	6	121	127
Wetlands	3.5	15	225	240
Croplands	16.0	3	128	131
Total	**135.6**	**466**	**2011**	**2477**

Source: CLAUSEN & GHOLZ. Carbon and Forest Management 2001: 12

For containing – and for emitting – so much carbon, tropical forests are a key issue on the climate regime.

This fact, taken to extreme, could be used as an argument to defend the continuous deforestation of the region, as soils as sinks are more 'effective'. It is worth pointing out that the more disturbed the soils are, the more carbon they emit to the atmosphere. Besides, the amount of carbon in the soils would have to be an incredible amount to balance deforestation. Another important issue is the fact that vegetation is responsible for environmental services, functions that cannot be exercised by the soil. The capability of the soil to retain carbon is influenced by several factors: climate, vegetation, type of activity carried out. Therefore, soil and vegetation are intimately connected, and cannot be treated separately.

One activity that shows strong impact in climate change is land use change, which refers to the management type imposed by human beings to the earth (DALE, 1997). This alteration is the most significant one (VITOUSEK et al, 1997). With this, humans change the ecosystem services, the interaction between ecosystems with the atmosphere. Land

use encompasses all kinds of activities: livestock, extractivism, agriculture, and deforestation, amongst others. It is also the main responsible factor for biodiversity loss in the world. One of these alterations is the conversion of forest into pasture or into agricultural land. Between 1850 and 1990, about 100 Gt of carbon were liberated into the atmosphere due to land use change (CLAUSEN & GHOLZ, 2001). Recent studies show that from 1990 to 2000 the same activity was responsible for 24Gt.

Land use change, such as deforestation, has an impact on the amount of carbon in vegetation, but disturbances also release the amount of carbon in the soil. Land use change, together with fossil fuel burning, is the biggest driver of anthropogenic CO_2 emissions[179].

Terra preta and its high carbon content motivated these studies on the production and insertion of biochar in the soil[180]. The origin of the fertility of terra preta de índio would be in its carbon content, the biochar. Terra preta is responsible for raising the debate on soil amendment through biochar (LEHMANN, 2009b)[181]. Although the reproduction of terra preta de índio itself today is far from being achieved, the reproduction of its fertility, believed to be related to the amount of carbon that it contains, is being researched. This is important for two main reasons. First, it would have a positive impact on agricultural production. The increase of soil organic carbon improves the quality of the soil and enhances crop yield by improving the water capacity of the soil, the supply of nutrients and other physical properties (LAL et al, 2007). Second, the storage of carbon in the soil feeds back to the climate change debate. These two issues – climate change and improving soil quality – set the stage within which biochar emerges as a possible win-win situation on a global scale (SOHI et al, 2010; LEHMANN, 2009a).

In a slow burning with partial or complete absence of oxygen of biomass that is plant-derived, which is called pyrolisis, other than combustible gases, volatile oils and tarry

[179] It is estimated that land use change was responsible for the emission of 1.6 ± 0.8 Pg C per year in the 1990s (IPCC, 2001).

[180] It is important to notice, however, that the focus of the study on biochar has shifted. In the beginning it was a proposal to improve the livelihoods of the farmers by improving the fertility of the soil. Now the main focus is on carbon credits and the impact on the livelihoods of the farmers was relegated to a second realm – if that.

[181] It is important to notice that biochar has been recognised as a soil amendment for a long time. The discussion on terra preta de índio brought it back to the centre of the debate rearding sustainable soil management and soil improvement.

vapours, a carbon-rich structure called char is produced. The result is biochar with a twofold higher carbon content then simple biomass (LEHMANN, 2007). Controlled pyrolysis appears to be a good option for producing biochar as it stabilises the carbon in a solid form[182] (SOHI et al, 2010).

As well as the reduction of emissions by deforestation and degradation, stabilization of biomass carbon, which is the process by which biochar is produced, is not eligible for carbon credits under the Clean Development Mechanism of the Kyoto Protocol (SOHI et al, 2010). Some countries from Annex II (developing and newly industrialized countries) of the Kyoto Protocol are seeking the inclusion of biochar in the programme post-2012 (SOHI et al, 2010). They are working through the Convention to Combat Desertification, which refers to the productivity of drylands, deserted and desertifying regions[183].

This section laid the scenario for the discussion of climate change and tropical forests and how this is related to terra preta de índio. The next section is dedicated to ecosystem services and reduction emission from deforestation and degradation, topics that are being intensively debated and are likely to play a key role in the future climate regime.

Ecosystem Services and REDD

Humanity is completely dependent on nature to survive. The production system of the eighteenth and nineteenth century, together with the increase in population, started to draw attention from scholars from that time. The changes that occurred in those centuries began a long time ago. This process started 10000 years before, when humanity began to domesticate nature (FISHER, TURNER, MORLING, 2008). Domestication led to changes in all sectors of life, from production to housing through energy consumption. Since then, we began to manage nature more actively. The services provided by nature have therefore played an important role for many years, although people may not have been aware of that so clearly.

[182] Pyrolysis is one amongst many technologies to produce energy from biomass, but what makes it stand out is the fact that it produces a solid by-product that is carbon-rich (Lehmann, 2007b: 381).

[183] Tropical countries are not key players within the desertification debate. However, the movement of those countries are important to the humid tropics as its raises the debate on biochar and as more extreme weather is experienced, desertification might be an issue to the tropics. In Brazil, for example, the Northeast of the country is susceptible to desertification.

Studies linking welfare and nature have increased exponentially in the past decades. In 1977, a work done by Westman proposed that the social values of the services provided by nature could be itemised so people could grade them in accordance with the importance that a service had to them (FISHER, TURNER, MORLING 2008). This would help policy-makers prioritise policies and management programme. These services were then called nature services. Ehrlich and Ehrlich in 1981 first used the term ecosystem services. Since then this concept has received a lot of attention and has grown in importance in papers written about the relationship between humankind and nature.

The concept of ecosystems services[184] has gained great dimensions and it underlines the discussion on biodiversity conservation and on the climate regime. It is also the concept behind REDD. They are defined as "the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfil human life" (DAILY, 1997: 3). Ecosystem services are the benefits that humans get from ecosystems (MEA, 2005). The Millennium Ecosystem Assessment divides ecosystem services into four categories: provisional (e.g. food, water), regulating (e.g. regulation of climate), cultural (e.g. recreation) and supporting services (e.g. soil formation) (MEA, 2005).

The bridge between this concept and policies deserves further attention. As seen by neoclassical economists, in a world ruled by the market, ecosystem services, as everything else, fit into mainstream economics. These services are seen as externalities (KOSOY & CORBERA 2010). According to the research carried out by the Millennium Ecosystem Analysis in 2005, the services that are marketable are in better condition than those that are non-marketable or derive from natural capital with obscure property rights (LANT, RUHL, KRAFT, 2008). For example: crops and aquaculture are increasing, whereas wild foods and freshwater are decreasing[185].

The ownership of goods - public or private - is a key issue that deserves further attention. Private goods are used in a rival and excludable way. One example to illustrate a private good would be barrels of crude oil. Public goods – such as air and water – on the other hand, are non-rival and non-excludable. Because of these characteristics, public goods are underprovided as the producer does not have any

[184] Here I will use ecosystem services and environmental services interchangeably.

[185] Only carbon sequestration is increasing.

incentive to maintain the provision and he is not bestowed with any advantage to provide them. With the exception of provisioning services, ecosystem services are mostly non-excludable (LANT, RUHL, KRAFT, 2008). This condition opens space for free-riders, who benefits from the services but do not pay for them. The depletion of ecosystem services is a result of the 'social trap' (LANT, RUHL, KRAFT, 2008).

Most of the services that are part of PES programmes are public goods, either local or global (MURANDIAN et al 2010). That means they are non-excludable –it is not possible to prevent people from benefiting from the service provided - and non-rival – the consumption of the good by one person does not prevent the consumption by others (ENGEL, PAGIOLA, WUNDER, 2008). Ecosystem services, however, do provide benefits that can be rival and excludable (FISHER, TURNER, MORLING, 2008).

It is important to stress, that as public goods, environmental services are not paid for, therefore market failure is common and society does not have enough provision of these services (VAN HECKEN & BASTIAENSEN, 2010). Nature provides services that do not yet have a market. Environmental degradation is thus seen as a failure of the market, and what would be best to resolve an issue created by the market than the market itself? This 'failure' needs to be internalised and the process to do so is through the payment for ecosystem services (PES) (BOND et al, 2009)[186].

According to the paragraph above, there is no incentive to keep the forest standing (which would maintain the provision of these services)[187]. There are few private benefits from an ecological and social optimal land use for farmers, such as conservation of the forest (ENGEL, PAGIOLA, WUNDER 2008). Therefore there is no competitive advantage to switch to less destructive land-use practices (VAN HECKEN & BASTIAENSEN, 2010). The payment for ecosystem services can be seen as an attempt to create the incentives for such a shift, representing the coupling of private land benefits with social conservation.

[186] Is this a scheme likely to succeed? The way that such proposal is being advocated by different groups suggests that many people do believe this is possible. However, the flaws of neoclassical economics are well-known.

[187] This could be argued for private land, but what about public land? Are governments going to be paid to enforce their Law?

The payment for these services would, in theory, resolve this issue by creating a market for these services. This argument finds its roots within market environmentalism, which has been a topic of discussion since 1980s (KOSOY & CORBERA, 2010). The pricing of the services provided by nature would resolve environmental problems. The assignment of property rights and the expansion of commodity markets are the other items of this tri-fold scheme. According to this view, private ownership – and consequently private benefits – will lead to better resource management. The foundations of this argument are found in Hardin's 'Tragedy of Commons' (1968)[188].

Within the environmental realm, the 'polluter pay' principle has prevailed. It is important to notice that the PES approach is a move away from the idea of taxing negative externalities or subsiding positive ones. PES is based on the Coase theorem[189] (VAN HECKEN & BASTIAENSEN, 2010), which states that the issue of external effects can, depending on the circumstances, be resolved by negotiations between the private parties (ENGEL, PAGIOLA, WUNDER, 2008). A social optimum can, therefore, be achieved through bargaining, despite the allocation of property rights. Trading amongst the parties, be that communities, individuals or international entities, would occur until a pareto-efficient provision would be reached, if property rights were defined and transaction costs were low (MURANDIAN et al, 2010). Government regulation would, therefore, be obsolete. This is a shift from negative to positive externality, changing how the farmer is seen, from a polluter to a service provider. In other words, there is not a negative connotation attached to the farmer.

Seeing ecosystem services as purely externalities, however, does not come short of critics. The limitations of this approach have been recognised by its own proponents, who support the view that PES should be seen as one piece of the puzzle for a more sustainable land use management (VAN HECKEN & BASTIAENSEN, 2010;

[188] Hardin's work has been highly criticised, specially his definition of "commons". Nonetheless, this metaphor explains the overconsumption of common-pool resources.

[189] Ronald Coase, an economist from the University of Virginia, wrote in 1960 an article entitled "The Problem of Social Cost" at the Journal of Law and Economics. Coase presents a critique to the Pigovian tradition, which he believes is socially inefficient. He explains that if A hurts B and then A has to stop doing whatever is hurting B, A will suffer. In this case B will hurt A. Therefore the right approach would be to analyse if A has the right to hurt B and vice versa. Without transactions costs, the externalities would be internalised and negotiations would take place. With transactions costs, the property rights have to be clear.

MURANDIAN et al, 2010). PES adopts stock-flow models[190] (NORGAARD, 2010). One should notice, however, that this framework does not encompass the complexity of ecosystem services as it only embodies one way in which ecologists study ecosystems. Ecologists themselves use these models to complement other frameworks, not as the sovereign one itself. Therefore the adoption of the ecosystem service as a way to understand the services that nature provides us is incomplete.

The embracing of PES itself entails that it is possible to quantify what nature can provide, how much of it can be provided and how long for. Ecologists, and advocates of the ecosystem approach, admit that there is still too much unknown about ecology to be able to predict the application of this concept (NORGAARD, 2010). One question raised regarding the stock-flow model is that ecologists do not think in terms of stock-flows. Rather, their work is based on food dynamics, population, biogeochemical cycles, and etc. The same is true for social scientists that study human behaviour. Therefore there is little literature that fits this framework, which poses a problem for the applicability of the concept (NORGAARD, 2010). It is important to notice that when ecosystem services are public goods, such as in the case of biodiversity, it is difficult to single out and delimit users (ENGEL, PAGIOLA, WUNDER, 2008).

The definition of PES most used, be that to adopt it or to criticise it, is the one set up by Wunder (WUNDER, 2005). The author describes five criteria for such schemes. The transaction has to be voluntary; the ecosystem service has to be well-defined or the land use has to provide the service that will be paid for; the service has to be bought by at least one buyer; there has to be one service provider (the land owner); and the service provider has to ensure the provision of the ES, the conditionality criteria. Conditionality means that there has to be an agreement that states that the ecosystem service will be available, restraining the landowner from any other form of land use. PES differs from other command-and-control and disincentive-base policies because it brings with it voluntariness and conditionality (BORNER et al, 2010).

[190] The Millennium Ecosystem Assessment studied several understandings of the relationship between human well-being and ecosystems in the course of 5 years. A multi-scale system view was elaborated, which saw the ecosystems as natural capital that provided ecosystem services, which is a stock-flow model (Norgaard, 2010: 1220). The elaboration of this design helped to raise key questions and to understand this relationship. However, this did not come without critiques and questions were raised regarding this framework.

PES can be financed in two different ways: by the government or by the user (BOND et al 2009; ENGEL, PAGIOLA, WUNDER, 2008). In the former case, the government is the buyer. These work on large scales and are more cost-efficient. In the latter, users such as municipalities, are the ones who buy. These projects are smaller and are likely to be more efficient than the former, as the buyers tend to have more information about the value of the service and therefore are more inclined to make sure the mechanisms are functioning well. However, they are less cost-efficient.

It is important to stress that the provision of ecosystem services is directly linked to poverty. As defined by the Millennium Ecosystem Assessment in 2005, poverty happens when there is a flaw in the linkage between human well-being and ecosystem services (FAO, 2011). PES is also linked to sustainability. The latter refers to three factors: economic resilience, environmental integrity and social development (FAO, 2011). PES is able to connect the economic, the environmental and the social dimensions of sustainability as its main objective is to provide incentives, protect ecosystem services and maintain the provision of benefits to society – the economic, the environmental and the social dimensions respectively.

As PES is seen as the most direct way of providing incentives for conservation to land users, it was adopted by many REDD proponents[191] (BORNER et al, 2010). That, added to the fact that land-use change is responsible for 1/3 of all the greenhouse gas emissions, (STERN, 2006: apud PESKETT 2008) triggered the increase in the interest towards it. The thought behind this approach is based on the idea that incentives can be offered to developing countries in order to stimulate the development and implementation of policies and measures that will reduce emissions from deforestation and degradation of forests (PESKETT, 2008). The reduction is the difference between the deforestation rates after REDD and what would 'normally' happen, which is called a baseline scenario[192]. These numbers are determined based on historical emissions, trends and drivers. Therefore landowners would receive money to maintain the forest as it is, preserving the provision of ecosystem services, such as carbon storage. It is

[191] Payment for Ecosystem Services is the most talked approach for REDD (Sandbrook et al 2010: 330).

[192] How the baseline will be defined is also important. If credits are based on historical rates of deforestation, depending on the year that is chosen, the credit will vary considerably. Moreover, deforestation varies greatly within countries, therefore the national average might not reflect a country's real situation.

important to notice however, that choosing historical emissions as the base to determine carbon credits can be problematic even for countries that have maintained a well-document track of its deforestation rates, such as Brazil (CHATTERJEE, 2009). Apart from the continuous drop of the last 5 years (2005-2010), deforestation rates in the Amazon go up and down, making it hard to foresee how these rates would look like in the future.

The Kyoto Protocol architecture encompasses afforestation and reforestation, but not credits for avoided deforestation and degradation. The reasons for this exclusion are multi-fold (PESKETT, 2008; BOND et al 2009). First of all, there is the issue with the technicalities – how to estimate the reduction of carbon, how to determine 'additionality', for example. The credit is only valid if, without the programme, deforestation would take place, and subsequently the payment for keeping the forest standing, would be responsible for the absence of degradation and deforestation. 'Additionality' is a key concept within the REDD regime and it is the element that makes the bridge between avoided deforestation and the carbon market. The need to prove it is the factor that, in theory, excludes countries that have protected their forests. This issue is important between but also within countries. If 'additionality' is in fact imposed as a determining element, the state of Mato Grosso, which has high rates of deforestation, in Brazil will be eligible to take part in the programme, for example, whereas the state of Amazonas, where deforestation rates are not so high, 'additionality' would not be a good measure to determine credits (FEARNSIDE, 2008b).

Another reason to explain the absence of REDD in the Kyoto Protocol is the argument that this programme would allow developed countries to continue their emissions at the usual rate rather than making structural changes in the way they live their lives. There are also political reasons. Not all countries with tropical forests, which are all in developing nations, were in favour of REDD. Within the Kyoto framework, only developed nations have targets. Some developing countries did not think it was worth setting up this strategy, although it would generate revenue, as it would also impose restrictions. This scenario is changing. Countries like Brazil are big polluters due to deforestation. And countries like the USA always stand on the argument that developing countries are enhancing their emissions exponentially, therefore they also need targets.

REDD proposals have been present in the international arena for a few years. Even during the discussions for the Kyoto Protocol in 2001, reduction of emissions from deforestation was present. The methodological difficulties, together with the uncertainties, were used as arguments to leave REDD out of the Protocol. In the following years, international institutions and government agencies started paying more attention and conducting researches on REDD. In 2005 at the COP 11 the Coalition for Rainforest Nations presented a proposal for GHG emission reductions from deforestation (GRIFFITHS, 2009). Scientists and NGOs also voiced their belief that such reductions should be part of the Kyoto Protocol. The outcome of this pressure was that the COP 11 asked the Subsidiary Body for Scientific and Technological Advice (SBSTA) to analyse the issue and report back at the COP13 in 2007. Between 2006 and 2007 two meetings on REDD were organised by the UNFCCC.

Brazil played an important role in the popularity of REDD. The country, which is against market-based REDD programmes, presented its own REDD proposal – which was fund-based – during a workshop of the SBSTA in 2007. However, discussions on conservation of tropical forest to avoid deforestation have been on the table since the discussion of the Kyoto Protocol in 1997. At that time Brazil was against the inclusion of such mechanisms (MAY & MILLIKAN, 2010). In 2003 Brazilian environmentalists presented a proposal of a 'compensated reduction' mechanism and in 2006, before the COP 12 in Nairobi, the Brazilian government presented a proposal for the creation of positive incentives for the reduction of deforestation emissions on a voluntary basis in developing countries. The government made it clear that these should not be used by Annex I countries to reach their targets, rather it should be seen as additional reductions.

In the beginning of 2007, the Stern Review was released. The review advocated that avoided deforestation should be included in the post-2012 accord, but it stressed that measures to tackle deforestation should be implemented from now onwards. The COP 13 was held in Bali in 2007. There the idea of including forests in the international climate regime moved forward. In the final document of the Conference, the Bali Action Plan, the parties decided that the actions that aimed at climate change mitigation would include reduction of emissions from deforestation and forest degradation (GRIFFITHS, 2009). In September of 2008 the UN-REDD agency, a cooperation between three UN agencies – FAO, UNEP and UNDP, was set up. In December 2008 the Brazilian

government published the National Climate Change Plan (in Portuguese PNMC[193]) just before the COP 14 in Poznan. In June 2009 the governors of the 9 states of the Brazilian Amazon basin signed a letter to President of Brazil Lula in support of the zero deforestation target and, of course, asking for Federal support in the implementation of market-based REDD mechanisms. In the letter, the governors asked for the set up of an institution at the federal sphere to prepare and implement a system at the national level of emissions reduction.

The name of the programme has evolved through time. First it was called RED – reduction of emissions from deforestation. Later, another D was added to represent forest degradation. In 2009, at the meeting of the Ad Hoc Working Group on Long-term Cooperative Action, the chair of the meeting chose to use REDD+, which has since then been used as the official definition of REDD. The plus sign refers to the sustainable forest management and the increase of carbon stocks in the forest (GRIFFITHS, 2009; IDESAM, 2010). In the COP meetings in Poznan and Copenhagen REDD discussions evolved and negotiations have taken place regarding the language and the structure of such proposals. There are, however, still many points open to discussion[194].

Within the political dimension, one issue that deserves attention is sovereignty. The establishment of the REDD implies that, although the owner of the land will maintain its rights, the decision of what to do with the land would no longer be his. The international pressure for cutting down deforestation in the Amazon is seen with caution internally in Brazil, for example, as it raises issues regarding sovereignty and clashes with economic and political national interests (LAHSEN, 2009). Developing nations are concerned about how this would affect their sovereign power over their forest resources (PESKETT et al, 2008). REDD also involves high risks. For the credits to be validated, the emission reduction would have to be long-term. However, how can one guarantee that the emissions will not happen? What would happen in the case of a fire, for example? And how could the owner and the buyer of the credits be sure that there will be no leakage[195],

[193] It is important to notice that there is the National Plan for Climate Change but there is also the National Policy for Climate Change, which was sanctioned on the 29th of December 2009.

[194] The COP in Cancun was positive for REDD+.

[195] Leakage can be either within a country or between countries. Leakage within a country would be easier to deal with as the increase in deforestation rates would affect the total country rate. Leakage between countries, however, is a different issue. Who would be held responsible for the leakage? How to determine that the deforestation is actually leakage and not just a trend that would happen regardless of the REDD

when the deforestation that would take place ends up happening but in another location, therefore not diminishing deforestation, just changing its location? It is important to notice, however, that in the long-term, the demand for land and pressure to change the land-use will not be the same as it is now. The global demand for food, for example, will add pressure and increase the likelihood that REDD programmes will move to low-biomass ecosystems (STICKLER, 2009). Conservation measures are more focused towards high-biomass ecosystems, but these are not necessarily more biodiverse. Therefore, the use of low-biomass ecosystems to produce whatever was being produced in high-biomass ecosystems had to change, but this might have devastating impacts.

A second potential threat of REDD is monocultures replacing native ecosystems (STICKLER et al, 2009), as some trees hold more carbon than others. For example, eucalyptus species hold more carbon than natural savannas. These trees maximize carbon sequestration, but have negative impact on biodiversity (FARLEY & CONSTANZA, 2010), affecting the provision of other services. In Brazil there is already a case of cerrado and savannas being replaced by these species to gain carbon credits (STICKLER, 2009).

In a strictly business transaction, issues regarding the impact on biodiversity and on the livelihoods of those who live in the forest are not a concern of the buyer. Nonetheless, the carbon market is part of a structure developed to diminish or stop the greenhouse gas emissions to reduce climate change. Therefore, at least in its roots, this is not just another business transaction.

Different from other lowering emissions programmes, REDD is not the product of an economic activity, it is the activity itself. Therefore, the incentives not to change the economic production from one location to another have to be high. Where deforestation is driven by demand, i.e. commodities of forest products, leakage has a 100% chance of happening (DAVIET, 2007). But within the economics of REDD there are also other issues that deserve attention. What will happen if there is too much offer of credits and the price of carbon in the market goes down? Would farmers be punished for changing their mind? How long would the payment last? Would the price be fixed[196]? Paying for

programme in a neighbouring country? How would this affect the country's participation in REDD? These questions need to be answered.

[196] The carbon market is growing at an incredibly fast speed and it encompassed US$125 billion in 2008 (Stickler et al 2009: 2804). This amount contrasts dramatically with the amount of money allocated to

avoided deforestation or degradation has an impact on the incentive to do so. If the reason not to degrade becomes solely financial, the relationship between humans and nature will be un-naturalized.

The feasibility of REDD will be highly determined by costs. The landowner will only switch to REDD programmes if the cost-benefit equation is financially worth it. If a person will not get at least the same amount for taking part in a REDD programme than he/she would otherwise, he/she will not consider it as a feasible possibility. Different models have different measuring methods, which consequently lead to different prices. In addition, different places with distinct realities have different thresholds regarding the price that will be needed to make the transaction from one land-use method to the other. A study conducted by Borner and Wunder illustrates this point (BORNER et WUNDER, 2008). In the state of Mato Grosso do Sul in the Brazilian Amazon, the cost of the CO_2 ton that would prevent deforestation, the 'choke price', is US$12.34. In the same region but in another state, Amazonas, the price is US$3.24197. With this in mind, are we to assume that most of the projects would be implemented in the state of Amazonas, where the cost for the buyer would be cheaper and the result would be the same?

Still on the issue of costs, there is also the cost of transaction, i.e. the costs to prepare whatever needs to be prepared for the beginning of the programme and the costs to maintain, which are reocurrent costs (BOND et al, 2009). There are few studies that analyse this part of the REDD scheme. Establishing these costs is important to determine not only the viability to start the programme but also how likely it is to continue in the long-term, which is the aim of any REDD programme. For Clean Development Mechanism (CDM) projects, for example, transaction costs are really high, which undermines their viability, particularly in communities with small projects (RICHARDS & JENKINS, 2007).

REDD is defended as one of the cheapest options to mitigate carbon (CORBERA, ESTRADA, BROWN, 2010). A study conducted by Mckinsey and Company argued that

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international conservation: <US$1billion per year on average in the 1990s. In the beginning of the 2000-2010, the amount decreased even further. The carbon market is projected to increase up to US$600 billion by 2013.

[197] The price difference reflects the differences land-uses in the region. In the state of Mato Grosso do Sul deforestation rates are higher than in the state of Amazonas.

15 Gt of CO_2 could be mitigated per year at zero cost or even negative cost through measures, such as energy efficiency. In the same line of thinking, restoration of degraded land could be cheaper than the high costs of preparing for REDD programmes[198].

REDD is criticized by the focus on a single ecosystem service and for the fact that non-carbon services, as well as social issues, will be neglected (STICKLER et al 2009; DAVIET et al 2007). Climate regulation is indeed an important service provided by ecosystems. Nonetheless, it is not the only service upon which our lives depend on. The provision of food and medicine for the entire world are also high-value services. By focusing only on the carbon storage service, there is the risk that the others will be undermined. In addition, the implementation of REDD programmes could easily incentive states to restrict the access of people to forests (LAWLOR & HUBERMANN, 2009). It is also important to notice that little is known about the links between the services, and about how the provision of one service affects the availability and the provision of other services in the long-term (NORGAARD, 2010).

Some countries defend the inclusion of conservation measures within the REDD scope (CORBERA, ESTRADA, BROWN, 2010). Countries like India and Costa Rica are openly in favour of this idea. However, this is not a unique view. Countries like Brazil and the European Union have been against it, as they believe this would halter the incentives for countries to invest in new ideas to cut down their emissions (LAHSEN, 2009), and it would create 'hot air' for REDD credits as the emissions would not take place in the first place.

This section focused on the topic of the moment regarding tropical forests, REDD. The next section will focus on the main issues around the feasibility of reduction of emissions of deforestation and degradation that need to be addressed.

[198] This argument challenges the idea that there will be a flood in carbon offer in the future due to REDD programmes, which would in turn bring the price of the carbon down, damaging its efficiency. These issues reflect the failure of the Kyoto Protocol, that first designed the commitments for reduction, which is the demand, and then designed the offer of activities that would be eligible to meet them (Corbera, Estrada, Brown 2010). The offer and the demand were not in sink and no one really knew how much carbon credits could be generated, which affects the carbon price in the market.

Unresolved issues

The post-Kyoto agreement and the reduction of emissions from deforestation and degradation are dominating the climate change debate and the role of the Amazon. This section will address some of the issues that still cast doubt on the success of such programmes in the Amazon rainforest. Here I will focus on four of them: institutions, drivers of deforestation, who will benefit from these programmes, and property rights.

The lack of suitable institutional framework is, in most cases, the main obstacle (BORNER et al, 2010), imposing serious restrictions to the implementation of PES for reduction of emissions from deforestation and degradation in a large scale (BORNER et al, 2010). This is also true in the Brazilian context. It is the institutional conditions that will determine the capacity of a government to secure PES in an effective manner, as well the capacity to monitor and enforce that is related to these schemes. Institutions are also responsible for the property rights situation, not only enforcing them but also regardingthe acquisition of land titles.

The payment for ecosystem services entails the passing of information from ecologists to markets. The information towards more integrative governance, however, stays in the second plan. The market regulates itself, making institutions a secondary element within its framework (NORGAARD, 2010). The cap-and-trade system of carbon management is based on the assumption that we can monitor and manage the carbon stocks that exist as well as invest in a new one. This assumption is embedded in the stock flow approach to nature that trusts that the market can solve environmental issues despite the institutional context. The Coasen approach towards PES sees the role of institutions as secondary (MURANDIAN et al, 2010), as the assignment of property rights is seen as the key element in defining efficiency. New institutions are in fact being designed under the UN umbrella, but it is important to point out that they do not take into account the history of institutional failure in halting tropical deforestation. The ability to both manage and monitor are subject to the institutional framework in place. Therefore, one discussion is implicit in the other.

Institutions are present within a given governance. Traditional institutions are not well-prepared to address the issues raised by global transformations (CORBERA & SCHROEDER, 2010). This governance has to go beyond national boundaries and it highlights systems that are interrelated and integrated, with formal and informal rules,

rule-making and actor networks in all the levels of governance that are designed to guide society in the prevention, mitigation and adaptation to both local and global environmental change. Governance in this new context, therefore, refers to:

"forms of sterring that are less hierarchical than traditional governmental policy-making (even though most modern governance arrangements will also include some degree of hierarchy), rather de-centralised, open to self-organization, and inclusive of non-state actors that range from industry and non-governmental organizations to scientists, indigenous communities, city governments and international organisations" (BIERMANN et al 2009: 4*).*

Regarding governance, there are three dimensions that encompass ecosystem services (VATN, 2010). The first one regards the normative side of coordination, such as the distribution of rights and the dynamic between the agents. The second dimension concerns technical issues, such as transactions costs. The third refers to the motivations that are supported by PES schemes. These three need to be aligned for the scheme to be efficient. This is possible through a well-defined governance structure.

Deforestation and land degradation are more prominent in countries with weak governance structure (RICHARDS & JENKINS, 2007). This situation would have to change for the implementation of REDD programmes, as this would require institutions to be well-functioning. But changing could be harder than it seems. Deforestation has been a problem for a long time and still no government efforts, led by the institutions in place, were able to solve this issue. Why would this time be any different? How would governments achieve now what they have been trying to achieve for many years? Deforestation and land degradation also represent further challenges, as their drivers are specific to local contexts, as well as the innumerable norms and policies in place in different countries and regions and at different levels of governance.

The implementation of REDD schemes may also lead to undesirable outcomes. REDD programmes aim to increase the value of standing forest. This, however could represent an increase in the incentives for governments to either maintain their central role over forest governance or to re-centralise in order to gain control over the trade of carbon credits (SANDBROOK et al, 2010). Payment for reduction of emissions from deforestation and forest degradation could lead government bodies to go back to old-dated centralised models of conservation, as well as work in partnership with

international institutions in the search of funding for carbon storage. Past experiences have demonstrated that such governance design has not been effective in maintaining forests sustainably. REDD therefore creates a paradox: the implementation of such programmes could stimulate governments to go back to past models. In addition, in states with a weak governance system with a low level of accountability, the implementation of REDD could lead to an increase in corruption. In these circumstances, REDD programmes, rather than stimulating forest conservation and having a positive effect in the livelihoods of those who live in the forest, will have a negative impact[199].

The Brazilian context also has singularities. It is important to notice that, according to the environmental legislation, private landowners have to maintain 80% of their property as natural or managed forests. Although compliance is not strict and neither is enforcement, to compensate farmers for not deforesting does not fit in with the additionally criteria, as the land should be maintained as forest in the first place. In the same line of thinking, indigenous groups, users of sustainable land use as well as land-reform settlements would not be entitled to take part as this would mean that they are being paid[200] to do what they are required to do by law (BORNER et al, 2010).

The governance system in place in the Amazon rainforest has not succeeded in protecting either the people or the ecosystems (BOYD, 2008). The international demand for resources from the forest plays an important role, but it is the inefficiency of the government to enforce policies that sets the tone for the failure in conservation measures. Both federal and state governments have failed in this[201]. This issue has been present within Brazilian policy for the past four decades and it is a consequence of the consecutive programmes to integrate the forest into the national economy. This policy objective focused on the natural resources that the forest had to offer for economic development, not taking into account the need to protect its biodiversity as

[199] This issue is intimately linked to the payment of REDD programmes.

[200] The answer to the question 'paid by whom' depends on the time of programme finance, but it would either be the government itself or another actor who is in charge of the programme.

[201] This statement might seem out of place when we look at the state of Amazonas, which has 98% of its area undisturbed. This is because most of the population in that state lives in the capital, Manaus, an urban city in the middle of the Forest that has all the problems of an urban city: lack of sanitation, planning, violence and so on. Although the Forest in undistubed, could anyone that has been to Manaus say that this is model of sustainable development for the region? The difference between the states within the legal Amazon highlight a point made earlier, that of the many AmazonS with the Forest. But, yes, the fact that the state of Amazonas has most of its area undistubed does not compromise the argument above.

well as attend the needs of the local communities. This is true for government projects in the 1970s as well as for more recent projects, such as *Avança Brasil* (2000-2003). The institutions developed in the past four decades were created to help implement these policies. These institutions, therefore, do not have enough mechanisms to counter-act the drivers of deforestation (BOND, 2008) as their goal was to create an environment that triggered deforestation. Governments have now created institutions with the objective of stimulating the sustainable development of forests.

It is important to notice that, since 2005, deforestation in the forest has been going down. This decline backs up the government's argument that deforestation in under control (MAY & MILLIKAN, 2010). It is also important to notice that in recent years there was an increase in protected areas and it was estimated that this increase is actually responsible for 37% of the deforestation reduction between 2004 and 2008 (MAY & MILLIKAN, 2010). Between 2004 and 2005 new protected areas encompassing 240000km^2 were created by the Brazilian Government (CGEE, 2011). Even with the incredible decrease in deforestation rate in the past years, Brazil is still on the top of the list of countries with high rates of destruction (CGEE, 2011). Needless to say that the maintainance of the low deforestation rate will depend upon the redefinition of the development model in region (CGEE, 2011)[202]. In addition, the construction of massive dams and other mega-development projects in the region demonstrate that, although the scenario is different, the forest is still seen as a source of resources for development.

In 2005 Brazil experienced a severe drought that heavily affected the Amazon. It was the worse drought in three decades and the dry conditions favoured the spread of fires. The damage caused by them was seen over 300.000 hectares of the forest and more than 400.000 people were affected by the smoke (BOYD, 2008). The region was declared in state of emergency and the army was called to help in the distribution of water and medicines for those in isolated areas. The chaotic situation led the state of Acre to create a 'situation room' with a group of different people all working to identify the fires and inform their location as quickly as possible to the authorities. This response demonstrates that it is possible to have such a governance system. The question is if that can be institutionalised.

[202] The prices of the international commodies, such as meat and soy, have gone down. How much will deforestation rise when the prices goes up is a disputed issue.

Also in 2005, the Brazilian government set in motion an institutional change. The past decades made evident the modest implementation of forest laws (BAUCH et al, 2009). A revision of the laws in place was carried out and it combined dialogues between all the actors involved[203]. Until the beginning of the 2000s, national forestry in Brazil was under the responsibility of IBAMA (Brazilian Institute of the Environment and Renewable Natural Resources – in Portuguese IBAMA), apart from indigenous reserves, which were under the auspices of FUNAI (Brazilian Foundation for Indians). IBAMA was created in 1989 and is located within the Ministry of the Environment and its main objective was to both protect and regulate the environment sector, as well as the fishery, forestry and rubber. Due to lack of resources, however, together with the lack of preparedness from the Institute staff, IBAMA was not able to secure the protection of the natural resources of the Amazon rainforest.

The law No 11.284 from the 2nd of March 2006 and the decree No. 6.063 from the 20th of March 2007 created the Brazilian Forestry Service (SBF), with the responsibility to manage areas designated for production in federal areas. The SBF then evolved[204] to become the Chico Mendes Institute for Biodiversity Conservation (ICMbio), which represents a division within IBAMA. ICMbio has authority over all protected areas. There was also a process of decentralisation of IBAMA, which was specified in the Law No. 11.284 of 2006, with some of the responsibilities of the Institute being handed over to state and municipal governments. This process, however, did not come short of critics, as many municipal governments did not have the capacity to enforce the laws (BAUCH et al, 2009). In addition, the conditions of lack of resources that were an issue with IBAMA, are still an issue now. Despite the reforms that took place, the inefficiency that was seen before still exists. The forest continues to be the target of policies that rather than protect the forest, stimulate or at least allows the unsustainable use of its forests. One example is the MP[205] No. 459 of 2009, which, according to its critiques, established pathways to legally regulate illegal occupation (BRITO & BARRETO, 2010). The Public Ministry turned to the Law No. 11.952 from 2009, which maintained the same facilities. This illustrates the weak and incoherent quality of the institutional framework for the

[203] The dialogues did take place, but the extent to which they were done in a inclusive matter is disputed.

[204] Temporary measure No. 366 from the 26th of April 2007 and Law No. 11.516.

[205] MP is Provisional Measure, which is not yet a Law in Constitutional terms, as it was not discussed by the legislative. However, it is adopted and can be implemented.

Amazon rainforest. In the context of PES and REDD, some changes will have to be made in order not only to strengthen institutions, but also to eliminate the contradictory nature of the policies towards the forest.

A governance framework with institutions with clear roles and transparency is important. The legitimacy of the decisions of environmental institutions has to be acquired. There has to be a balance between environmental governance and market (NORGAARD, 2010). REDD+ is environmental governance in the making (CORBERA & SCHROEDER, 2010). The dialogue and understanding between the different actors, such as the scholarly community, policy-makers and the public has to be increased.

When looking at the past CDM projects in Brazil, most of them have focused on landfill and energy projects. Only two projects on afforestation and reforestation were approved[206]. This indicates the lack of experience of the country in elaborating forest projects on emissions reduction (MAY & MILLIKAN, 2010). At the national level, in 2010 a Congress bill was introduced to allow private landowners to take part in carbon credits from avoided deforestation. At the state level, some states have already approved laws regarding climate change, such as the state of Amazonas with the Climate Change Law number 3135 of 2007, which allows the REDD projects to take place nationally as well as it allows for payment for environmental services. In September 2010, seven states of the Brazilian Amazon region had concluded their PPCDAMs[207] (MAY & MILLIKAN, 2010).

Having said that, it is important to highlight that there have been changes. The government effort to monitor the Amazon with INPE and the PRODES with information available to all is a milestone. Another effort that must be stressed was the Sustainable Amazon Programme, which has the aim to implement another development model in the region based on the valorisation of its natural and socio-cultural heritage[208]. Mangabeira Unger, the minister responsible for the programme, believed that land regularisation

[206] Both outside the Amazon.

[207] PPCDAM is the acronym in Portuguese of the Plan of Action for the Prevention and Control of Deforestation in the Legal Amazon. The Plan emerged as an answer of the federal government to the increase rate of deforestation registred in the early 2000s. The PPCDAM was launched in 2004. The Plan is in its second phase (2009-2011).

[208] http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=59&idMenu=3155 Accessed on the 30th of October 2011.

should receive high priority if sustainable development was going to be reached in the Amazon (PRADO, 2008). A slow movement towards using the sustainable development approach can be identified in the forest. And in this aspect, the archaeological research that lead to evidence of patterns of land use that are less destructive than those employed lately (HECKENBERGER, 2005). In addition, it was in the late 1980s and 1990s that alternative practices to forest use became more widely known. There have been a number of proposals that aim to encourage conservation, such as the ecological value-added tax, the ecological income tax, the rural land tax, the environmental compensation fund, support for extractivism, amongst others. All these initiatives have suffered fallbacks and the fact that they were even put forward demonstrates that there is some space for change.

Deforestation is another issue that is contentious. To tackle deforestation effectively it is important to tackle its drivers, which are not necessarily the same in all places. Drivers can be either national or international. Global forces modify the local factors that establish land use at the local scale (LAMBIN, et al, 2001). Forests are cleared for cattle[209], for logging and for soy production. These are commodities in the international market. If the demand for these products does not change, the supply will change location but it will keep the pace[210]. A simple establishment of REDD programmes will not change the demand for these commodities. The economic incentive for deforestation will still exist. This is the case for both the international and the national market. Forests are cleared because people gain money from it. The financial return can be high or low, depending on the land-use. Plus, to be effective, REDD schemes have to offset the incentives to deforest. It is important to understand the complex relationship between supply and demand of forest products, which is not featured in simple PES models. This point highlights the need for a well-defined governance system for REDD, which will address not only the issues at the local, but also at the international sphere. If the latter is not taken into account during the formulation process of REDD governance, which will tackle the international drivers of deforestation, REDD programmes will not be effective.

[209] Cattle has been the main driver of deforestation and it accounts for about 75% of the area deforested (Barreto & Silva 2010: 3).

[210] One could argue that that is the case unless REDD affects the price of the commodities. It is important to remember, however, that there are many illegal enterprises that work with wood and meat.

One aspect that hampers the effectiveness or even the elaboration of actions to tackle deforestation is the lack of an accurate land title record. According to the Forest Code of 1965 the owner of a property is allowed to use 20% of its land. As there is no information as to who owns how much of land, there is no way of knowing if the current deforestation is legal[211].

It is important to notice, however, that deforestation in tropical countries is not just a matter restricted to forestry. It is related to land use, because the causes of deforestation come from outside the forestry sector or the political scope of environmental government agencies (CORBERA, ESTRADA, BROWN, 2010). The causes for deforestation are multi-fold and are a combination of direct, indirect, underlying causes, together with other factors, which involve different stakeholders, such as community groups, development projects, individuals, government agencies, and etc. In Brazil, for example, to have a broad picture of the drivers of deforestation, one would have to look at the price of commodities in the international markets, the exchange rates of the Brazilian real to the American dollar, government development plans, land title issues across the country, bank loan plans, among others. This means that addressing the issue simply by implementing PES schemes throughout the forest are not likely to go to the roots of the problems. A multi-fold problem requires a multi-fold solution.

Deforestation has been researched for the past four decades, but still some actors seem to misunderstand the drivers of deforestation. There is a tendency of governments to blame shifting cultivation for degradation and deforestation (GRIFFITHS, 2009). Looking at nine REDD programmes studied by Forest Peoples Programme (FPP) and Forests and the European Union Resouce Network (FERN)[212], eight of them (Panama, Guyana, Paraguay, Democratic Republic of Congo, Liberia, Ghana, Lao PDR, Vietnam) recognized 'traditional' or 'shifting' agriculture as one of the most important causes of forest loss.

Throughout the last decade, one can identify two drivers of deforestation in the Brazilian rainforest (RUDEL et al, 2009). First of all, there is a clear pattern before 1990, when

[211] Now the rate of deforestation decreased mainly in large areas. Deforestation in small areas remain roughly the same, but its share in the total amount of deforestation has increased due to the decreased of large scale deforestation.

[212] Dutch non-profit organisation.

small farmers were the main drivers of deforestation. The building of roads promoted by the colonisation programmes of the government opened the way to new regions for exploitation. Land occupation occurred by these roads and, reviewed from above, it created a pattern that resembles a fishbone. In Brazil, one phrase that represents this time is that the government would bring "the people without land" (especially from the Northeast of Brazil) to the "land without people" (the Amazon region). In the 1970s, the construction of the Transamazon road boosted migration from other regions, in particular from the Northeast of Brazil. In the 1980s, the building of the BR-364 eased the movement from the state of Paraná (in the South of the Country) to Rondônia (FEARNSIDE, 2008). Some of these migrants were colonists, who were placed on official settlements, and others were squatters, who claimed land as their own[213].

The second trend is post-1990. After this period, researchers identified agribusiness as the main driver of deforestation in the region. The programmes that took place in the 1970s up to late 1980s that focused on small-farm holders were no longer in place. Government programmes in the 1990s, such as Avança Brasil (Fernando Henrique Cardoso's Government) were driven by the private sector[214]. The increase in the participation of private enterprises fuelled the export of forestry products[215]. The patches of disturbance also changed from fishbone deforestation to large patch areas[216].

Since 2005 a different trend is being identified in the rate of deforestation in the Amazon. After reaching a high level in 2004, from 2005 until 2009 the rate went down (NEPSTAD et al 2009). The average rate of deforestation from 1996 to 2005 was 19.500 km^2/year. The decrease in deforestation in the subsequent years served as an incentive for the Government to agree to reduce deforestation by 20% of its historical rate (1996-2005) (NEPSTAD et al 2010). Between July 2005 and July 2009, deforestation declined by 36% in relation to its historical rate. The reason for this decline lies not only in the

[213] Inter-regional migration movements are now more prominent then migration between regions.

[214] That is not to say that small-holders did not benefit from the programmes. The drive of the programme came from the private sector.

[215] Another factor that can account for the decrease in the participation of small-holder farmers in the deforestation of the Amazon is urbanisation. Rather than going to North region of the country to search for land, more and more people are going to urban cities.

[216] The correlation between food production and deforestation in the Amazon no longer exists. This is a recent event, which reflects the changes that occurred in the past five years. Despite the increase in production, in 2007-2008 deforestation went down and it was almost 75% below the rate of 2004 (Tollefson, 2010: 554). This is important as we try to understand the drivers of deforestation in the forest.

increase of protected areas (from 1.26 to 1.82 million km^2) and in public campaigns to cancel credit for land holders that were illegal, but also in the retraction of the soy and cattle industry, therefore lowering the incentive to clear land. It is also important to highlight that the Brazilian currency is stronger against the US dollar and therefore the exchange is not as favourable as it was before 2006 (FEARNSIDE, 2009). The currency exchange, which diminished the revenue of the farmer, represents a decrease in the incentive to deforest[217].

It is important to stress the role of banks in deforestation (TOLLEFSON, 2010). Subsidies have been an important incentive in the deforestation of the forest. In the 1970s and 1980s, the Superintendency for the Development of Amazonia (in Portuguese SUDAM) provided money for cattle ranchers (FEARNSIDE, 2008)[218]. Other institutions, such as the Amazonia Bank (in Portuguese BASA) and the National Programme for Strengthening Family Agriculture (PRONAF) also provided loans that triggered deforestation.

Studies have shown that most of the forest conversion in Brazil has low return per hectare. This means that production is not very efficient and the revenue gain could be compensated through REDD (BORNER et al 2010). This point stresses the fact that REDD programmes could be successful in the region from a strictly financial point of view.

The drivers of deforestation, be they national or international, cannot be overlooked when setting up REDD. Without addressing the causes of deforestation, REDD programmes will probably generate leakage. This means that REDD has to be a part of a bigger framework for the Amazon, that will tackle the incentives to deforest, the institutional flaws that incentive and allow it, as well as monitoring its effectiveness.

Within the REDD debate, another question that needs to be addressed is: who will benefit from it? This question is intimately linked to another: what is the essence of REDD programmes? If the focus of REDD schemes is solely to reduce greenhouse

[217] It is important to highlight that there was great pressure in the meat packing industry in Brazil, which could have had an impact in the rate of deforestation. One should not forget, however, that one third of Brazilian slaughter houses were clandestine (Barreto & Silva, 2010: 15).

[218] The tax breaks inserted in the loans from SUDAM persist to this day, although they ended in mid-1990s (Fearnside 2008: 11).

gases emissions, then the people that will benefit from it will be those who can fit themselves within this framework. If, however, the focus of such schemes is to, as well as reducing emissions, reduce poverty having a broader sustainable approach, then the poor will also benefit. These forests are amongst the poorest regions of the world[219].

The source of funding will also have an impact on the inclusion or not of poverty reduction and equity (BROWN, SEYMOUR, PESKETT, 2008). Funding could either be market or fund-based[220]. The former has two main restrictions. Firstly, it is unlikely that this will encompass the public goods aspects of REDD, which includes the work that needs to be done before its implementation. This is because being prepared for REDD programmes implies changes that go from the monitoring capacity to the development and/or reform of institutions, which will require extensive work and is more likely to be left out. The second restriction refers to the fact that market-based funds could probably be unevenly distributed between developing countries. Those who have a more structured and mature legal framework will definitely be preferred. Where governance structure is blurry, there is no guarantee that the projects will be maintained. This would favour emerging countries, such as China and Brazil, leaving other developing countries with little opportunity to participate in REDD.

Fund-based financed programmes have a different spectrum. In the short and long-term it is more likely to benefit poverty reduction. This is because the funding is not tied to a market and because these are related to development agenda. This is in principle, of course. It is important to notice, however, that fund-based finances may not be as efficient as a market financed programme, as it weakens the link between performance and payment and could, therefore, reproduce the mistakes of traditional forest aid programmes (BROWN, SEYMOUR, PESKETT 2008).

The marked-based approach was put forward by Papua Guinea and Costa Rica in 2005 at the Montreal meeting (HUMPHREYS, 2008). Developing countries would create carbon credits through avoiding deforestation and these could be sold to those countries

[219] It is important to notice that, while being the home to very poor people, these forests are also the home for rich land owners, who have large property and incomes. The gain that these people have in selling their products, be that nationally or internationally, have not been spread out through the region.

[220] Some public funds have already been established to support REDD activities, such as the World Carbon Forest Carbon Partnership Facility, which was established in 2007.

that have targets (Annex I). The fund-based approach, supported by Brazil[221], based upon voluntary deforestation targets as well as donations, is gaining space within the international arena. The government of Ecuador and of Guyana made declarations in 2007 that they would protect their forests if there was money to do so[222]. Indigenous people have criticised projects that adopt the market-based approach, as they believe it will privilege global and national control over the forest (HUMPHREYS, 2008). They also stress that distribution of the benefits is an issue and the social values of the forest, as well as other environmental values besides carbon storage, will be left out. In addition, many actors – such as environmental and development NGOs – do not support REDD programmes that are based on the market approach as they believe that this will shift the focus on reduction emissions of GHG gases as whole through structural changes to the carbon market, which would allow developed countries to continue to emit as they do now (GRIFFITHS, 2009). Therefore, REDD reduction emissions would be additional to rather than move the focus from emissions reductions from Annex I countries.

The Amazon Fund was created in 2008 with the Decree 6.527, signed by President Lula (2003-2010). The Fund received US$110 million from Norway and it is expected that it will receive more contributions from other 12 countries. The aim of the Fund is to realise actions for reducing deforestation on a voluntary basis (MAY & MILLIKAN, 2010). The first projects were approved in 2009 so Brazil could present the projects in the Copenhaguen Conference of the Parties. Since then, changes were made and the Fund operates not without criticisms. It can be argued that the fund was created as a response to the international pressure for Brazil to take action. It is important to remember that the Fund was created during a difficult moment regarding the environment in 2008, with Marina da Silva leaving the Environment Ministry and the arrival of Carlos Minc to replace her. The Fund was also created before the National Climate Change Plan, which demonstrates a slight disarticulation between the elaboration of the Fund and the Brazilian strategy regarding climate change[223].

[221] Brazil has its on interests in supporting the fund-based approach, as it is expected that the country will be one of its most beneficiaries.

[222] The president of Ecuador, Rafael Correa, referred to the international community as a whole. The government of Guyana was referring to the British government.

[223] The Fund was created in August of 2008 and the Plan was launched in December of the same year.

REDD concerns the deforestation and degradation in forests. Basic definitions could be adopted internationally, but also national understandings of what forest is will play a role. For the poor this is specially a concern because some non-forestry categories, such as agroforestry, can play an important role in food security, but might not be eligible for REDD (PESKETT et al, 2008) as it is not avoided deforestation. Thus, what is meant by forest is crucial for the definition of who is eligible to participate in such programmes. In addition, the inclusion of degradation will broaden the scope of the application of these programmes[224]. Narrowing the definition could have negative effects, favouring logging companies, for example, for the high carbon content of trees. NGOs that work within the forest stress that there are problems with national as well as international definitions of 'forest' (GRIFFITHS, 2009). They argue that such definition allows the distortion of statistics and rates of forest cover. Unless there is a revision of 'forest' definition, REDD programmes will be inconsistent in its theoretical framework.

The governance structure of REDD programmes has two sides, the international and the national. The international will define its broad scope. However, the extent to which it will have poverty reduction considerations and how the benefits will be distributed is very much defined by the national governance framework (BROWN, SEYMOUR, PESKETT, 2008). The local characteristics are best known and should be addressed by the national framework. Consequently, it is vital that countries have a well-established governance structure in place. For REDD to have a positive impact on poverty reduction, it has to be aligned with other policies towards development and inclusion, which involves education, economic development, health and etc.

If REDD is implemented based on the baseline reference, which is determined through looking at historical trends, only countries and land owners that have been condemned by their activities would be contemplated. In order words, those who deforested the most would benefit more. Within this line of thinking one could argue that PES should prioritise the most degraded farms or land owners, therefore rewarding those that polluted the

[224] A forest can be degraded for decades and not be totally deforested. Thus, tackling deforestation will not necessarily tackle degradation. Degradation is, as defined by the IPCC (IPCC 2003: 14) is the long-term loss of at least y% of forest carbon stocks (and forest values) since that is directly human induced by a certain amount of time and not be deforestation (Murdiyarso et al 2008: 100). The activities that lead to degradation are: selective logging, large-scale and open forest fires, collecting non-timber forest products as well as wood for fuel, shifting cultivation, producing charcoal, grazing and sub-canopy fires. Degradation, however, is harder to define, as well as monitor and verify than deforestation.

most. For example, landowners who deforested their land in Brazil would be eligible for credits, while landowners in Costa Rica, who conserved the green in their land, would not. This raises serious questions regarding the feasibility of this scheme (VAN HECKEN & BASTIAENSEN, 2010). This situation would create winners and losers within the REDD framework, the losers being those who in fact did more in terms of protection and conservation. The message sent would be quite disturbing as those who have been reprehended for deforesting would gain from this new scenario.

REDD programmes that focus only in the reduction of deforestation based on national rates are likely not to attract all countries for three reasons (DAVIET, 2007). First of al, the economic and political costs in the short term might be too high for some countries at the national level. Secondly, REDD at national level can reduce the rate of deforestation, but it won't necessarily stop forest loss. Thirdly, the issue of equity – between but also within countries - arises. The problem of leakage and additionality will also have to be considered within the national framework. If national policies benefit landowners who have deforested their land in the past, for example, how about those who manage to maintain the forest? And how about the indigenous population?

Coase theorem does not take into account equity issues (PASCUAL et al, 2010). This is because the basis for such policies is the fact that efficiency could be achieved regardless of the allocation of property rights. Equity issues are not a common topic within the PES literature. Neither is the inclusion of traditional and indigenous people. The PES literature focuses on the economics around the application of such schemes, leaving the people that live in the forest out of the debate. Even the definition of the term – a service provided by nature – carries the assumption of demand and supply. If the focus is solely economic, it is difficult to expect that PES schemes will address other issues – such as equity – let alone attempt to solve them.

If REDD programmes are to go beyond carbon mitigation, in other words, if such programmes will focus on improving the livelihoods of those from the forest, the mistakes of past projects need to be avoided. Programmes for sustainable forest management have not succeeded or have had weak performance, not reaching the desirable outcome (CORBERA, ESTRADA, BROWN, 2010). The reasons for this failure are also multi-fold but one point that deserves further attention is the cost-benefit of switching to such land use. For people to make the change and maintain it, the

profitability has to be higher or at least the same as the other land use. In addition, the lack of secure land rights is a major issue, which can lead to conflicts (ITTO, 2005). Land can have overlapping claims over it and the slowness of the legal resolution of the matter, in addition to the different uses that the claimers want to apply, can trigger conflicts. Moreover, the person with *de jure* and *de facto* rights has to be the same. The difference between the *de jure* and *de facto* rights over land makes programmes such as REDD impossible to be implemented.

The implementation of REDD programmes will not necessarily lay its benefits towards the communities. This argument was demonstrated in the experience carried out in Bolivia, in the Noel Kempff Mercado National Park Project (LAWLOR & HUBERMANN, 2009). State agencies, local governments as well as conservation agencies, rather than local communities, were the ones that received the benefits. In a study conducted by Borner et al (BORNER et al, 2010), large landowners would receive the absolute majority of the benefits. This is because they are responsible for 4/5 of deforestation in the region[225].

Equity and efficiency are not necessarily related. When looking at PES programmes, it is important to notice that the aim of being efficient – which would generate more revenue – would potentially change the power dynamics in place that shape access to resources, which would in turn have implications in equity (PASCUAL et al, 2010). Another point that needs to be highlighted is the fact that different places have different perceptions of what is fair. This has a direct impact in the legitimacy of decisions regarding the allocation of resources. Fairness criteria, as well as the meaning of equity and of what is just differ within cultural and social groups (PASCUAL et al, 2010). This means that each programme would have to be looked at individually at the local scale to address equity and to have a firm base for legitimacy within a given group. This, however, imposes barriers to the design of international set of rules for the implementation of such programmes.

The value of forest differs depending on the point of view of the actors (KOSOY & CORBERA, 2010) Setting the price of carbon will homogenise this value. For an indigenous community, for example, the price of carbon implies giving a monetary value to a divine forest being. For a logging company, depending on the price of carbon, the

[225] Between 2002 and 2006, properties above 20ha accounted for 80% of deforestation.

rate of production will fluctuate. For landowners, the price of the carbon will determine the type of land use. Assigning a monetary value to biodiversity might indeed help conservation. However, the imposition of a single value to measure nature can harm the understanding and of other values. The monetary value of biodiversity represents only a small fraction of its total value (KOSOY & CORBERA 2010).

REDD does not necessarily imply active forest management. To the extent that communities are paid not to deforest, these programmes do carry an implicit forest management proposal. An example in Mexico illustrates this point. The Mexican National Forestry Commission implemented a PES project, which gave money to the community so they would not deforest (CHATTERJEE, 2009). There was not a project of forest management involved, as only a piece of land was set aside for conservation. This, however, left the area prone to fire, pests and illegal logging. It was not until the Commission talked to the community and a contract was signed that the latter fenced the forest, kept cattle out of the conservation area and put firebreaks. This experience highlights the fact that the inclusion of the community is key for the overall success of the programme. Current forest management policies of many countries do take into account the role played by the forest in both maintaining societal adaptation strategies and in sustaining livelihoods in the new scenarios triggered by climate change (SEYMOUR, 2008).

For PES schemes to meet equity criteria, land regularisation as well as secure land rights have to be a pre-condition (GRIFFITHS, 2009). It is important to notice, however, that not everyone supports that PES programmes should focus on poverty alleviation as well as ecosystem services protection. Wunder (2008), for example, argues that poverty reduction is a significant side objective, but it should not be the main goal of PES.

Tropical forests are the home to the poorest dwellers (CHOMITZ et al, 2007). The diminishing of forests in developing countries has great impact on the livelihoods of people who depend on forest products and services (SUNDERLIN et al, 2005). Tropical forests shelter 60 million people, which means that social issues cannot be overlooked. In addition, transfers - be that of monetary nature or not - take place within a specific set of social relations, with specific values and perceptions (MURANDIAN et al, 2010). These will decide the conditions for PES as well as its outcome. It is the trust between the service providers and the government, the relationship between communities and

their governments and how the people within a community regard each other, all of these – which mirrors the social relations between a given community and its government – that will determine the outcome of the PES scheme.

There are three elements within the political dimension that deserve further attention (HUMPHREYS, 2008). First, forests are evoked as a sovereign national resource of the state where they are. This is explicit in the 1992 Forest Principles. Sovereignty is constantly evoked in international negotiations by developing countries. The second claim is that forests are a common good. This implies that all states, not just the ones that have the forest within their territory, and all people have a stake in them. This claim was highly rejected by developing nations and it has no legal base within international law. The third claim is that indigenous people, as well as local communities, have traditional land rights over the forests where they live. This implies that discussions of carbon sequestration and avoided deforestation that stay in the international arena between states from North and South, do not fully encompass those who have protected the forest and are the ones who will 'implement' REDD projects.

In the meeting leading to the Poznan COP (COP 14), indigenous people together with civil society emphasised the need for binding decisions of conference of the parties on rights as well as international obligations regarding human rights, sustainable development and the environment (GRIFFITHS, 2009). They stressed the discussions and decisions on REDD must be broadened to include the indigenous and local communities. Words such as 'need' and 'co-benefits', which are currently used, do not encompass the role these actors play and it is therefore not sufficient. Indigenous groups and NGOs are calling the parties to recognise their obligations in relation to the rights issue, as it has been done in other treaties, as in the Conference of Biodiversity (CBD). Despite the fact that the European Union has put forward in the COP 14 that any decision in that Conference should refer to indigenous people and other communities participation, no parties have proposed a specific language on rights. In addition, agencies that propose REDD programmes do seem to require countries with forests to meet human rights targets (GRIFFITHS, 2009).

The essence of REDD programmes will define who will actually benefit from it. Within a PES framework, equity and poverty reduction appear in the background. Therefore, if policy makers and REDD programmers want to include these issues as major themes,

this has to be made explicit by those who design the programmes so the people that implement it are fully aware of that.

For PES to achieve its aim, property rights need to be well defined. This encompasses two sets of rights: the right regarding the resource and the right of the landowner to determine what happens to the land (VATN, 2010). For PES to be established, property rights over the land need to be clear. This way, the owner can receive for the services that his land is providing. This is not so difficult with private land, but the story is different in common land, where land title is also less formal. In addition, poor people, as well as traditional land users may not have their land titles up to date with government agencies and therefore lack secure property rights (BOND et al, 2009). This means that it would be difficult for them to benefit from PES schemes and directly participate in them.

The property rights issue goes beyond the application of REDD. This is at the core of a more sustainable way to manage forests. Poor people and traditional users, such as indigenous people, are also those who encounter more difficulties in the acquisition of these property rights. To illustrate this point, in 2008 for example, 71 violent conflicts took place worldwide regarding the allocation of natural resources. Almost two thirds of it concerned property rights (WHITE et al, 2008). Most forest land is still owned, at least in paper, by tropical states (LAWLOR & HUBERMANN, 2009; BROWN, SEYMOUR, PESKETT, 2008). In addition, land rights in developing countries are covered by a lack of transparency.

Rights over land can be *de jure* or *de facto* rights. For land management, the ownership of these rights needs to be well-established as this will define who will benefit from it (CORBERA, ESTRADA, BROWN, 2010). In cases of illegal appropriation of public lands, for example, PES cannot be implemented as there is no legitimate landowner to receive the payment (BORNER et al 2010). The same is true for land under right dispute.

The implementation of PES schemes gives origin to new power asymmetries through price formation, which does not take into account the actual availability of resources over time and the attribution of property rights (KOSOY & CORBERA, 2010). A new economic activity based on a resource – the land that provides the services – will generate hierarchy of those who have more land and therefore more bargaining power. This creates new socio-economic hierarchies, which brings new actors to stage,

changes the places occupied by actors already important in the scenario and are very likely to reproduce the inequalities within the power relation regarding the access to both wealth and environmental resources.

There are economic as well as political barriers to the development and enforcement of secure land rights (SANDBROOK et al, 2010). Who will decide what and who will get what – which is also linked to the acquisition of land rights – will depend on the governance structure of the forest. The REDD paradox – the incentive of such programmes to make governments maintain or go back to centralised models of conservation strategies so they will control the financial flow from the carbon credits – is important to the question of who will benefit. The aim to share the benefits has to be made explicit. With the payments, there is an incentive for governments to pass through the issue of property rights of indigenous as well as traditional communities (SEYMOUR, 2008). REDD will therefore push for solving the issue of who owns the forest and, therefore, its carbon. The REDD financial potential has triggered concerns that local communities, which have a long history of exclusion, will be further excluded by the local elites and private investors. In the other hand, REDD programmes might push investors to talk to local communities, as these are the actors who have most control the forest from fire, pest, and other threats.

Both the movement of people and of money (investments) in the Amazon are based upon the belief that claiming public land will lead eventually to permanent land title (FEARNSIDE, 2008). *Grileiros* are important actors in the history of the Amazon. They forge land titles and obtain land through forgery and bribery (FEARNSIDE, 2008). The overlapping land claims in Amazonia, together with the fact that document repositories are decentralised and spread out throughout municipalities opens the way for this practice. This has been done in the past four decades and in order to change this practice, the Brazilian national policy will have to change, being more visible and becoming more enforced.

In the Amazon rainforest, an area of 491 million ha, 209 million are protected by the state, amongst indigenous land, federal and state governments protected areas and areas that are used by the military (BARRETO et al, 2008). Within the federal protected areas, some are for integral protection (25.5 million ha) and others are for sustainable use (26.9 million ha).

The property rights situation in the Brazilian Amazon rainforest is complex and represents an obstacle to efficient forest management. In 2003, INCRA (National Institute of Colonisation and Agrarian Reform) had 302 thousands of registrations of land possession, which represents 23.7% of the registered land (BARRETO et al, 2008). In 2001, the federal government was bringing into question the legality of two thousand properties, which represented 70 million hectares. There is also superposition of land titles between indigenous and conservation areas and private ownership. This scenario shows that before implementing REDD programmes in a large-scale in the forest, the government has to clarify a few blurry areas within the property rights over the region.

What to Expect

The reconciliation between the human need for food, fibber and fuel and the urge to preserve and restore ecosystems is one of the key challenges of conservation (STICKLER et al, 2009). Payment for ecosystem services is seen, by many[226], as the most forward way to stimulate forest conservation. This is the basis for reduction of emissions from deforestation and degradation. However, both PES schemes and REDD carry a few assumptions that need to be looked at.

PES schemes assume that the market can indeed solve environmental problems. Building environmental markets, however, creates the illusion that the environment can be "saved" without changes in the existing political power distribution (MCAFEE, 1999). To see ecosystem services as a technical issue, boiling it down to a question of matching supply and demand, is not free of social problems. This view would reinforce the exclusion of the poor as well as allowing the free-riding effect by the rich (VAN HECKEN & BASTIAENSEN, 2010). REDD programmes are designed for developing countries. Developed nations will pay for the credits generated by the programmes. One question that arises from this, is why only developing nations? Why are developed nations – currently the only ones with targets in the climate regime – not eligible for such programmes? This fuels the argument that REDD programmes will in fact allow developed nations to emit GHG gases at the same rate and, if structural changes are not

[226] Economists, policy-makers.

made in those countries that will receive REDD programmes, it will reinforce regional inequalities.

To some extent, REDD programmes will be beneficial to biodiversity. Patches of landscape will be maintained as they are, avoiding the loss of biodiversity by degradation and deforestation. However, it is important to highlight that patches with more deforestation are not necessarily the ones with highest biodiversity rates, in other words, REDD will not necessarily lead to biodiversity protection. Market-funded REDD projects are more likely to focus on high carbon emission areas, whereas fund-based projects will have a higher impact on biodiversity conservation. It is important to notice that the essence of REDD is not to safeguard biodiversity. Therefore, if other factors need to be included, such as poverty reduction and conservation, these have to be explicit in the design of the projects. What also has to be included is the role of indigenous and traditional communities in the fate of the forest.

As in the Kyoto Protocol, which allows the cap-and-trade system as a way to manage greenhouse gases, the payment of ecosystem services goes from the starting point that we can monitor and manage these gases (NORGAARD, 2010). The market is thus the solution of the problem, without taking into account the specificities of the institutional scenario, at the national and local level. In order to improve both the monitoring and management of theses gases, however, the necessary technology has to be in place as well as an institutional framework that supports it. This is related to the development of institutions under the REDD framework. What is the real essence of those institutions? The way these institutions are framed seem to perpetuate the belief that the market can solve environmental problems, coupled with a lack of attention to the building of institutions, and the maintainance the power situation of the developed world in polluting the way they normally do (NORGAARD, 2010).

REDD programmes aim at maintaining the forest standing, which would sustain the supply of services provided by that ecosystem. Poverty reduction and equity appear, when they do, in the background. The issues of distribution are also not clear element within the REDD framework. It is important to point out, however, that equity and distribution are embedded within a framework that goes beyond PES programmes, and it is related to development interventions and government plans that have been designed for the regions (MURADIAN et al, 2010). The essence of sustainability lies with

distribution (NORGAARD, 2010) and this has been an issue within the history of the Amazon. REDD programmes, therefore, will not necessarily lead to a more sustainable development.

All the issues that need to be resolved for the efficient implementation of REDD within the Brazilian Amazon go beyond the REDD framework. These issues are related to the sustainable management of the forest. These have been a problem for decades and reflect the continuous lack of integration between science and policy in Brazil regarding the Amazon (LAHSEN, 2009). In order to solve them, structural changes need to be made. PES schemes are not a silver bullet that can resolve all environmental and development problems (ENGEL, PAGIOLA, WUNDER, 2008), and neither is REDD.

The reproduction of the fertility of terra preta de índio through the production of biochar and its application in the soil is affected by this discussion. With the booming of climate change and the far-reaching possibility of carbon credits with biochar in the soil this aspect of the study of TPI has gained a life of its own. The issues that need to be addressed for REDD implementation, however, are also valid for carbon credits through biochar. The lack of adequate institutions, the blurry property rights situation, the background place that poverty reduction occupies, as well as other issues related to the population, are all questions also related to biochar. If the aim of such programmes is to both create credits and help the livelihoods of people, this has to be explicit. If not, as with REDD, it runs the risks of reproducing the same pattern of exclusion of the poor and privileging those better-off. It is important to point out that most projects on carbon in the soil, that started a way to both improve the fertility of the soil, which would have an impact in the livelihoods of small farmers, and generate carbon credits, is mainly now about the latter. The existence of terra preta de índio questions the belief that stood for decades that the forest was pristine and it highlights the key role of the population in the fate of the forest. It is also important to highlight that the debate on terra preta goes way beyond carbon credits. The soil rewrites the history of Brazil, has great impact on the archaeology and demonstrates the key role of humans in the management of forests.

The aim to reproduce the fertility of terra preta was to help small producers. This would increase the fertility of the soil. However, the possibility that carbon capture and sequestration in the soil could render carbon credits has raised the stakes and it has changed the focus from small producer to carbon credits. It can even be argued that

there was a shift from an approach focused on the local population to the climate change market. What is the role of small producers in this? Experiments are being carried out all over the world to evaluate how much biochar increases production, how it can be added to the soil, how long it lasts in the soil, and so on. However, how many of these studies take into consideration the small producer? Well, I guess the first question would be: would they use it? How accessible would this be? The absence of these questions, together with the great spotlight that carbon credits has gained – and it is likely it will stay that way – will maintain the issues regarding the local population relegated to the second realm. The discussions on terra preta de índio put the role of the population in the centre of the discussions regarding the future of the forest. The change in the focus, however, has put the population where it was and has been for decades.

The definition of PES, which is the basis for REDD programmes, focuses on a single system. Although this methodology might make the evaluation of a system – and the process of paying for it – easier, it oversimplifies the complex and intricate dynamics of ecosystems. PES presents an incomplete way of understanding them. In addition, different people have different values and therefore attributing a monetary value to an ecosystem service represents one person's value, which might not be in sink with the value that the people that will maintain the forest so the service is provided have.

REDD+ is governance in the making (CORBERA & SCHROEDER 2010). Reforms in weak governance architecture in developing countries are necessary. These would have to be structural to achieve the goal of respecting community rights and enabling changes in forest, laws and regulations referring to forest products. The evidence demonstrates, however, that many REDD proposals do not encompass such reforms. They rather focus on complex systems of carbon accounting and monitoring. Only a small number proposes the monitoring of social impacts and governance performance, which have been suggested by civil society (GRIFFITHS, 2009).

It is important that indigenous people, local communities and civil society in tropical countries have full participation in the development of forest and climate change policies. Otherwise there is the risk that REDD programmes will in fact reinforce the *status quo*, which serves the interest of the elite and government agencies (GRIFFITHS, 2009). REDD on its own will not slow down deforestation (BETTS, MALHI, ROBERTS, 2008).

Its effectiveness is embedded in how its implementation will relate to other issues, such as ethical issues, land rights as well as forest governance.

The public policies in place in Brazil, both at the national and at the state sphere, together with the engagement of civil society indicate that there is a base for reaching the target of reducing emissions (MAY & MILLIKAN, 2010). However, the persistence of the government in setting contradictory policies compromises further progress. These policies are those of infrastructure, agribusiness as well as the mining sector. Needless to say that this is added to the lack of enforcement in illegal deforestation, and land rights. Efforts have been made to change the scenario in the forest. However, the path towards a more sustainable development model in the region is still long and many more changes are needed.

Conclusion: evaluation and outlook of a relevant issue

The first chapter was dedicated to terra preta de índio, going through the history of its research and the different visions of Amazonian soils. The second chapter focused on the role of the Amazon in the national political sphere from the 1970s onwards. The third chapter also focused on the role of the Amazon, but this time in the international sphere, from the rise of an international environmental agenda in the 1970s onwards. The fourth chapter was dedicated to the current issues of sustainable development and the climate regime, in particular the discussions on REDD.

The occupation of the Amazon started at least 11000 years ago, it can even be earlier. Its fauna and flora are grandiose, as tropical forests are the most biodiverse biome in the world. The large extension of the forest into Brazil highly contributes to the fact that the country is one of the world's megabiodiverse nations.

The Amazon touches people in a way that no other forest or biome does, and it does so not only to Brazilians but also to other people around the world. The fascination that it has over people is not new. Long before the arrival of the naturalists in the nineteenth century, long before the independence of Brazil, long before the treaty of Madrid, the unknown of the Amazon was already captivating Europeans. Carvajal's account of the first expedition of the Amazon river triggers controversy until today. The mysteries of the forest are enriched by the cultural diversity in the region.

Moving forward a few centuries, the Amazon still plays with our minds. Our image of the Amazon was first one of luxury, then of a green hell and later of the lungs of the world. That is quite a task, being responsible for our most basic need of all, the air. Although inaccurate, these representations demonstrate just how the Amazon plays with our imagination. The advances of archaeology in the region and its further – albeit still superficial – insertion within the Brazilian population has helped change the perspective that Brazil did not have any extensive population or even that the population that lived before the arrival of the Europeans did not leave any legacy. The vast extension of the Amazon rainforest in Brazil and the fact that, despite advances in recent years to connect the region to the rest of the country, many Brazilians do not know the region, helped maintain some of the mystery that surrounds the rainforest. The dense

vegetation of the forest might still hold some mysteries. El Dorado, metals, gold, indigenous tribes that live their lives oblivious to all that is outside the borders of their protected area. This is the land of legends such as the boto rosa, cobra grande and macunaíma.

The question that started this whole process was: why terra preta de índio – and the history of a more productive and populated Amazon – was hidden for about 100 years?

I had as a starting point the premise that in order to understand the 'absence' of terra preta de índio in scientific and policy debates one would have to look at the bigger picture, understanding TPI as piece of the puzzle, not as the puzzle itself. Therefore it was important to look at national policies for the Amazon region and how the region appears in the international environmental debates to understand this absence. The scenario did change from the 1980s onwards and now, therefore, the question refers to what we can learn from terra preta regarding the current scenario in the region of sustainable development and climate change.

Anthrosols are the soils that have been deeply modified by human activities (FAO, 2006). The addition of organic material or household waste, irrigation and cultivation are amongst these activities. Anthrosols are not unique to the South American rainforest. It is seen in other corners of the world, wherever people have been cultivating the soil for a long period of time. This is the case in the Netherlands, Germany and Sweden with their soils formed by the *plaggen* fertilisation system. Scotland, Ireland, Norway and Belgium are also countries that have large areas of anthrosols (WOODS, 2010). The South and Southeast of Asia also have anthrosols, which resulted from rice paddy fields. What makes terra preta different from these is the fact that the soil itself is an archaeological artefact and that it was created without the help of sheep manure, which was used in the development of other anthrosols.

There were indeed articles and research on terra preta from 1880 until 1980, but it was not until the 1980s that the soil started to delineate a space within the academic circle. The reasons for that are multi-fold and go over the national and international political spheres. Starting from the latter, there are three events that have contributed – either directly or indirectly – to the growth of space of terra preta de índio. First it is the anniversary of the arrival of Columbus in the Americas in 1992. The 500th anniversary was an important date that triggered studies into the history of the Americas before the

arrival of the European. One study that illustrates this is the *1491* book from Charles Mann. The second event was the emergence of an international environmental agenda, which by the 1980s had already delineated specific regimes. The environment issue gained more space both in the political agenda and in the institutional space. The third event, which is intimately connected to the second, is the emergence of the climate regime in the 1980s. It was in that decade that the IPCC was first set up in the 1987 and it was in that decade that studies on the subject became more visible, putting carbon on the centre of environment discussion.

On the national sphere there were also reasons that made the 1980s the decade of the terra preta visibility. First, it was the decade the country slowly started moving back to a democratic regime. This gave space to the emergence of social movements around the country, but also in the Amazon. Chico Mendes and the rubber tappers movement illustrate this point. This new scenario was key to open the door to 'new' issues related to the forest, which was until then mainly seen for its economic value. Second, it was in the 1980s that archaeological research on the Amazon gained more visibility and also presented an alternative view to the forest as a hostile environment. The role of the Amazon in the national scenario in the last century was focused on the economic gain that could be attained from the forest. Therefore, research investments in the twentieth century were low. Until the 1980s, 1990s there was very little archaeological research carried out in Central Amazon. It was in 1995 that the Project Central Amazon, an initiative of Michael Keckenberger from the University of Florida, James Petersen from Vermont University and Eduardo Neves from the University of São Paulo, was launched. The project had a crucial role in the remedy of the lack of arqueological research in that area of the forest and had great repercussions for the archaeology, anthropology and history of the Amazon. There was disenchantment with the theories that followed the evolutionary approach (OLIVER, 2008). From then on, it is clear that the third view of Amazonian soils establishes itself maybe not as the dominant one, but as one of the main views of the Amazon. In this context it is important to stress the role of the Emilio Goeldi Para Museum, which published papers in Portuguese in the end of the 1980s. In the same line, Embrapa also had a crucial role as it also published reports in Portuguese with the description of some TPI profiles.

Another change that had an impact on the rise of terra preta was the shift in the role of human beings. They were once thought to be outside of the ecosystem. When humans began to be seen as an integral part of most ecosystems, there was a paradigm shift.

The subject of this thesis is a soil from the Amazon, but the discussions about this soil are not restricted to the chemical or archaeological characteristics related to this issue. The subjects that the soil encompasses go beyond land sciences.

This is about human agency. The anthrosols of the world, in particular the terra preta de índio in the Amazon, indicate that infertile soils such as those found in the forest – ferrasols and acrisols – can be turned into fertile ones through the increase in capacity to keep the nutrients (biochar) and through the addition of nutrients by organic residues management. This is about the importance of the local population, so much acclaimed by NGOs, international agencies and even government bodies but very little put in practice. Terra preta demonstrates that there is knowledge to be learnt from them.

The role of the local population is also key when talking about sustainability. One must not forget that the environmental crisis is indeed political and it is related to the choices of specific actors. Sustainable development arrived as an alternative to the way of decision-making, a way that would incorporate the knowledge of traditional inhabitants, the incorporation of those most affected by a determined policy in the decision-making. The fact that the environmental crisis needs an interdisciplinary approach is acknowldged and many attempts have been made to do so – not all were successful. An approach that integrates both the social and ecological aspects of a given system is complex. The lack of perspective into the importance of a coupled approach does more harm than good. Managers responsible for biodiversity conservation do not give the necessary importance to politics while politicians seldom take into account those responsible for conservation. This communication problem between the two sets could shed light on why sustainable development has been so hard to achieve.

It is also relevant to those who are concerned about sustainability, which is intimately linked to humanity – or the survival of humanity. In order to actually achieve another model of development, new parameters need to be acquired. Sustainability is also related to learning from indigenous populations, looking at what insights can be gained from their life style. Terra preta is a good model for sustainable agriculture in the tropics (NOVOTNY et al 2009). Trials were set up focusing on smallholders, rather than on

carbon credits. Sustainability is not simply a less harmful model of production, it is a new relationship with the forest, one that respects the particularities of a place.

Terra preta is also about history. What does that tell us about history? One must go back to study the history of Brazil well before the arrival of the Europeans. We all learned at school that when the Europeans arrived in Brazil they encountered native indigenous tribes. Unfortunately we do not learn much about those tribes. The archaeology of the Amazon demonstrates that these indigenous populations could have been more relevant that initially thought, not only in terms of numbers but also in terms of modifying the forest.

TPI also touches on the discussion on ecological concerns – the conservation of the forest, all the discussions on carbon sinks, ecological systems, and payment for such services. Carbon sequestration into the soil is an ecosystem service. Human beings depend on these services to survive. Payment for such services is the topic of the moment and the reduction of emissions from deforestation and degradation adopt this model.

Because it is a soil and the reproduction of its fertility could help farmers in their production, terra preta is also concerned with food production. Food is the source of energy that keeps us alive. The growing world population together with the growing need for resources – the wealthier the more goods one wants – have pushed the world into debate how to sustain the population. Hunger has never stopped being a problem. Small farmers are those more affected by market price changes and climate change, which greatly impacts the harvest. As terra preta is seen as a model for sustainable agriculture, the soil should go into the agenda for smallholder agriculture production in the region.

When looking at the policies for the region, we can see that it has been very attractive to maintain the second view of the Amazonian soils, seeing the forest as infertile. In the 1970s the Brazilian government saw the Amazon as a “demographic void”. The Amazon was a land without people, without history, without present, the *terra nullius* of the past very much embedded in the present. Being seen an empty land completely disregards the existence of people in the region and the history of the forest and it also has implications for the property rights in the region. This of course was very convenient, as the existence of an indigenous population in the region would not give grounds for the

plans that the military regime put into practice. It had also been attractive to see the forest as pristine. That, however, says more about our need to connect with an ecological past in the Amazon than about reality itself (MORAN, 1996).

Last but not least, this research is about not repeating the mistakes of the past. Local population, indigenous people, were relegated to a second place in the government plans for the Amazon. This was true in the 1970s, 1980s and 1990s. Now, the discussions on the REDD and sustainable development bring some hope as to what could be different, but there is still much to change. It is still clear that the local population are still not high in the agenda. The same is true for the value of the Amazon. The economic value of the forest is still the most sought for and dominates the agenda for the region. In this sense, terra preta de índio is related to the development of the Amazon. In addition, when looking at who benefited throughout these years with the projects, once again we see the same people benefited from the government plans, and they are not the local population. As it was in the past, large plans are still elaborated for the forest.

For many decades the Amazon was seen as an issue of security and of sovereignty. Government plans and the agencies appointed to carry out those plans clearly reflect that. Together with this, another vision that remained unchanged is the one that sees the forest as an economic frontier. So far, the Amazon has not been seen as an environmental nor as strategic frontier by the Brazilian government.

There have been advances in some areas of Brazilian government, it is true. However, mainstream development policies are still top-down, featured by institutional fragmentation and most importantly it is still embedded in the development-environment dichotomy (MAY & MILLEKAN, 2010). Despite the changes, the view of the Amazon as an endless source of resources is still the prevailing paradigm among decision-makers (HALL, 2008). There was not a real political effort to integrate environmental issues into development policies. The lack of a clear and coherent national policy of the past is still very much present (BARROS-PLATIAU 2006).

Science and knowledge rarely incorporate the values of local knowledge (POSEY, 1998). They neither refer to local control over access to resources. This is why a different approach, one that would take that into account, is more than needed. The analysis of the past four decades of government policies towards the Amazon helped

highlight the mistakes made so they can be avoided in the current scenario. Both sustainable development and climate change are the main themes within the national and the international arena regarding the Amazon. However, an analysis of the REDD debate demonstrates that the mistakes of the past are still very much present.

The years have changed, the presidents have changed as have the discourses. However, in order to actually transform how the Amazon is treated, more than words are needed. We have learned a lot from terra preta de índio. If all this knowledge will actually lead to a different approach, however, is a different matter.

Conclusão: avaliação e perspectiva de uma questão relevante

O primeiro capítulo do trabalho foi dedicado a terra preta de índio, passando pela a história da sua pesquisa e as diferentes visões sobre o solo da Amazônia. O segundo capítulo abordou o papel da Amazônia no plano político interno a partir de 1970. O terceiro capítulo também focou no papel que a Amazônia ocupou, mas desta vez no plano internacional a partir do início da agenda ambiental internacional da década de 1970. O quarto capítulo foi dedicado às questões atuais do desenvolvimento sustentável e do regime do clima, em especial as discussões sobre REDD.

A ocupação da Amazônia começou há pelo menos 11000 anos atrás, e ainda pode ser mais antiga. Sua fauna e flora são grandiosas, já que florestas tropicais são o bioma mais biodiverso do mundo. A grande extensão da floresta no Brasil contribui enormemente para o fato do país ser um país megabiodiverso.

A Amazônia encanta pessoas de maneira que nenhuma outra floresta ou bioma faz, e isso não fica restrito apenas aos brasileiros, pessoas ao redor do mundo também ficam deslumbradas. A fascinação que ela exerce sobre as pessoas não é recente. Antes da chegada dos naturalistas, antes do tratado de Madrid, o desconhecido da Amazônia já cativava os europeus. Os registros de Carvajal sobre a primeira descida pelo rio Amazonas gera controvérsia até hoje. Os mistérios da floresta são enriquecidos pela diversidade cultural da região.

Avançando nos séculos, a Amazônia ainda brinca com as nossas mentes. Nossa imagem da Amazônia como abundante, passou para uma imagem da floresta como um inferno verde e depois como o pulmão do mundo. É muita responsabilidade ser encarregado da nossa necessidade mais básica, o ar. Apesar de incorretas, essas representações demonstram como a Amazônia mexe com nossa imaginação. Os avanços da arqueologia na região e sua maior – apesar de superficial – disseminação entre a população brasileira ajudou a mudar a perspectiva de que não havia uma população significativa ou mesmo que a população que morou na floresta antes da chegada dos europeus não teria deixado um legado. A grande extensão da floresta Amazônia no Brasil e o fato de apesar dos avanços recentes para integrar a região com o resto do país muito brasileiros não a conhecerem, ajudou a manter parte do mistério que cerca a floresta. A densa vegetação da Amazônia ainda guarda alguns mistérios. El

Dorado, metais, ouro, tribos indígenas que vivem sem saber da existência de um outro mundo fora das fronteiras das áreas protegidas. Esta é a região das lendas do boto rosa, cobra grande e Macunaíma.

A pergunta que começou todo esse processo foi: por que a terra preta de índio – e a história de uma Amazônia mais produtiva e populosa – ficou escondida por cerca de 100 anos?

Como ponto de partida eu tive a premissa de que para entender a "ausência" da terra preta de índio nos debates científicos e políticos seria necessário olhar para um contexto mais abrangente, entendendo a TPI como um pedaço do quebra-cabeça, não como o quebra-cabeça em si. Portanto, foi importante olhar para as políticas nacionais para Amazônia e como a região aparece nos debates ambientais internacionais para entender essa ausência. A partir dos anos 1980 o cenário de fato mudou, portanto, a questão se refere ao que podemos aprender sobre a terra preta em relação ao cenário atual da região sobre desenvolvimento sustentável e mudanças climáticas.

Solos antrópicos são solos que foram modificados profundamente por atividades humanas (FAO, 2006). Entre estas atividades estão a adição de material orgânico ou lixo doméstico, irrigação e cultivo. Solos com modificações antrópicas não são únicos da Amazônia. Eles podem ser encontrados ao redor do mundo onde quer que as pessoas tenham cultivado o solo por um longo período. Solos antrópicos existem nos Países Baixos, Alemanha e Suécia com seus solos formados pelo sistema de fertilização *plaggen*. A Escócia, Irlanda, Noruega e Bélgica também são exemplos de países com solos antrópicos expressivos em espaço (WOODS, 2010). O sul e sudeste Asiático também tem seus solos antrópicos, resultado do cultivo de arroz por alagamento. O que torna a terra preta de índio diferente destes solos é o fato do próprio solo ser um artefato arqueológico e de ter sido criado sem a ajuda de esterco, muito utilizado no desenvolvimento de outros solos antrópicos.

Entre 1880 e 1980 artigos e pesquisas sobre a terra preta de fato foram desenvolvidos, mas foi apenas a partir de 1980 que o solo começou a ter um espaço cativo no círculo acadêmico. Várias razões explicam esse fato, razões essas que são de cunho nacional e internacional. Internacionalmente, três fatores culminaram com o aumento do espaço da terra preta de índio, tanto direta quanto indiretamente. Primeiro foi o aniversário de 500 anos da chegada de Colombo nas Américas em 1992. O aniversário foi uma data

importante que desencadeou estudos sobre a história das Américas antes da chegada dos Europeus. Um estudo que ilustra este ponto é o livro de Charles Mann *1491* (2005). O segundo evento foi o surgimento de uma agenda ambiental internacional que na década de 1980 já tinha delineado regimes específicos. O meio ambiente ganhou mais espaço tanto na agenda política quanto no espaço institucional. O terceiro evento, que está intimamente ligado ao segundo, foi a emergência do regime do clima dos anos 1980. Foi nesta década que o IPCC foi criado (1987) e foi nesta década que mais estudos sobre a questão climática vieram à tona, o que colocou o carbono em evidência nas discussões ambientais. É importante ressaltar que a terra preta de índio ganhou detaque não pelo fator agronômico, mas por estocar carbono no solo e a possibilidade de reduzir emissões e talvez até mesmo seqüestrar carbono.

Mudanças também ocorreram na esfera nacional para explicar a visibilidade da terra preta de índio na década a partir de 1980. Primeiro esta foi a década em que o país começou o retorno à democracia. Isto deu espaço para a emergência de movimentos sociais por todo o país e também na Amazônia. Chico Mendes e o movimento dos seringueiros ilustra esse ponto. Esse novo cenário foi chave para abrir a porta para "novas" questões relacionadas a floresta, que tinha sido até então vista principalmente pelo seu valor econômico. Segundo, foi durante os anos 1980 que a pesquisa arqueológica ganhou mais visibilidade e apresentou uma visão alternativa a visão da floresta como um ambiente hostil. O papel da Amazônia no cenário nacional no século passado evidencia o carácter ecnonômico do interesse na floresta. Portanto, os investimentos em pesquisa na Amazônia no século vinte foram baixos. Até a década de 1980, 1990 havia pouca pesquisa arqueológica na Amazônia central. Foi em 1995 que o Projeto Amazônia Central, uma iniciativa de Michael Heckenberger da Universidade da Flórida, James Petersen da Universidade de Vermont e Eduardo Neves da Universidade de São Paulo, foi criado. O projeto teve um papel crucial na remedição da falta de pesquisa arqueológica nesta área da floresta e teve grande repercussões para arqueologia, antropologia e história da Amazônia. Houve também o desencantamento com as teorias que seguiam a abordagem evolucionista (OLIVER, 2008). A partir de então, fica claro que a terceira visão dos solos da Amazônia se estabelece, talvez não como a visão dominante, mas como uma das visões principais. Neste contexto é importante ressaltar o papel do Museu Paraense Emílio Goeldi, que começou a publicar trabalhos sobre terra preta de índio em português no final de 1980. Nesta mesma linha,

a Embrapa também teve um papel crucial ao publicar relatórios com a descrição de alguns perfis de TPI, também em português.

Outra mudança que pode ter tido um impacto na abertura de espaço para a terra preta de índio foi a mudança no papel dos seres humanos. Já se pensou o ser humano como fora de um ecossistema. A partir do momento que os seres humanos passaram a ser vistos como parte integral do ecossistema, houve uma mudança de paradigma.

O assunto da tese é um solo da Amazônia, mas as discussões sobre o solo não ficam restritas apenas as características químicas ou arqueológicas envolvidas nesta questão. Os assuntos que a terra preta abrange vão além de temas das ciências da terra.

O trabalho é sobre agência humana. Os solos antrópicos do mundo, e em particular da Amazônia, indicam que os solos inférteis encontrados na floresta – principalmente os ferrasolos e acrisolos – podem ser transformados em férteis por meio do aumento da capacidade de reter nutrientes (biochar) e da adição de nutrientes pelo manejo de resíduos orgânicos. Isto se refere a importância da população local, tão aclamada pelas ONGs, agências internacionais e até mesmo instituições governamentais, mas muito pouco posto em prática. A terra preta demonstra que existe um conhecimento a ser resgatado.

O papel da população local também é chave quando se fala em sustentabilidade. Não se pode esquecer que a crise ambiental é política e está relacionada às escolhas de atores específicos. O desenvolvimento sustentável chegou como uma alternativa também na maneira de tomar decisões, incorporando aqueles mais afetados pelas políticas. A crise ambiental demanda uma abordagem interdisciplinar e várias tentativas nesse respeito já foram tomadas, apesar de poucas terem tido êxito. Uma abordagem que integre os aspectos sociais e ecológicos em um dado sistema é complexa. A falta de perspectiva da importância de uma abordagem casada prejudica mais do que ajuda. Gestores responsáveis pela conservação da biodiversidade não dão a importância necessária a política e políticos tampouco incluem os responsáveis na tomada de decisão. Este problema de comunicação entre esses dois grupos significa que será difícil atingir o desenvolvimento sustentável.

A terra preta também é relevante para aqueles que se preocupam com sustentabilidade, que está intimamente relacionada com a humanidade – ou com sua sobrevivência. Para que se possa atingir um outro tipo de desenvolvimento, novos parâmetros precisam ser adquiridos. A sustentabilidade também está relacionada ao aprendizados com as populações indígenas, buscando entendimentos a partir do estilo de vida deles. A terra preta é tida como um modelo de agricultura sustentável para os trópicos (NOVOTNY et al 2009). Experimentos que focam no pequeno produtor rural e não nos créditos de carbono, foram iniciados. Sustentabilidade não é simplesmente um modelo menos agressivo de produção, é uma nova relação com a floresta, uma relação que respeita as particularidades de cada lugar.

A terra preta de índio também é sobre história. O que o solo nos diz sobre a história da Amazônia? É preciso estudar a história do Brasil antes da chegada dos europeus. Na escola aprendemos que existiam tribos na Amazônia quando os europeus chegaram. Infelizmente nós não aprendemos muito mais sobre essas tribos. A arqueologia da Amazônia demonstra que as populações indígenas podem ter sido mais relevantes do que originalmente imaginado, nao apenas em termos numéricos, mas também em relação às suas ações na floresta.

A TPI também toca nas discussões sobre ecologia – a conservação da floresta, as discussões sobre os ciclos de carbono, serviços ecossistêmicos, o pagamento por esses serviços. O sequestro de carbono no solo é um serviço ecossistêmico. Os seres humanos dependem desses serviços para sobreviver. O pagamento por eles é o tópico do momento e a redução de emissões por desmatamento e degradação adota esse modelo.

Como o solo e a reprodução de sua fertilidade poderiam ter um impacto positivo para produtores, a terra preta também se refere a produção de alimentos. A crescente população mundial e a crescente necessidade de recursos – quanto mais rico mais recursos são consumidos – empurraram o mundo para discussões sobre como manter a população. A fome nunca deixou de ser um problema. Pequenos agricultores são os mais afetados pelas mudanças no preço do mercado, o que tem grande impacto na colheita. A terra preta é vista como um modelo de agricultura sustentável, portanto o solo deveria ir para a agenda de produção do pequeno produtor da região.

Quando se olha para as políticas da região, podemos ver que foi atraente manter a segunda visão dos solos da Amazônia, que entendia os solos como inférteis. Nos anos 1970 o governo brasileiro via a Amazônia como um vazio demográfico. A Amazônia era uma terra sem pessoas sem história, sem presente, a *terra nullius* do passado ainda muito viva no presente. A visão da floresta como uma terra vazia desconsiderava a existência de pessoas na região e na história da floresta, o que também acarretava implicações nos direitos de propriedade. É claro que isto foi conveniente já que a existência de populações indígenas na floresta não daria base para os planos que os generais colocaram em prática. Também foi atraente ver a floresta com virgem. Isso, no entanto, diz mais sobre a nossa necessidade de se conectar com o passado ecológico da Amazônia do que com a própria realidade (MORAN, 1996).

Essa pesquisa também é sobre não repetir os erros do passado. A população local, populações indígenas, foram relegadas ao segundo plano nas prioridades do governo. Isso foi verdade nos anos de 1970, 1980, 1990. Agora as discussões sobre REDD e desenvolvimento sustentável trazem esperança sobre o que poderia ser diferente, mas ainda há muito o que mudar. Esta claro que a população local ainda não está na agenda. E o mesmo pode ser dito sobre o valor da Amazônia. O valor econômico da floresta ainda é o mais procurado e domina a agenda da região. Nesse sentido, a terra preta de índio está relacionada ao desenvolvimento da Amazônia. Além disso, quando olhamos para quem se beneficiou aos longos dessas décadas com os projetos, mais uma vez vemos que as mesmas pessoas se beneficiaram com os planos de governo, e não foram as populações locais. Assim como foi no passado, os grandes empreendimentos ainda fazem parte da floresta hoje.

Por muitas décadas a Amazônia foi vista com uma questão de segurança e soberania. Planos de governo, assim como as instituições apontadas para fazer a gestão dos projetos, reflete isso. Junto com essa, outra visão que se manteve sempre presente durante o tempo foi a visão da floresta como fronteira econômica. Até então, o governo brasileiro ainda não viu a floresta amazônica como uma questão ambiental ou mesmo estratégica.

É verdade que avanços foram feitos pelo governo brasileiro. No entanto, as políticas desenvolvimentistas *mainstream* ainda são elaboradas de cima para baixo, caracterizadas por fragmentação institucional e ainda engendradas na dicotomia

desenvolvimento-ambiente (MAY & MILLEKAN, 2010). Apesar das mudanças, a visão da Amazônia como uma fonte infinita de recursos ainda é o paradigma principal entre os tomadores de decisão (HALL, 2008). Não houve um esforço político real para integrar as questões ambientais nas políticas de desenvolvimento. A falta de uma política nacional clara e coerente do passado ainda estão muito presentes (BARROS-PLATIAU, 2006).

A ciência e conhecimento raramente incorporam valores do conhecimento local (POSEY, 1998). Eles tampouco se referem ao controle local sobre os recursos. É por isso que uma abordagem diferente, uma que levasse isso em consideração é mais do que necessária. A análise das últimas quatro décadas de políticas de governo para a Amazônia ajudaram a ressaltar os erros feitos para que possam ser evitados no cenário atual. O desenvolvimento sustentável e a mudança climática são os principais temas nas arenas nacional e internacional sobre a Amazônia. No entanto, uma análise sobre o debate sobre REDD demonstra que os erros do passado ainda fazem parte do presente.

Os anos passaram, os presidentes mudaram e os discursos evoluíram. No entanto, para que se possa de fato transformar a maneira como a Amazônia é tratada, é preciso mais do que palavras. Aprendemos muito com a terra preta de índio. No entanto, se este conhecimento vai de fato levar a outra abordagem para a floresta é outra questão.

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