Acre:

Low-emissions, high-growth sustainable development in the Amazon

Stephan Schwartzman, Ph.D.
Environmental Defense Fund
Director, Tropical Forest Policy
Washington, D.C.
April, 2015

Acre: low-emissions, high-growth sustainable development in the Amazon

The people of Acre in the western Brazilian Amazon, with a remarkable thirty year history of struggle for environmentally sustainable and socially equitable development, have made their state a world leader in reducing tropical deforestation and greenhouse gas pollution while growing their economy and improving social indicators (Figures 1, 2, 3). A stable, progressive government (the Workers' Party/Popular Front has won five consecutive gubernatorial elections, dating to 1998) highly committed to sustainable, forest-based development has made great strides toward transforming the state's 143,000 km² of intact, richly diverse forest estate (roughly the size of New York state) into a new class of valuable economic assets. Deforestation in fact decreased across the Amazon from 2005 – 2012 while soy and cattle production increased. What sets Acre apart is leadership not only committed to core values of good governance, sustainable growth and development, social equity and forest protection, but able to build a political majority based on these values and the development results they have delivered. Relatively modest private sector investment can send the signal needed that the significant environmental services that the forest and its traditional inhabitants and defenders provide can in fact become the basis for robust prosperity, ensuring their continued contribution to global biodiversity and climatic stability. It may not be immediately necessary for living forest to become worth more in the market than dead forest, at scale, for Acre and other tropical jurisdictions to stay on a pathway to zero deforestation. Policy makers and local leaders however argue that the best way to avoid a return to runaway deforestation, secure past gains and move forward is to show proof of concept for the idea that large-scale, state- or nation-wide reductions in emissions from deforestation below historical levels can become environmental and economic assets.

Investing in Acre's sustainable development offers exceptional social and environmental value. About 87% of Acre's 164,221 km² is primary, dense moist tropical forest, of which over half is officially protected as indigenous territories, parks and reserves. The state's ecological/economic zoning program, based in inventories of flora and fauna, lists about half of the state as "extremely high" or "very high" biodiversity. While research remains sparse in relation to other Amazon regions, diversity of Lepidoptera, amphibians and fish appears to be exceptionally high.[1] There are in addition 15 indigenous peoples, speaking 14 languages, with 34 recognized indigenous territories in the state, including several isolated indigenous groups.[2] Acre exemplifies the extremely high social and biological diversity of the Amazon, and this depends on its having maintained nearly 90% of its forest cover and ecosystems largely intact. The state continues to have ambitious growth goals and aspirations, including the development of large-scale fish farming, plantation forestry, small livestock and increased corn production on already cleared and/or degraded lands. Acre's success in setting and reaching ambitious deforestation reduction goals (60% below the 1996-2005 average by 2012, 80% below the average by 2020) while increasing GDP, agriculture production and social indicators is a clear demonstration that the 11.5 million verified t/CO_2e it has registered with the Markit Environmental Registry are real,

measureable and permanent emissions reductions and high environmental and social-quality offsets for voluntary or compliance market investors.

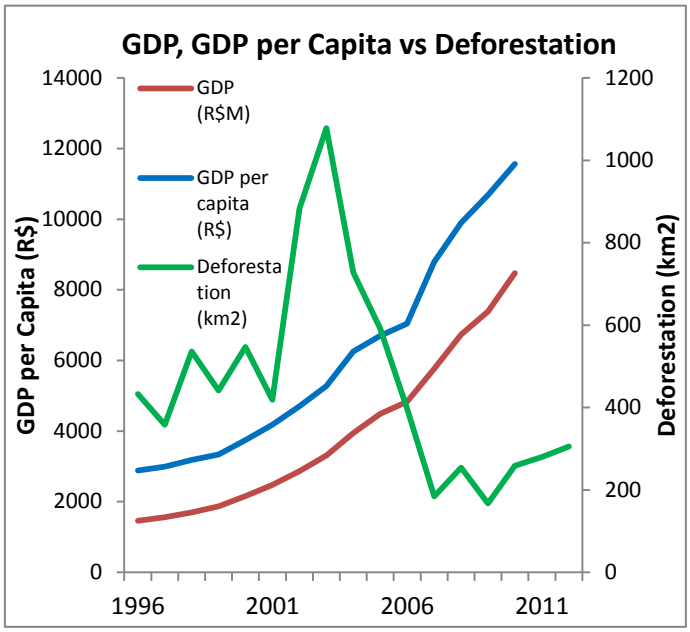


Figure 1. Acre GDP, GDP per capita and Deforestation, 1996 – 2012 (source: Acre em Números 2013, Secretaria de Estado de Planejamento, Rio Branco, Acre, 2014.)

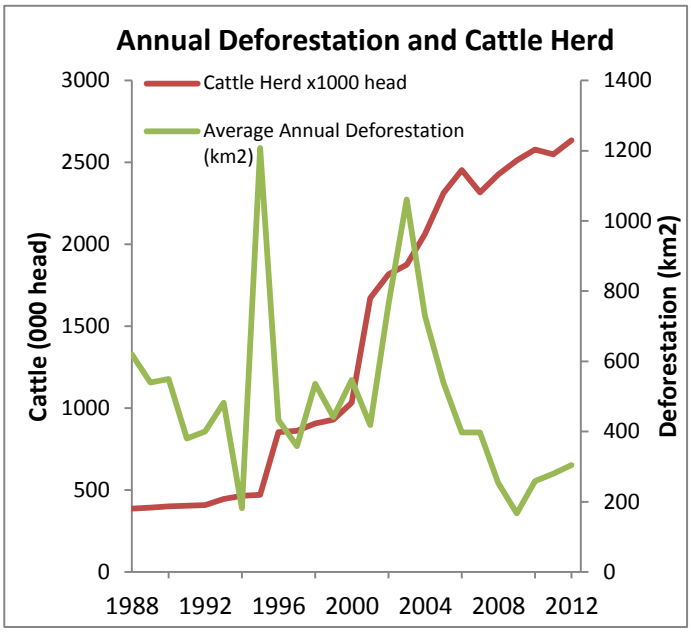


Figure 2. Acre Deforestation, Cattle Herd 1988 – 2012. Acre broke the historical link between increasing deforestation and cattle herd after 2005. (source: Acre em Números 2013, Secretaria de Estado de Planejamento, Rio Branco, Acre, 2014.)

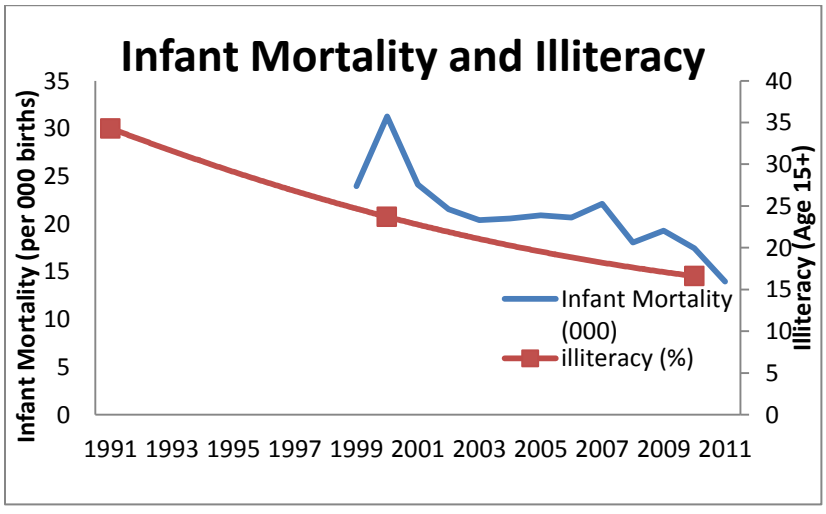


Figure 3. Infant Mortality and Illiteracy, 1991 – 2011. source: Acre em Números 2013, Secretaria de Estado de Planejamento, Rio Branco, Acre, 2014.)

The "Government of the Forest" -- History

Much of Acre's success today – as well as the challenges it continues to face – are best understood in the context of the state's history, and particularly the history of the "Government of the Forest". This progressive, environmentally committed group was first elected in 1998 and has now won five consecutive gubernatorial elections. Political sustainability has been central to advances in governance capacity. The Acre Workers' Party (PT) and allies in the center-left "Popular Front" are strongly identified with slain rubber tapper and environmental leader Chico Mendes, whose vision and life story inform the state' s sustainable development program.

Acre was first occupied by Brazilians around 1878 during the rubber boom, and native rubber (*Hevea brasiliensis*) latex extraction was the core of the state's economy. Poor rubber tappers, working for the owners of the rubber estates in a company store-like system were usually indebted to estate owners and endured harsh working conditions. The state was incorporated into Brazil by the Treaty of Petropolis in 1903, after the rubber tappers' uprising against Bolivian rule. But the Amazon rubber boom collapsed with the introduction of plantations elsewhere. By the 1960s' government offered tax breaks and subsidized credit to ranchers to buy the old rubber estates and clear the forest for cattle pasture. Ranchers sent their hands to cut down the forest – and hired guns to get rubber tapper families out. Chico Mendes and other grassroots leaders organized forest communities to resist expulsion and protect the forest – and thus the rubber and Brazil nut groves they made their living from – by organizing demonstrations in the forest to stop deforestation. Mendes allied with national and international environmentalists to strengthen the isolated movement of poor rubber tappers' unions he had organized, and developed a vision both of development and forest protection strikingly ahead of its time: "We realized that in order to guarantee the future of the Amazon we had to find a way to preserve the forest while at the same time developing the region's economy."[3] Murdered in 1988 by a rancher whom he had prevented from clearing forest in a rubber estate he and his supporters wanted government to protect for the local community, Chico's story – unlike hundreds of other rural union leaders and activists assassinated in Amazon land conflicts – ran on the front page of the New York Times and in international and Brazilian media. Ten years later, Chico's closest colleagues came to power in the state, strongly identified with his core values of social justice, and a new, sustainable and equitable development model based in protection and sustainable use of the forest.

Governance

The first challenge Governor Jorge Viana faced upon taking office in 1999 was the legacy of corruption and crime left by previous administrations. Basic infrastructure was decaying, the state's finances were in disarray—the state owed R$45 million in unpaid salaries alone. Drug traffickers and criminals

Governor's Palace, Rio Branco, Acre. 1999, with air conditioners removed.

controlled the state police and legislature. The previous administration had looted the Governor's Palace in Rio Branco, even stealing the air conditioners before vacating the premises.

Governor Viana, at considerable personal risk, worked with Federal Police to root out organized crime. Congressman, retired police officer and head of the violent local drug, extortion and robbery gang Hildebrando Pascoal, known for murdering rivals with a chainsaw, was only one of 50 criminals (including 30 state police) convicted and jailed early in Viana's first term.[4] Ensuring the rule law and security in the previously crime and violence-ridden capital of Rio Branco, and putting the state's finances in order, laid the groundwork for developing and implementing new development policies.

The Government of the Forest – elected 1998, re-elected 2002, 2006, 2010, 2014. Ex-governor Jorge Viana, 1998-2006 (second from right), former Senator and federal Minister of Environment Marina Silva, ex-governor Binho Marques (2006-2010), Governor Tião Viana (2010 – present).

Ending rampant government corruption and instituting transparent and responsible financial management greatly increased the state's revenues and ability to invest – the state budget went from R$536 million in 1998 to R$5.3 billion in 2014, while the state's dependence on federal transfers decreased. Its principal internal source of revenue, the ICMS value-added tax, went from R$56 million in 1998 to R$789 million in 2013. Increased investment stimulated economic growth -- state GDP grew from R$1.87 billion in 1999 to R$ 8.79 billion in 2011, the third fastest GDP growth among the 26 Brazilian states over the period.[5]

The "government of the forest" emphasized public participation, transparency and social control in policy design, establishing a system of mixed civil society – government State Councils, deliberative bodies charged with proposing, analyzing and monitoring public policy in their sectors, including the Environment, Science and Technology Council, the Forests Council, and the Sustainable Rural and Forestry Development Council. Broad public participation has been the hallmark of the state's sustainable development policies.

Sustainable Development Policies

The basis of the post-1998 Acre government's stability has been its close focus on development results, particularly infrastructure, and on planning and investment in both urban and rural zones, coupled with forest protection and management. A good example of how improved financial management allowed increased investment and growth is the Maternity Canal in Rio Banco (so called for the maternity

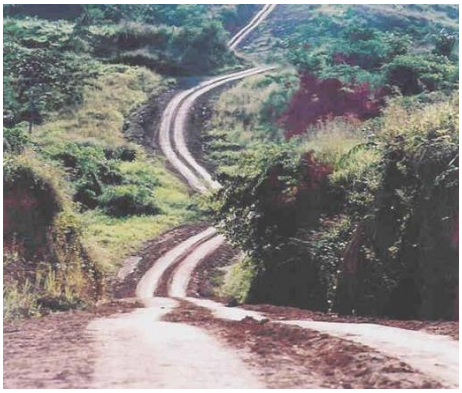
Maternity Canal, Rio Branco, 1998.

hospital beside it.) Already by the mid-1980s, the Maternity Canal was notorious as a symbol of corrupt, unaccountable government. An open sewer running through the middle of the capital flanked by scrub vegetation, the canal was an eyesore and a public health hazard. While a series of public works projects to clean up the canal had been approved and funded, funds vanished and nothing changed. Among Governor Viana's first initiatives was to create the Maternity Park, transforming the abandoned land into a landscaped, well -equipped and maintained public space, with bike and walking trails, playgrounds, tennis courts and cafés. Rio Branco had, for the first time, an outdoor public space families could use in leisure hours as well as an attractive site for new small businesses. Many other urban infrastructure projects followed.

Maternity Park, Rio Branco, 2002.

Paving the state's highways, previously virtually impassable during the six-month long rainy season and tortuously slow and difficult under the best of circumstances, was another high priority, and has undoubtedly contributed to GDP growth. Land-use zoning and fire protection policies attenuated the historically strong link between road building and paving and markedly increased deforestation in the Amazon. While much of the state's residual deforestation remains concentrated within 20 km of major roads, both absolute area and proportion of the state total declined from 2004 – 2012[6] The Acre Ecological - Economic Zoning plan (ZEE) was the first of these policies, and laid the groundwork for subsequent policy development.

Acre Ecological – Economic Zoning (ZEE-AC)



BR 317, "Road to the Pacific", 1998

Ecological – Economic zoning was established in federal legislation as an instrument for state-level land use planning and territorial management. In the Amazonian context of semi-continental spaces, confused land tenure, frequent conflicts over land and natural resources, and ungoverned, often illegal resource extraction, Ecological – Economic Zoning can be an important instrument for territorial governance. In Acre, the ZEE and the policies based on it are much more ongoing, and increasingly data-driven and granular multi-sectoral, multi-stakeholder discussions about the future of land use and development in the state than abstract governmental dictates. Given the

BR 317, "Road to the Pacific," 2006

considerable time, energy and resources invested in these processes, the last five state-wide elections may be taken as referenda on them. The first phase of the ZEE from 1999 - 2000, consisted in compiling a cartographic base characterizing existing land uses and occupation, land tenure, natural resources, and socio-economic profiles of the several regions of the state at a 1:1,000,000 scale. From 2006 – 2007, government mobilized civil society, the private sector and local government in all 22 of the counties of the state to use remote sensing and GIS mapping at a 1:250,000 scale to develop a broad consensus on land use rules and goals. The result was the definition of four major zones, with distinct goals and priorities (Figure 3):

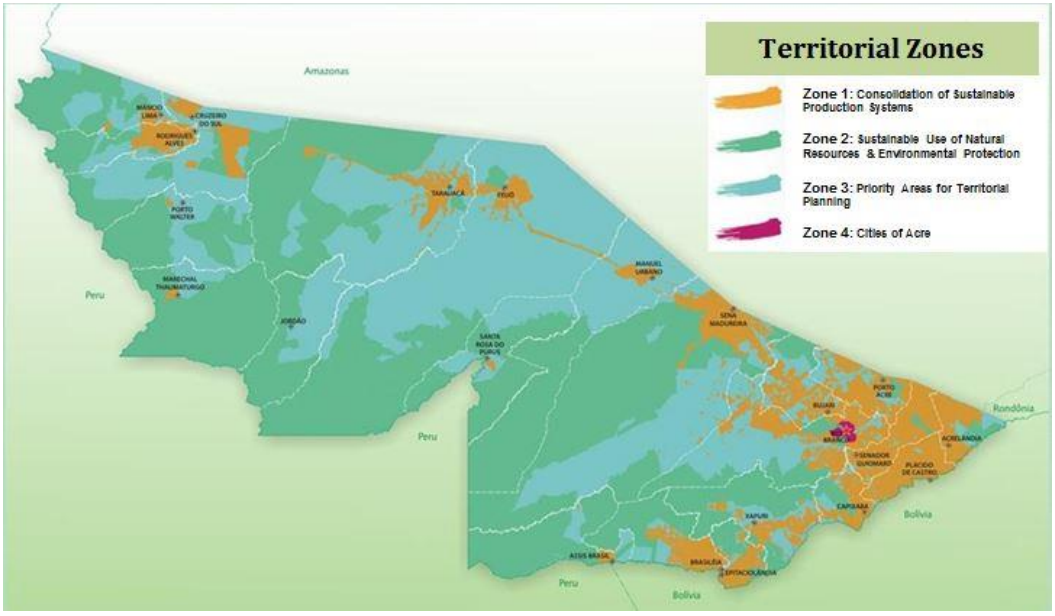


Figure 3. Land Use Zoning (Ecological-Economic Zoning, ZEE)

- Zone 1)- the 25% of the state in private land or agricultural settlement projects, of which about half is deforested and half is primary forest in legally required reserves on private land and forest remnants in settlement projects, and where the goal is to bring landholdings into legal compliance and promote sustainable practices
- Zone 2) the 49% of the state in intact primary or managed forests, including indigenous territories, sustainable use reserves and settlement projects, state and national production forests, and strictly protected areas, where the goal is long-term conservation of protected areas and long –term sustainability and improved living conditions in indigenous territories and other inhabited reserves;
- Zone 3) the 26% of the state where, while forest cover is very largely intact, land tenure is unclear or claims overlap. Here the priority is defining land tenure so that sustainable practices can be promoted.
- Zone 4) Cities, which cover 0.2% of the state, with 70% of the state's population. Priorities are improved infrastructure and services, particularly to add value in sustainable agriculture, forestry and non-timber forest product supply chains.

The zoning plan became state law in 2006 (passed unanimously by the legislature) and has since moved to still more granular (1:100,000) elaboration at the sub-municipal level in the Local Territorial Planning process, concluded in 12 counties. This detailed, spatially explicit land use plan defining what kinds of

economic activities are permitted in which areas, with broad social support, became the basis for a series of focused sustainable development policies (Figure 4). The overarching strategy consists in project investments in already deforested lands to intensify agriculture and ranching and restore and reforest degraded lands, while promoting legal compliance, improved management and certification for good practices in still forested, but altered areas, and payment for ecosystem services and sustainable management in intact, primary forest areas (Figure 4).

Figure 4. Development/Environment Policy Framework for Land Use, based in Ecological-Economic Zoning Plan.

The principal sustainable development policies based in the ZEE include the Policy for Valuing Forest Environmental Assets, through which some 3,000family farms have been certified for adopting better agriculture practices (e.g., fire-free farming) and receive technical assistance and incentives[7].

Developing institutional capacity for environmental licensing and bringing properties and enterprises into compliance with environmental legislation was critical to putting the ZEE into practice and getting control over previously illegal economic activities. The forestry sector illustrates. In 1999, an estimated 90% of the timber extracted in the state came from illegal deforestation[8]– a pattern characteristic of most of the Amazon until the present. At that point, even loggers who wanted to operate legally could not in practical terms do so, since the agency responsible for licensing and enforcement lacked the staff and resources necessary to even minimally do its job. The Acre government however, struck an agreement in 1999 with the federal environmental agency (IBAMA) and the Timber Industry Union of Acre to build the operational capacity of the state licensing and enforcement agency (IMAC) so that it could legalize the sector. Today, virtually all of the timber produced is legal, and 96% comes from the legally required and licensed management plans rather than from deforestation. This cascaded into processing, since furniture manufacturers and cabinet makers who previously also operated illegally since they were unable to obtain licensed timber, are now very largely legal.

The state has also advanced on clarifying and documenting land tenure – a source of uncertainty and conflict throughout the Amazon – and registry of properties in the Rural Environmental Registry (CAR). The ZEE took the first step toward resolving land tenure issues in locating the ambiguities and conflicts (mostly grouped together in Zone 3, but also including landholdings in Zones 1 and 2). Of the approximately 42,000 landholdings in the state, 90% occupy about 10% of the total area of private lands, while about 2,000 holdings (or 4%) occupy 90% of the total area. About 26,000 of the holdings are legally titled private property. While titling is now the state's responsibility, the state Land Institute is relatively new, with limited staff and resources to resolve a long-standing and complex problem. It is consequently important for the state's environmental and development programs that the new national Forest Code (Law No. 12.651, 25 de maio, 2012), has for the first time made it possible for the state to exercise environmental governance over private properties and landholdings without having to first resolve the numerous contentious and time-consuming tenure issues. Under the new Forest Code, landowners are required to register satellite maps of their properties with the state Rural Environmental Registry (CAR), detailing whether or not they are in compliance with requirements to maintain forest along watercourses and on fixed proportions of private properties (80% in the Amazon forest biome), and commit to coming into compliance with the law if needed. Under the CAR, unlike previous environmental licensing requirements, landholdings need not have clear title before they can legally comply with environmental regulations. Landholdings can thus comply with environmental law while complex land tenure issues are resolved, contributing to increasingly legal, regulated land use rather than generalized non-compliance and illegality. A joint task force of Acre's Environmental Secretariat and Environmental Institute has registered 24,392, or a little over half, of the state's landholdings.

The most detailed phase of the ZEEE, Local Territorial Planning exercises, have concentrated on counties along the 317 and 364 (which runs east-west, the length of the state), where road paving has recently concluded. The state has also supported indigenous communities in the elaboration of Indigenous Territorial Environmental Management Plans (PGTI), in accordance with the National Indigenous Environmental Territorial Management Policy (PNGATI) in 29 of the 36 indigenous territories of the state. These local-level land use plans are pre-conditions for indigenous territories to access REDD+ finance. Government also enabled the elaboration of Community Development Plans for small, isolated non-indigenous forest communities. The state System of Incentives for Environmental Services (SISA), is the most ambitious and comprehensive of the programs building off of the ZEE-AC, and is discussed below (p. 11).

Acre has also adopted specific measures to directly prevent and control deforestation and fires. In 2009, the Secretariat of Environment coordinated the state Plan for Prevention and Control of Deforestation (modeled in part on the national Plan), engaging most if not all sectors of government and civil society in an integrated plan to control and reduce deforestation in the state.[9] In 2011 (following the drought of 2010) Secretaria de Meio Ambiente (SEMA) coordinated a comprehensive fire prevention and control plan,[10] as well as organization a state commission on managing environmental risk. The effectiveness of these plans was grounded in comprehensive, regular and accurate monitoring of deforestation and fires, as also holds at the national level.

Monitoring and Measuring Deforestation: ensuring that reduced emissions from deforestation are real, measurable and verifiable

When a jurisdiction such as the European Union or California establishes a greenhouse gas emissions reductions regime, it must first measure its past emissions, then define some level of emissions below

which it undertakes to reduce, either an historical reference level, or a projected business-as-usual scenario based on historical trends. Jurisdiction-wide emissions reduction and emissions trading systems such as the EU and California have chosen historical reference levels (1990 in the EU, 2005 in California) because past emissions can be measured with more certainty than future trends can be projected, and because it can be reasonably assumed that reductions below economy-wide historical levels are "real" reductions, that is, they would not happen in the absence of policies and regulations designed to achieve them. A tropical state such as Acre, with the preponderance of its emissions from deforestation, which creates a jurisdiction-wide emissions reduction system, must also be able to measure its emissions and establish an emissions reference level. Measuring emissions from deforestation requires measuring both historical deforestation rates and forest carbon stocks. Jurisdiction-wide reductions in emissions from deforestation are best calculated against historical reference levels for the same reason that jurisdictions such as the EU and California have adopted them.

Acre's monitoring and measurement systems for deforestation meet and exceed accepted international standards, ensuring that its calculations of emissions are reliable and that its emissions reductions from deforestation are real and verifiable. Acre has also adopted a demonstrably conservative approach to establishing its deforestation reference level.

Acre accesses and uses the Brazilian National Space Research Institute (INPE) Project for Monitoring Amazon Deforestation by Satellite (PRODES) annual satellite map of Amazon deforestation.[11] The system has monitored annual deforestation since 1988 though analysis of about 220 Landsat 5/Thematic Mapper and other satellite images, covering the Amazon forest biome, to measure year-on-year changes in forest cover. PRODES measures only clear-cutting: transformation of forest into non-forest. Deforestation is measured from August 1 – July 31, with August 1 as the "reference date". August, in the Amazon dry season, typically has the lowest cloud cover in the year. Scenes obscured by clouds on August 1 are taken from the closest cloud-free date. Landsat 5 images, and the other high-resolution images used have a 30-meter resolution and can detect deforestation above about 6.25 ha. Prior to 2003, analysis of each image was done visually, then digitized, while after 2005, INPE adopted a visually assisted automated process. In 2003, INPE took the important step of making its entire data set publically available on the internet. Previously, the agency had released only the yearly satellite map and deforestation calculations. Making the underlying remote sensing data publically available has meant that the governments' analysis can be independently verified or questioned by scientists and NGOs, greatly increasing the transparency of the monitoring system. INPE also operates the DETER[12] near-real time monitoring system, which detects clearings of 25 ha or larger for ongoing enforcement purposes, and the DEGRAD system, which monitors forest degradation from selective logging and fires.[13]The international remote sensing science community has long regarded INPE's deforestation monitoring system as a global leader.[14]

Acre, however, also has its own deforestation monitoring program, the Central Geoprocessing and Remote Sensing Unit (UCEGEO), which since 2008 has conducted its own analysis of the PRODES data, as well as acting as the repository for the data base of Ecological-Economic Zoning process, and other geographic information relevant for land-use monitoring and planning. While Acre uses INPE's deforestation analysis in order to ensure comparability with other states, its own, more detailed, re-analysis of the PRODES data shows that historical deforestation from 1996 - 2005 was somewhat higher than INPE had calculated. This means that using the INPE analysis to formulate a deforestation Reference Level produces a conservative estimate, and that real reductions in deforestation in the state since 2005 were probably higher than INPE reported. In addition, UCEGEO is in process of obtaining very high-resolution satellite data (4-meter resolution Rapid Eye images) for the state, further enhancing the accuracy and precision of deforestation and emissions monitoring.[15]

Greenhouse Gas emissions from deforestation are measured according to generally accepted international guidelines for measuring emissions from land use change (IPCC Good Practice Guidelines; GOFC-GOLD), based in forest inventories and the map of 18 forest types prepared for the second phase of the Ecological-Economic Zoning Plans, as systematized by Salimon.[16],[17] Carbon values are derived from deforestation using the average carbon density of the state's forests, based on the inventories and vegetation mapping, of 123 t/C/ha. Total emissions for the state in 2010 were 22,683,000 t/CO_2e, of which about 97% were from deforestation and land use change. While the state's emissions inventory estimates soil carbon as well as Above Ground Live Biomass (AGLB), for purposes of carbon crediting, Acre has taken a conservative approach, using only AGLB.

Deforestation Reference Level and Targets: a transparent, conservative approach.

Acre has, in conformance with the National Climate Change Policy (Lei No. 1287/2009), adopted a reference level based on average annual deforestation from 1996 – 2005, or 602 km²/yr⁻¹. As noted, Acre uses INPE's PRODES deforestation analysis in order to maintain consistency with the national system. Also in keeping with the NCCP, the reference level is adjusted downward, such that from 2011 – 2020, the reference level is the average annual deforestation from 2001 – 2010, or 496 km²/yr⁻¹. (Figure 6).

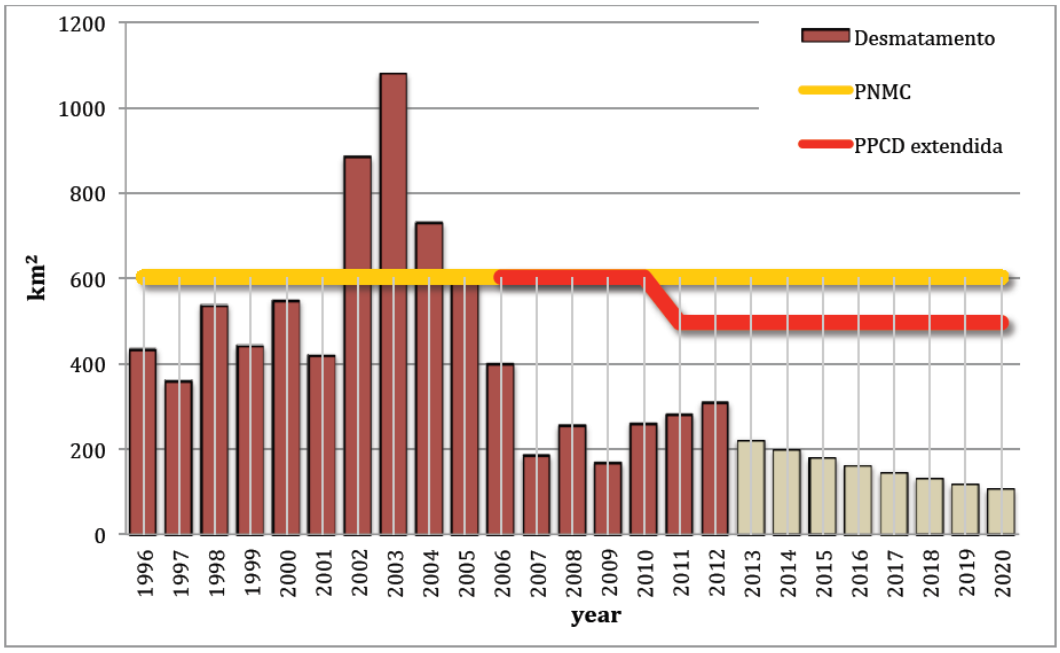


Figure 5. Acre emissions reduction reference level, adjusted downward after 2010. Source: Jurisdictional Program of Incentives for Environmental Services Related to Carbon of the State of Acre, Brazil. Institute for Climate Change and Regulation of Environmental Services, Environmental Services Development Company, Rio Branco Acre, 13/08/2013.

This is in fact an extremely conservative and therefore reliable method of calculating the deforestation reference level, as is evident from comparison with modeling of the projected business-as-usual deforestation trajectory (Figures 7, 8). Extrapolation of deforestation trends using the SimAmazônia model[18] yield far greater expected deforestation than the 1996 – 2005 average (Figures 7, 8). Average annual deforestation under the business-as-usual projection would be over 1,900

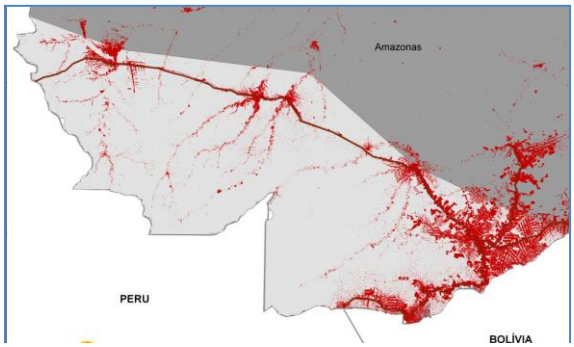


Figure 6. Deforestation, 2009.1.9 Million ha. 12% of state (source: SimAmazonia (see note 19).

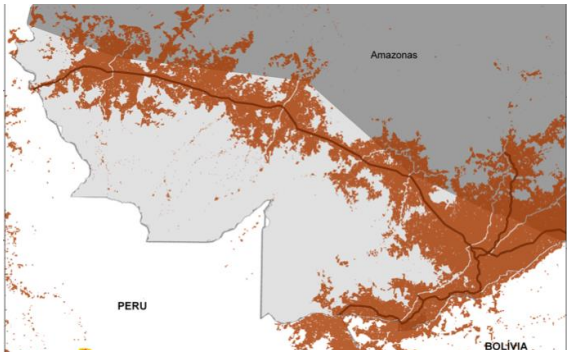


Figure 7.Projected 2030 Deforestation. 5.9 Million ha. 36% of state (source – SimAmazonia (see note 19).

km^2/yr^{-1}, or over three times more than under the state's historical reference level[19].

Accurate, and increasingly fine-grained, deforestation and emissions monitoring is the basis for Acre's Incentives for Environmental Services – Carbon Program, under its state Incentive System for Environmental Services.

Incentive System for Environmental Services (SISA)

Acre's long-term vision for a sustainable, equitable and prosperous forest-based economy, underpinning all of its development and environmental policies, is based on the understanding that in a world of increasing global demand and a finite stock of strategic natural resources, environmental services and global public goods such as rainfall, climate stabilization, water supply and biodiversity should, and will, eventually come to be recognized and valued in global markets. This value may take various forms, from government subsidies for and investment in sustainable production, support and incentives for intensifying production on already cleared areas and legalization of legitimate enterprises, to market access and premiums for certified products and developing actual markets for environmental goods and services. The state's Incentive System for Environmental Services (SISA) and the creation of tradable carbon credits for emission reductions from deforestation and forest degradation (REDD+, in the terminology of the United Nations Framework Convention on Climate Change), is generally recognized as the world's most advanced system for creating carbon market value for reducing deforestation[20].

The SISA, established by state law No. 2.308/2010, creates the institutional framework and operational principles for a comprehensive system of incentives for environmental services, potentially including biodiversity conservation, water supply and quality, as well as carbon sequestration and reduction of deforestation. The first program of the SISA is the Incentives for Environmental Services – Carbon program.

The SISA created the state Institute for Climate Change and Regulation of Environmental Services (IMC), the regulatory agency, and the Environmental Services Development Company (CDSA), a mixed, public/private company able to enter into commercial partnerships with private investors or companies as the operation arm of the Carbon (and eventually other environmental service) program. In addition,

the SISA established a Validation and Monitoring Commission (CEVA), comprised of equal numbers of civil society and government representatives, and responsible for monitoring and evaluating actions and initiatives undertaken through the SISA, as well as for approving all supplemental regulations and procedures. The CEVA reports its findings to the state Forestry and Environment and Rural Development Councils. An independent Scientific Committee, including several IPCC land use change scientists and the former vice-chair of the IPCC, Dr. Gylvan Meira, established Acre's reference level and has validated 11.5 million tons/CO_2e of emissions reductions achieved between 2009 – 2013 under the Acre Carbon Standard, registered with the Markit Environmental Registry.[21] The SISA also includes an Ombudsman, charged with investigating and addressing questions or complaints that may arise in relation to the program.

Ten percent of reductions achieved are set aside as a "technical reserve" in case of reversals, and a further ten percent of reductions are set aside so that they can if needed be issued to private projects, nested into Acre's jurisdiction-wide program.

SISA's treatment of "carbon rights" represents an important innovation, of particular importance for carbon crediting in tropical forest regions. It is often argued that confused land tenure or conflicts over land rights in tropical regions such as the Amazon makes assigning carbon rights difficult or impossible, thus undermining the rationale for incentives to reduce deforestation. The SISA, however, regards reducing deforestation and enhancing carbon sequestration as services, rather than regarding carbon as a good. It then defines who the providers of the environmental services are: "The providers of environmental services are those who promote legitimate actions of preservation, conservation, restoration and sustainable use of natural resources, in conformance and convergence with the directives of this Law, with the ZEE-AC, with the State Policy for Valuing Forest Environmental Assets, and with the Plan to Prevent and Control Deforestation."[22] The SISA then stipulates that the providers of environmental services are eligible to benefit from the SISA if they participate in the programs, sub-programs, action plans and special projects defined in the law. In this way the SISA clearly separates the issue of "carbon credit" or benefit distribution under the state law from land tenure.

The creation of the SISA was preceded by extensive public consultation with all sectors of civil society. Acre's state-level policies and practices regarding indigenous peoples are particularly important in this context.

Indigenous Peoples, Reducing Deforestation and Payment for Environmental Services

The legal recognition and on-the-ground protection of indigenous territories in the Amazon over last several decades is one of the principal reasons that Brazil has been able to reduce Amazon deforestation over 70% since 2005. Indigenous peoples now have legal rights and largely control access to 20% of the Amazon, an area of forest twice the size of California. Historically, Amazon states have been among the leading opponents to demarcation of indigenous lands, regarding them as obstacles to development. Acre under the Government of the Forest, has taken a different approach.

Unlike most Brazilian states, Acre has supported indigenous rights and developed various programs with indigenous communities, as well as conducting broad consultations with indigenous communities in the

process of constructing its sustainable development and payment for environmental services policies. The concept of the "Government of the Forest" was in fact an expression of solidarity, and identification, with the "peoples of the forest" or indigenous groups and traditional communities of rubber tappers and Brazil nut collectors. Recognition of indigenous land rights, protection of indigenous territories, and indigenous health services are federal responsibilities, but Acre has invested in complementary programs and initiatives, focusing on territorial and resource management and land-use planning.

There are 15 indigenous peoples in Acre, who speak 14 languages, and live in 36 recognized indigenous territories, with a population of about 15,000. Twenty-nine of these territories have carried out ethno-zoning and ethno-mapping in the process of elaboration of Indigenous Environmental Territorial Management Plans, with support from the state government. In fact, the National Indigenous Environmental Territorial Management Policy (PNGATI), which governs indigenous access to REDD+ and other development resources, drew on Acre's experience with indigenous land-use planning over the last decade.[23]

Ashaninka indigenous people's musical performance at indigenous meeting in Acre.

The state government, through a 2009 agreement with the National Indian Foundation, has developed and funded projects in the indigenous lands on territorial monitoring and management, sustainable economic alternatives, and strengthening local organizations and traditional culture. Between 2011 – 2014, the state invested over R$10.8 million in management programs in the indigenous territories,[24] in addition to resources directed to the indigenous areas under Acre's first-ever international transaction of REDD+ credits under its jurisdictional REDD+ program (see X, below).

The SISA includes an Indigenous Working Group, consisting of two state and one federal agencies, one indigenous support NGO (the internationally recognized Acre Pro-Indian Commission, CPI-AC, with over 25 years of experience with indigenous bi-lingual education, health and resource management projects with indigenous groups in the state), and seven indigenous organizations. The Working Group has, after extensive consultations, elaborated a letter of principles to govern incentive for environmental services programs with indigenous groups (see Annex 1). The Working Group has since 2013 worked on the design of the SISA Indigenous Sub-program -- one of the principal beneficiaries of Acre's first sale of REDD+ credits to the German Development Bank (KfW) REDD Early Movers Program. This transaction is the first international sale of verified REDD+ credits from a jurisdictional program as well as a good illustration of how the jurisdictional system works, in particular regarding benefit sharing.

KfW REDD+ Early Movers Credit Purchase

The German Bank for Economic Cooperation and Development and the development aid agency KfW, created the REDD+ Early Movers Program seeking to reward states or countries that have achieved real, verifiable emissions reductions from deforestation and forest degradation, by buying REDD+ credits on a payment-for-performance basis and retiring the credits. The program aims to support jurisdictions that have moved to reduce emissions from deforestation in the absence of carbon market crediting, and explicitly requires that emissions reductions are real, measurable and verifiable, that indigenous and other forest communities' rights are respected and that these communities benefit from funds allocated under the program. Acre is the first program supported by the REM program. Seventy percent of the first €16 million tranche of KfW funds are being invested in dozens of small projects for indigenous and other forest peoples – economic alternatives, technical assistance, monitoring and certification of sustainable agroforestry systems, subsidies for sustainable forest products, territorial and resource management plans, and others.

Under its agreement with KfW, Acre contracted with the Markit Environmental Registry, among the largest environmental services registries in the world, to register verified emissions reductions from its state-level program. The Climate Change Institute submitted a description of how the program is structured and how emissions reductions were measured to Markit,[25] which accepted the methodology as the Acre Carbon Standard, including the emissions reference level and targets described above. The SISA Scientific Committee, based on PRODES deforestation data and a conservative estimate of average above-ground biomass for the state, validated the reduction of 106 million tons/CO_2e from August 2006 – July 2012, below the annual average emissions from 1996 – 2005.[26] Markit's evaluation of the Acre system found that validation by the SISA Scientific Committee met the required standard for independent validation of emissions offset credits.

Of these reductions Acre then registered 11,550,000 t/CO_2e, which were purchased by KfW for €16 million. Based in discussion with the Committee for Monitoring and Validation (CEVA) 70% of these resources have been allocated to projects with indigenous and traditional communities (rubber tappers, Brazil nut collectors, artisanal fishers), while 30% go to the relevant government agencies (IMC, CDSA, and SEDENS). Projects with indigenous peoples include capacity building courses for leaders on climate change and environmental services, training of indigenous agroforestry agents (aiming to join traditional and scientific knowledge of forest resources to improve incomes and livelihoods on a sustainable basis), paying indigenous agroforestry agents, and a small projects fund for communities to implement their ethno-zoning and Territorial Management Plans. Resources for traditional communities are concentrated on intensifying and adding value to agriculture and other production activities on already cleared and/or degraded lands. The resources have been divided evenly between directly reducing deforestation (producing more on already cleared lands), or carbon flows, and protecting existing carbon stocks (support for indigenous initiatives).

Acre's state wide incentive system, coupled with institutional capacity for public participation and transparency, has allowed it to achieve significant emissions reductions, monitor and measure them using robust but simple criteria, have them validated by independent, internationally recognized scientists, and register them in a widely used international registry. The "jurisdictional approach" also makes benefit sharing simpler and more equitable than a purely project based-approach would. Under a project methodology, indigenous and traditional communities, who are directly responsible for very little past deforestation, would be able to claim much less credit than historically large-scale deforesters. Calculating reductions would involve complex and expensive projections of business-as-usual emissions and measurement of local forest carbon values. Instead, once state-wide emissions reductions are achieved, IMC and the CEVA (including the Indigenous Working Group) can make the common sense determination that both people who directly reduce deforestation and people who protect existing carbon stocks need to benefit from an incentive system if it is to be effective, and allocate benefits using a "stock-flow" approach (division of benefits between reducing carbon flows, and protecting carbon stocks[27]. KfW plans to buy a second tranche of vintage 2012 – 2013 Acre credits this year for some €9 million.

Growing the Economy while Reducing Deforestation: Public/Private/Community Partnerships

Acre's private sector has, since the collapse of the rubber boom, been limited in both scope and ambition, as could be expected from a small isolated state with poor transportation infrastructure, little access to external markets and a relatively small, impoverished population. Consequently, supporting the growth of a vibrant private sector in a high-environmental quality, low-carbon economy, has been a major challenge and priority. Following the establishment of rule of law, fiscal responsibility and good governance, and the development of the sustainable development and deforestation reduction policy framework, Governor Tião Viana made significant advances in expanding productive activities on already cleared lands from 2010 – 2014, largely through the Government of the Forest's strategy of "public/private/community partnerships". Government invests in infrastructure, training and technical assistance, to allow communities to undertake higher-value added, higher return activities, and where possible attracts private investors to invest in and manage new undertakings.

Native Rubber Latex Condom Factory – Natex

Natex, the only condom factory in the world to use native (non-plantation) rubber, started when then-Senator Tião Viana got federal government support for building a state-of-the-art condom factory in Xapuri. Government also trained and equipped rubber tappers in the neighboring Chico Mendes Extractive Reserve and other reserves to supply native rubber latex, a much higher quality and more demanding product than the coagulated rubber they had delivered to processors for tire factories. Staff from Xapuri were also trained to meet the rigorous quality and sanitation standards needed for surgical-quality latex products. Today, the factory employs 170 people and buys latex from 700 families on the Chico Mendes and neighboring Reserves[28]. Last year, Natex delivered over 86 million condoms to the Ministry of Health's AIDs prevention program. The factory has space to double its output.

Brazil Nuts – Cooperacre Coop, Brazil nut and Fruit Processing Plants

Brazil nuts historically represent an important source of cash income for forest communities in the eastern part of Acre (where Brazil nut trees *(Bertholettia excelsa)* occur, but collectors' isolation and lack of access to processing technology meant low prices for unprocessed nuts. State government has organized most of the rural families that collect Brazil nuts into cooperatives, and invested in processing technology, increasing incomes and output. Coooperacre, the largest of these, now has 2,000 member families and is the owner of the largest-scale industrial plant in the state, including 3 Brazil nut processing plants, with working capital of R$11 million for acquisition of the harvest.[29] Brazil nut production increased from 6,600 tons, worth R$2.8 million in 2002 to 14,000 tons valued at R$19.3 million in 2011, while family income from Brazil nuts nearly quadrupled.[30] Cooperacre now has the capacity to produce fruit pulp and has begun processing *açaí* (*Euterpe precatoria*) from about 2,000 ha of *açaí* planted to restore deforested areas, with public and private investment. The Coop now has the capacity to process not only all of Acre's production, but production from other states as well. With the modernization of the three processing plants, Cooperacre is likely to t become the largest Brazil nut processor in the country. Cooperacre is a successful example of public/private/community partnership.

Alternative Protein on Cleared Land: Fish Farming—Amazonia Fish

The Acre Business Agency (ANAC), a public/private company under the Secretariat for Development of Forestry, Industry, Commerce and Sustainable Services (SEDENS), is a key agency for the development of public/private/community partnerships. Like CDSA, it can negotiate and participate in ventures with private, for-profit investors. Amazonia Fish, which has achieved significant growth in the volume and value of farm-raised fish over the last four years is an illustration. Before 2011, there were a few fish-farming operations in the state. ANAC organized cooperatives of fish farmers in 22 counties (now with about 2,500 members), and donated 3,700 fish ponds. The agency also created the public/private company, Amazonia Fish, in which ANAC and 16 private investors are partners, and the Coop, Acrepeixe, has 25% of the shares. The company has invested R$70 million in public and private resources in an Acre Fish Farming Complex, including a fish fry factory, a feed factory and a refrigerated fish packing plant. Some 10,000 families, including coop members and others, are investing in the sector. Fish production grew from 4,000 tons in 2009, to 17,000 tons in 2014, and is slated to increase to 20 million tons when the complex is complete in 2014, creating 2,000 direct and 10,000 indirect jobs.[31] Farmed fish are a potentially significant export product for the state.

ANAC has begun similar joint ventures for pork, sheep and chickens as well. The government also greatly increased grain storage capacity in the state, constructing new silos in fivecounties. The effect of the investment in small livestock has been to increase demand for and production of corn, which went from 56,000 tons in 2007 to 96,000 tons in 2012. There is scope for increasing corn production, since 50% of consumption comes from outside the state. Leaving stalks and leaves in the field and using no-till planting makes growing corn a means of restoring degraded lands.

These are clearly effective means of increasing employment, incomes and revenue through investment in new technology and higher-value use of already deforested or degraded lands.

Rationalizing and Legalizing the Forestry Sector – Forestry Management

As in most of the Amazon, until recently, most timber production in Acre was illegal, in part because of bureaucratic obstacles to obtaining the necessary licenses and authorizations, and in part for lack of law enforcement. Acre has both improved enforcement and established 240,000 ha of forestry concessions in state forests, as well as 180,000 ha under community forest management. In 2010 there were only 180 community forest management projects, while by 2014 there were 960.[32] Growth in legal forestry management made it possible in 2011 to legalize the 350 woodworking operations in the state, which had previously operated illegally because of the difficulty in obtaining legally produced timber, as well as in finding buyers for more expensive timber from managed concessions.[33] The initial public-private-community partnership in the sector was the Xapuri Forest-Industrial Complex, a flooring factory in the town of Xapuri built by government, which buys legally produced and FSC certified timber from forest communities in the Cooperfloresta forestry management coop. The privately managed factory now produces material for construction, including doors, windows and beams. Two further forest-industrial complexes have been installed, in Sena Madureira and Cruzeiro do Sul, each with the capacity to process 100,000 cubic meters per year of timber and employ 200 people. The government is now buying furniture from the state woodworkers, as well the components for the 10,350 new homes it is constructing in a major new public housing project, "City of the People", which will house 50,000 people now in substandard or at-risk housing. Government has also invested in infrastructure for a Furniture Manufacturing Nucleus (Polo Moveleiro), making high-quality furniture manufacturing possible for the first time.

Investment and Business Planning—Private Investment Fund

The Acre government has been enterprising in accessing national and international funding sources, mobilizing some $R4.7 billion from 2011-2014 in both grants and loans from donors ranging from the World Bank and Interamerican Development Bank, Brazil's National Bank for Economic and Social Development (BNDES), the Amazon Fund, Kfw and others. As in case of the public/private/community partnerships, the state has pursued innovative financial structures to leverage private investment. The state has for example created a Private Investment Fund, the Fund for Sustainable Business of the Amazon, in which both ANAC and BNDES are partners, along with three private investors, and which is investing in Amazonia Fish and other PPC partnerships.

The state has also negotiated the creation of an Export Processing Zone (ZPE), a tax-advantaged free-trade district intended to stimulate exports though the Pacific Highway to Peru, Bolivia and out of Pacific Ocean ports to Asia and the western US and Canada. Some forty businesses have submitted letters of intent to operate out of the ZPE.

Risks

Despite impressive progress in creating the basis for long-term environmentally sustainable and socially equitable development, Acre remains a relatively poor, isolated state, whose economy remains dependent on the public sector (albeit to a somewhat lesser extent than historically). While investment

in Acre's innovative programs offers potentially great environmental, social and economic returns, there are several kinds of risks associated with it.

- Political Risk: The "Government of the Forest" is now in its fifth consecutive term – an exceptionally long run for any party or coalition in a democracy. Young voters have no memory of pre-1999 conditions in the state, and expectations have increased among all voters. A new government of the current opposition could promote a higher-deforestation development paradigm. To the extent that investment in Acre's SISA and other green-economy programs fails to grow, this risk will increase.
- Financial Risk: The government has invested heavily in developing the green economy and in fomenting growth in general, including taking on national and international debt, while at the same time remaining (like many Amazon states) dependent on federal transfers for substantial part of its budget. In the event of a severe economic downturn, or serious underperformance of government investments, government's ability to invest in and sustain new programs could be constrained. This could exacerbate political risk for the current government.
- Risk of conflict with the federal government: The SISA carbon program (Incentives for Environmental Services-Carbon) in particular is premised on the supposition (supported by legal analysis of the state's Attorney General) that a substantial part of the emissions reductions form deforestation achieved in the state can be transacted by the state government. The federal government, however, has not yet regulated the national REDD+ policy, and might either claim rights to the emissions reductions or attempt to prohibit their use in international compliance markets, or both.

Several factors may ameliorate or buffer against these risks. The "government of the forest" is keenly aware of voters' burgeoning expectations, and its continued investments in infrastructure, services and economic opportunities – as well as effective disaster relief, for example in this year's floods – have earned it continued popular support. It will be difficult for the opposition to unseat this government merely because of its long term in office. Financial risk, while non-negligible, is limited by the fact that major federal transfers are constitutionally mandated and represent fixed shares of federal income and other taxes. These may decline, but will not cease. The federal government position on national REDD+ policy is a source of uncertainty – but Acre has already set aside substantial reserves of emissions reductions to meet federal demands, and not only Acre's Attorney General, but states' AGs in general conclude that states do in fact have legal rights to dispose of at least part of the emissions reductions in their states.

Conclusion

Acre's declining deforestation trajectory since 2005 and increasing agriculture and cattle production mirrors the other Amazon states on the "Arc of Deforestation" where most forest clearing has historically been concentrated. The reasons for the approximately 70% decline in deforestation over this period include creation of new protected areas and recognition of indigenous territories, consumer

pressure through supply chains and regulation for deforestation-free soy and beef, improved monitoring and ramped-up law enforcement, as well as lower commodity prices.[34] [35] [36] Some were undoubtedly more salient in some regions rather than others – Mato Grosso, for example has relatively few protected areas and indigenous territories, while Acre and Amazonas havevery little or no soy, respectively.[37] Acre's comparative advantage is in leadership that is not only committed to core values of good governance, sustainable growth and development, social equity and forest protection, but demonstrable success over the last 16 years in building a political majority based on these values and the development results they have delivered. While there are risks associated with investment in the state, Acre's society and government have overcome challenges of similar or greater dimensions in achieving development and environmental results to date. Investors now have a singular opportunity to help the society of Acre lock in the protection of the 87% of its surface still forested, an area the size of New York state of some of the most biologically diverse and carbon rich forest in the world, supporting a vibrant cultural diversity, by investing in the state's first-in-class state-wide forest carbon emissions reductions.

Annex I – Indigenous Working Group of the Monitoring and Evaluation Committee of the SISA: Letter of Principles for Payment for Environmental Service projects with indigenous peoples.

The Charter of Principles, agreed to by the GT after months of discussion at regular meetings, training workshops, moments of consultation with indigenous organizations and opportunities for expression from other stakeholders, underscores how fundamental the guidelines for the implementation of incentive programs for environmental services in indigenous lands of Acre are:

a) Recognition of rights in the Brazilian Federal Constitution, Convention 169 of the International Labor Organization (ILO) and the Declaration of the United Nations (UN) on the Rights of Indigenous Peoples (among them, self-determination and the process of consultation, free and informed).

b) Compliance with the National Environmental Management Policy and Territorial Indigenous Lands (PNGATI) and land management policy underway in the state, through ethno-zoning and ethno-mapping of their respective Indigenous Lands Management Plans (PGTIs)

c) Respect for the set of social and environmental safeguards approved by CEVA for SISA, such as: i) legal compliance, ii) recognition and guarantee of rights, iii) benefit sharing, iv) economic sustainability, improving the quality of life and reduced poverty, v) conservation and environmental restoration, vi) participation vii) monitoring and transparency viii) good governance.

d) Recognizing and strengthening the historical contribution of indigenous peoples to maintain forest inventories (forest stand) and other environmental services, through traditional resource management as well as land management strategies, allocating financial support to enable sustainable development actions of each nation.

e) All shares also objectify the following assumptions: i) recognition and respect for the rights of indigenous peoples pertaining to their lands, cultures and traditional customs; ii) strengthening forest governance in Indian lands; iii) implementation of government actions according to the reality and needs of each nation and region; iv) guarantee the effective participation of all peoples and their organizations; v) participation of indigenous peoples in the construction of respective actions and programs relevant to indigenous peoples, through the process of free, prior and informed consent (FPIC); and vi) ensuring the participation of indigenous women in consultation processes and other project-related activities;

f) The programs and actions should contribute to strengthening the activities of agroforestry agents in indigenous lands as a tool of territorial management.

Endnotes

[1] De Souza, Moisés B., M. Silveira, M.R.M. Lopes, L.J.S Vierira, E. Guilherme, A.M. Caloura, and E.F. Morato. "A Biodiversidade no Estado do Acre: Conhecimento Atual, Conservação e Perspectiva." *T&C Amazônia* 1, no. 3 (2003). http://www.scribd.com/doc/120001186/A-Biodiversidade-No-Estado-Do-Acre#scribd.

[2] Ricardo, Beto and F. Ricardo, Eds. *Povos Indígenas no Brasil, 2006 – 2010.* São Paulo: Instituto Socioambiental, 2011.

[3] Mendes, Chico. *Fight for the Forest: Chico Mendes in his own words.* London: Latin American Bureau, 1989.

[4] Carneiro, Cláudia. "Jorge Viana, o senhor da floresta." Isto é Gente, 1999. http://www.terra.com.br/istoegente/14/reportagens/rep_viana.htm.

[5] Vaz de Lima, Fabio. "Conceitos e preconceitos sobre desenvolvimento sustentavel." Artigo, 2014.

[6] Maia, Heliandro, N.L. Sacarro Junior, J.J. Gomez, M. Roper, and M.O. Pires. "Avaliação das políticas de desenvolvimento sustentável do estado do Acre (1999-2012)." Rio Branco, Acre*: Comissão Econômica para Amêrica Latina e o Caribe (CEPAL)* (2014), p. 23.

[7] Maia, Heliandro, N.L. Sacarro Junior, J.J. Gomez, M. Roper, and M.O. Pires. "Avaliação das políticas de desenvolvimento sustentável do estado do Acre (1999-2012)." Rio Branco, Acre*: Comissão Econômica para Amêrica Latina e o Caribe (CEPAL)* (2014), p. 36.

[8] Maia, Heliandro, N.L. Sacarro Junior, J.J. Gomez, M. Roper, and M.O. Pires. "Avaliação das políticas de desenvolvimento sustentável do estado do Acre (1999-2012)." Rio Branco, Acre*: Comissão Econômica para Amêrica Latina e o Caribe (CEPAL)* (2014).

[9] "Plano estadual de prevenção e controle do desmatamento do Acre." *Governo do Estado do Acre; Secretaria de Meio Ambiente (SEMA)*, 2014.

[10] "Plano Integrado de Prevenção e Controle das Queimadas e Incêndios Forestais no Acre." *Governo do Estado do Acre; Secretaria de Meio Ambiente (SEMA)*, 2011.

[11]Ministério Da Ciéncia, Tecologia e Invação. *Instituto Nacional de Pesquisas Espacais.* www.inpe.br.

[12]Ministério Da Ciéncia, Tecologia e Invação. *Sistema DETER.* http://www.obt.inpe.br/deter/.

[13]DeFries, Ruth, F. Achard, S. Brown, M. Herold, D. Murdiyarso, B. Schlamadinger, and De Souza, C. "Reducing Greenhouse Gas Emissions from Deforestation in Developing Countries: Considerations for Monitoring and Measuring." Global Terrestrial Observing System (GTOS) 26, no. 46 (2006). http://www.obt.inpe.br/degrad/.

[14] *Ibid.*

[15] *Avaliação do desmatamento no estado do Acre para os anos de 2011 e 2012 com base na metodologia da UCEGEO.* Rio Branco: *IMEC*, 2013.

[16] Salimon, Cleber I. Putz, F.E. Menezes-Filho, L. Anderson, A. Silveira, M. Brown, I.F. and Oliveira, I.C. "Estimating State-wide Biomass Carbon Stocks for a REDD Plan in Acre, Brazil." *Forest Ecology and Management* 262.3 (2011): 555-60.

[17] Costa, Falberni de Souza, Amaral E. F., Butzke, A. G.,and Nascimento F.F. "Inventário De Emissões Antrópicas E Sumidouros De Gases De Efeito Estufa Do Estado Do Acre: Ano-base 2010." Rio Branco: Embrapa Acre (2012): 41-77.

[18] *Ibid.*

[19] Soares Filho, Britaldo, DC Nepstad, LM Curran, Cerqueira GC, Garcia RA, Azevedo Ramos C, Voll E, McDonald A, Lefebvre P, Schlesinger P., Modeling Conservation in the Amazon Basin. *Nature*, Vol 440|23 March 2006|doi:10.1038/nature04389.

[20] Duchelle, Amy E, M. Greenleaf, D. Mello, M.F. Gebara and T. Mello. Acre's State System of Environmental Services (SISA), Brazil. In Sills EO, Atmadja SS, de Sassi, C, Duchelle AE, Kweka DL, Resosudarmo IAP, and Sunderlin WD, eds. *REDD+ on the ground: A case book of subnational initiatives across the globe.* Bogor, Indonesia: CIFOR, 2014.

[21] "Markit Environmental Registry- Buccleuch Estates." *Markit Environmental Registry- Public Reports*, 2015. https://mer.markit.com/br-reg/public/index.jsp?entity=issuance&name=&standardId=&unitClass=&sort=account_name&dir=DESC&start=3180.

[22] Governo do Estado do Acre, *Law No. 2.308/010*, *Section III, Art. 4.,* 2010.
[23] "Nota Técnica: Políticas Públicas do Estado do Acre para os Povos Indígenas." *Instituto de Mudança Climática e Regulação de Serviços Ambientais*, 2014.
[24] *Ibid.*
[25] "Jurisdictional Program of Incentives for Environmental Services Related to Carbon of the State of Acre, Brazil." *Institute for Climate Change and Regulation of Environmental Services, Environmental Services Development Company,* 2013.
[26] "Markit Environmental Registry - ISA Carbon Program of Acre (ID: 103000000005599)."*Markit Environmental Registry - Project Details*, 2015. https://mer.markit.com/br-reg/public/project.jsp?project_id=103000000005599.
[27] Cattaneo, Andrea, Incentives to Reduce Emissions from deforestation: A Stock-Flow Approach with Target Reductions in V. Bosetti and R. Lubowski eds, *Deforestation and Climate Change: reducing carbon emissions from deforestation and forest degradation.* Edward Elgar, Cehletenham UK. 2010.
[28] "Governo do Estado do Acre, Banco Nacional de Desenvolvimento Econômico e Social." Caminhos do Acre, 2014.
[29] Vaz de Lima, Fabio. "Conceitos e preconceitos sobre desenvolvimento sustentavel." Pagina 20,31/12/2014, Rio Branoc Acre..
[30] Maia, Heliandro, N.L. Sacarro Junior, J.J. Gomez, M. Roper, and M.O. Pires. "Avaliação das políticas de desenvolvimento sustentável do estado do Acre (1999-2012*)." Comissão Econômica para Amêrica Latina e o Caribe (CEPAL)* (2014).
[31] "Governo do Estado do Acre, Banco Nacional de Desenvolvimento Econômico e Social." Caminhos do Acre, 2014.
[32] Vaz de Lima, Fabio. "Conceitos e preconceitos sobre desenvolvimento sustentavel." Página 20, 31/12/2014, Rio Branco, Acre.
[33] Governo do Estado do Acre, Banco Nacional de Desenvolvimento Econômico e Social." Caminhos do Acre, 2014.
[34] Nepstad, Daniel, D. McGrath, M., Stickler,C., Alencar, A., Azevedo, A., Swette, B., Bezerra, T., DiGiano, M., Shimada,J., Seroa da Motta,R., Armijo, E., Castello, L., Brando,P., Hansen, M.C., McGrath-Horn, M., Carvalho, O., and Hess, L. "Slowing Amazon Deforestation Through Public Policy and Interventions in Beef and Soy Supply Chains." *Science* 344 (2014): 1118-1123.
[35] Soares Filho, Britaldo, Moutinho, P., Nepstad, D., Anderson, A., Rodrigues, H.,Garcia, R., Dietzsch, L., Merry, F., Bowman, M., Hissa, L., Silvestrini, R.,and Maretti, C. " Role of Brazilian Amazon protected areas in climate change mitigation." *PNAS* (2009).
[36] Ferretti-Gallon, Kalifi and Jonah Busch. "What Drives Deforestation and What Stops It? A Meta-Analysis of Spatially Explicit Econometric Studies." *Center for Global Development* 361.2 (2014).
[37] Assunção, Juliano, C.C. e Gandour, and R. Rocha. "Deforestation Slowdown in the Legal Amazon: Prices or Policies?" *Climate Policy Initiative* (2012).