The Nature Conservancy

São Félix do Xingu, Brazil

A Jurisdictional Approach to Conserving the Amazon

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Table of Contents

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Executive Summary

Since 2009, The Nature Conservancy has supported a jurisdictional program in the municipality of São Félix do Xingu (SFX), Pará, Brazil to reduce deforestation and support sustainable economic development. SFX represents a microcosm of the challenges of deforestation and sustainable development in the Brazilian Amazon. The program was built to bring together multiple conservation strategies into a single landscape to demonstrate how to balance improved environmental governance with economic alternatives that do not contribute to deforestation.

With official leadership of the municipal government, the program first responded to the federal deforestation blacklist of the top deforesting municipalities by registering private lands in the Rural Environmental Registry (CAR) and forging a multi-stakeholder pact to end illegal deforestation that also aimed to improve the social and economic well-being of SFX communities. This involved supporting the municipal government to improve capacity by establishing an Environmental Observatory to monitor deforestation, improving licensing processes, improving public communications, and helping develop a low-carbon agriculture strategy.

TNC also supported the identification and development of specialized strategies for specific stakeholders. From these emerged sustainable models on cocoa agroforestry systems (for smallholder farmers), sustainable cattle intensification (for medium and large landholders), indigenous territorial management, and support for management of public protected areas.

Thus far, promising results are being observed within these strategies. Small farmers testing cocoa agroforestry systems have increased their incomes and food security. The cattle intensification model is proving profitable for larger landholders. The cocoa and cattle strategies are expanding into neighboring municipalities with similar land and actor dynamics, and the state of Pará is supporting the scaling up of these models into its Pará 2030 sustainable development plan.

The jurisdictional approach emphasized coordination among focused programs for specific stakeholders and developed from a shared vision of where the municipality and the state wanted to go. Strategies began with early adopters to test ideas before scaling up. The program showed the importance of coupling environmental enforcement with positive economic incentives to create effective partnerships. TNC's technical expertise and political neutrality allowed it to play a critical role as convener and backbone organization to support the jurisdictional and sectoral strategies.

Ongoing challenges include the need to provide effective incentives to transform productive models, and the need for continued environmental enforcement to control illegal deforestation and land grabbing. Empowering local actors to lead the agenda is also critical to maintain progress on environmental governance, and to create resilience to inevitable political changes that can interrupt availability of resources (e.g. reduced enforcement budgets). While major uncertainties remain on governance, resource availability, and protected area management, several viable paths forward have been developed that are worth continued investment and experimentation.

1. Introduction

Tropical forests harbor some of the world's highest biodiversity and carbon stocks, making them essential for conservation and the mitigation of climate change. Yet in many countries, tropical forests are seen as ingredients for economic development, with high demand to harvest or convert them to produce crops, livestock, and timber. These same landscapes are often home to diverse cultures and peoples who have inhabited and used the forests for generations. The challenge of how to balance the protection of vast forested ecosystems and cultural heritage with economic development is a global problem that finds greater urgency in the face of rapid climate change and growing populations.

The Nature Conservancy has worked for nearly 20 years in the Brazilian Amazon[1] on strategies that seek to balance conservation with human well-being. TNC's vision is one where the conservation of natural ecosystems is balanced with the prosperity and well-being of local communities. In the Brazilian Amazon, TNC's programs have focused on sustainably intensifying large-scale cattle and soy production, supporting implementation of environmental policy, and helping to improve the capacity and management of indigenous territories, as well as supporting watershed management, forest restoration, and sustainable economic alternatives for farmers.

In 2009, TNC developed a jurisdictional program in the municipality of São Félix do Xingu, where deforestation rates were the highest in the region, and where many of the challenging issues of the Amazon region overlapped. TNC aimed to build upon progress made at the federal and state levels in addressing deforestation by developing a municipal-scale model for a low-emissions, green economy that could be replicated and scaled up throughout the Amazon. TNC was particularly interested in bringing multiple conservation strategies to a single landscape and to explore how a future funding mechanism might work, both as to how money could flow and how to maintain social justice in decision-making. The vision was to shift from an economy relying on unsustainable natural resource use and deforestation to a model that would value forests and ecosystem services, while improving productivity and socio-economic benefits for its people. The complexity and size of São Félix do Xingu posed a daunting challenge, but also represented the best opportunity for taking lessons to scale.

In São Félix do Xingu, TNC used a multi-stakeholder, jurisdictional approach based on a common vision and shared interests, while also supporting targeted sectoral programs to develop viable development models. These programs were designed to address the needs of major actors in the region: improved cattle ranching for medium and large landowners; cocoa agroforestry and restoration as an economic alternative for small landholders; and territorial planning for indigenous territories to help them continue protecting their lands while realizing their own vision for sustainable development. Throughout, the goal was to balance improved environmental governance with viable economic alternatives that would not contribute to deforestation.

This paper is one in a series of three case studies—alongside the Yucatán Peninsula, Mexico, and East Kalimantan, Indonesia—that represent a decade's worth of TNC's experience in supporting conservation and sustainable rural development in tropical forest landscapes at the jurisdictional scale. Although approaches have varied from place to place, TNC has supported program development, coordination, facilitation of processes, technical assistance, funding, and testing innovations to ensure sustained momentum and progress toward sustainable landscape goals. While REDD+ program development has formed a core part of each program, the programs have embraced a broader sustainable development agenda over time that goes beyond one specific mechanism.

This document aims to systematically describe the jurisdictional program in São Félix do Xingu (SFX) and its relationship to the programs and policies carried out in the state of Pará and the national level from 2009 to the present. The case study discusses the program's development, major milestones, results, and lessons learned. From the start, the SFX program aimed to develop a municipal-scale REDD+ program to support several linked initiatives aimed at environmental governance, multi-stakeholder engagement, and developing models for sustainable production. Key experiences developed at the municipal level have been leveraged to support an emerging statewide plan known as Sustainable Pará. By sharing key insights from this multi-year effort, we hope to inform other experts and jurisdictions facing similar challenges in reducing tropical deforestation and achieving landscape-scale sustainability.

Lessons from this jurisdictional program have contributed to the development of TNC's common framework for Collective System Leadership (CSL) at the landscape scale. CSL represents a promising problem-solving approach to enable diverse stakeholders and sectors to work together effectively in a complex environment to achieve a wide range of sustainability goals at a large scale. The key components of CSL—including a real understanding of the landscape dynamics at play, a defined process for empowering innovation, network-based leadership, and the development of shared vision and accountability—are demonstrated in diverse ways through these programs.

We invite you to consider this case study as one part of a package of inter-related products that contribute to conceptual evolution and advancement of jurisdictional programs throughout tropical forest areas. In addition to the CSL document and other case studies, we have also completed a deep-dive paper on cross-sector collaboration, a systems analysis of key challenges faced by jurisdictional programs, and a survey of existing jurisdictional programs around the world.

2. Context of the Brazilian Amazon

2.1 Social, environmental, and land dynamics

As the world's most biodiverse country, Brazil possesses an astounding wealth of natural and cultural resources. It holds the largest rainforest on Earth, which is home to a quarter of the world's species, and discharges one-fourth of the world's freshwater into the Atlantic Ocean. The Brazilian Amazon contains 40% of the world's remaining rainforests (3.5 million km^2 remaining) and holds 150 billion metric tons of carbon, making its forests enormously important to the world in terms of climate change. For thousands of years, the Amazon Basin has also been home to hundreds of different groups of indigenous peoples, with many continuing to practice their traditional customs and ways of life.[2]

Brazil's natural resources underpin vast agricultural production. But like most types of wealth, Brazil's resources generate both opportunities and conflicts. Brazil is the world's top producer and exporter of several major agricultural commodities, including soy, coffee, sugar, poultry, and beef.[3] Brazil's agricultural, ecological, and cultural values intersect along the Amazonian frontier where tropical deforestation occurs on a massive scale, largely due to unplanned clearing for pastureland. Since 1970, around 18% of the Amazon has been deforested (60 million hectares), with most deforestation concentrated in a broad arc across the states of Pará, Mato Grosso, and Maranhão (see Figure 2).[4] This conversion is immensely harmful to natural systems and the benefits they provide, undermining the very soil and water quality that are the foundations of Brazil's agricultural dominance. Deforestation places Brazil as the world's sixth largest contributor to climate change.[5]

Clearing forest for cattle ranching is the single largest driver of deforestation in the Amazon. Since the 1990s, an estimated 66-80% of deforestation in the Brazilian Amazon was carried out for conversion to cattle pasture;[6,7] this figure is 65% today.[8] This is driven by unsustainable pasture management, which often leads ranchers to abandon degraded land and subsequently clear new forest areas in a destructive cycle. Soy farming has also contributed to deforestation of the Amazon, although has mostly been established on existing pasturelands. Before 2006, around 30% of soy fields were established on lands in the Amazon region that had been deforested within the previous three years; after the 2006 moratorium, this portion decreased to around 1%.[9]

The state of Pará—the focal region of this paper—exemplifies these dynamics, having lost approximately 10% of its total forest cover (12 million hectares) from 1975 to 2014. In 2016, Pará occupied first place among Brazilian states in greenhouse gas emissions (GHG), being responsible for 12.3% of national emissions, or 280 Mt CO2e.[10] Deforestation in Pará is mostly caused by the expansion of cattle production into the forest frontier.[11] Since 2001, Pará has accounted for 39% of all deforestation in the Brazilian Amazon. While

deforestation in Pará has declined significantly since 2004, the state continues to lose more forests per year than any other state in the Amazon with 241,300 hectares of forest lost in 2017.[12]

In recent years, deforestation in the Amazon has been observed occurring in smaller patches with a higher percentage of deforestation seen among smallholders. Large landholders are adapting to avoid satellite detection by clearing in smaller patches (less than 25 hectares). While smallholders have not increased their absolute contribution to deforestation, policy actions to date have not been able to greatly alter their patterns, and thus their percentage contribution to deforestation has increased. Many smallholders still lack access to positive incentives or productive models that would allow them to preserve standing forest while implementing more sustainable production practices.[13]

Despite these challenges, Brazil has made significant progress since 2004 in reducing deforestation, largely through improved monitoring and enforcement. A comprehensive set of policies to improve forest monitoring, strengthen protected areas, keep illegal deforestation products off the market, and require municipal governments to take an active role have helped reduce deforestation by 75% from its peak in 2004 (Pará has seen a 73% reduction).[14] However, rapidly changing political dynamics can threaten this progress, as recent years have seen budget cuts to environmental agencies and intense lobbying by powerful interests to weaken the Forest Code, Brazil's main policy instrument for avoiding deforestation.[15]

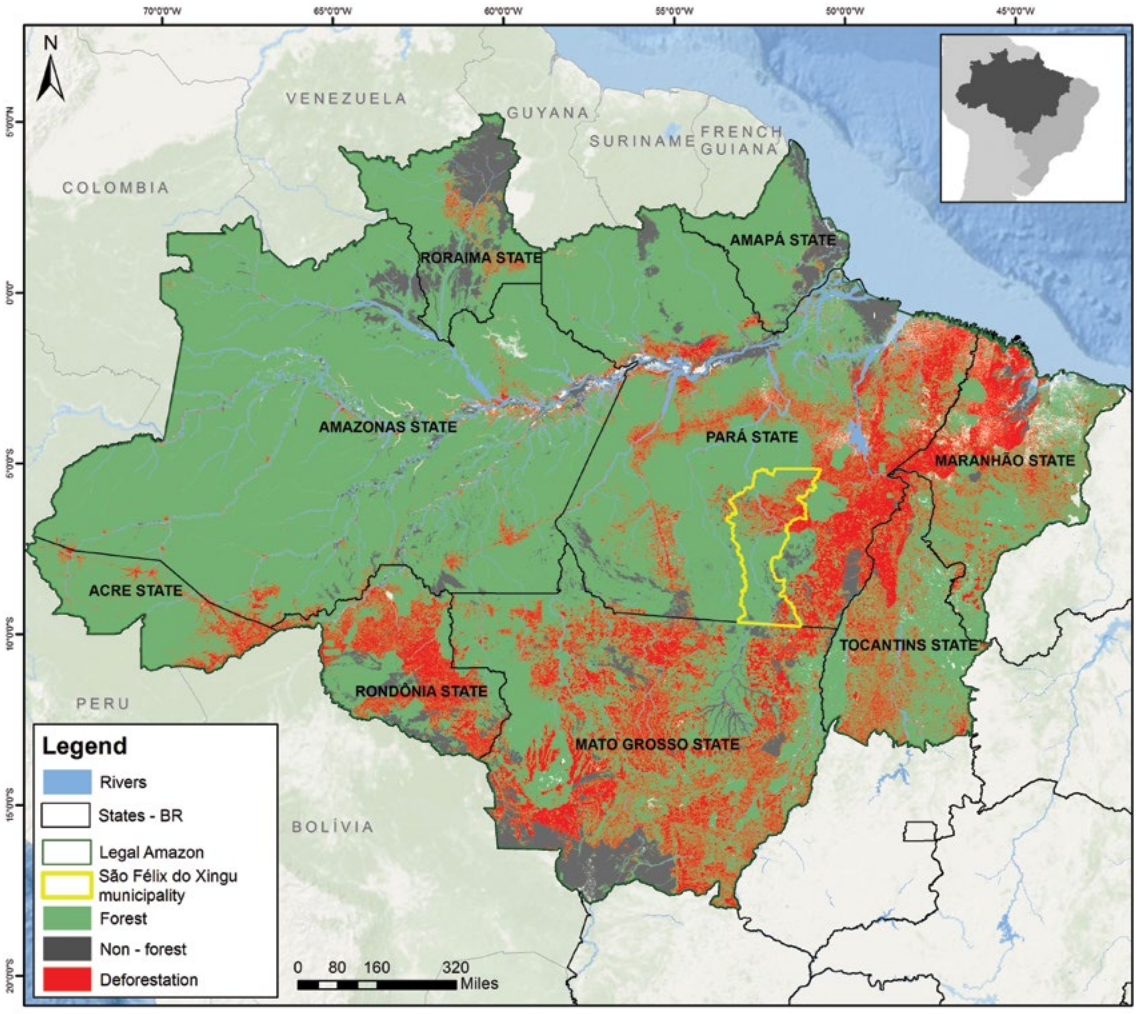


Figure 1. Deforestation in the Brazilian Legal Amazon up to 2017. The São Félix do Xingu municipality is outlined in yellow (TNC 2018).

Figure 2. Deforestation rates in the Brazilian Legal Amazon and the state of Pará.[16]

2.2 Policy Dynamics

Land-use dynamics across the Amazon have followed evolving political positions on what the Amazon means to Brazil. Beginning in the 1960s, the military regime led efforts to integrate the vast Amazon region into Brazil's economic development and consolidate control, in part to prevent incursions from neighboring countries and counter internal dissent.[17] Deforestation took off in the 1970s, coinciding with the opening of the Trans-Amazon highway, colonization programs for landless farmers from the south and northeast, and investments in hydropower and mining.[18]

Brazil's Forest code was passed in 1965 and established the legal framework for management and conservation of forests on private lands. The Forest Code requires landowners to set aside 50-80% of their land as protected forest or allows them to pay other landholders to conserve forests who have surplus over what is required by the Forest Code. Although it is one of the most progressive laws for forest protection in the world, the Forest Code remained largely unenforced for decades in large part due to lack of clear ownership and property records for lands in the Brazilian Amazon and limited government capacity.

The 1970s and 1980s saw environmental organizations multiply throughout Brazil as democratic institutions and governance returned. International concern for the Amazon rainforest dramatically increased in the 1980s and 1990s, sprouting from media coverage of fires in the Amazon, the assassination of rubber tapper Chico Mendes in 1988, criticism of large-scale development projects, and growing concerns about global climate change. These events helped elevate the fate of Amazon rainforest to the forefront of global environmental discussion.[19]

With growing concern at home and abroad on the fate of the Amazon rainforest, Brazil began taking domestic action to address the deforestation crisis. The last two decades have seen dramatically increased enforcement of the Forest Code.[20] In 2004, thirteen ministries within the national government joined forces and launched the Action Plan for Prevention and Control of Deforestation in the Amazon (PPCDAm). The first phase of PPCDAm focused on monitoring and enforcement: it created an advanced remote sensing deforestation

detection system known as DETER and strengthened the capacity and funding of IBAMA (the Brazilian Institute of Environment and Renewable Natural Resources), the agency tasked with policing and enforcing environmental law. PPCDAm established an additional 25 million hectares of federal conservation areas, 10 million hectares of indigenous territories, and 25 million hectares of conservation units at the state level to serve as strategic barriers to the arc of deforestation.[21]

Two Greenpeace reports released in the 2000s also helped link international and Brazilian demand for soy and beef to deforestation in the Amazon, leading to additional policy changes. In 2004, the transnational agribusiness giant Cargill began operating a soybean terminal in Santarém, at the confluence of the Tapajós and Amazon rivers. In 2006, Greenpeace released the report, "Eating Up the Amazon," which charged that Brazil's surging soy sector and multinational companies like Cargill and McDonald's were complicit in the Amazon's deforestation. This increased consumer awareness pushed companies to declare a moratorium on any soy grown on lands deforested after July 2006.[22] The second report by Greenpeace in 2009, "Slaughtering the Amazon," described how the beef sector, supported by government investment, was driving around 80% of deforestation in the Amazon.

As the soy industry accepted these new rules, The Nature Conservancy and Cargill began a solutions-focused collaboration in Santarém. They developed a system of satellite monitoring and land registration of farmers' properties to ensure that Cargill only purchased from farmers that were not deforesting. This registration system was also used to help farmers work towards compliance with the Forest Code. This tool became the Rural Environmental Registry (*Cadastro Ambiental Rural* [CAR]).[23] In 2012, Brazil's Forest Code was revised to require registration of private properties in CAR as a key step to enforcing legality of land use. This revision also provided amnesty for landholders who had illegally cleared forest prior to 2008 and reduced total requirements for restoration.[24,25]

Toward the end of 2007, the federal government reinforced the PPCDAm through a federal decree that made reducing deforestation a shared responsibility between state and municipal governments and the private sector.[26] This second phase of PPCDAm created a list of Priority Municipalities (commonly known as the "blacklist") targeting the 36 municipalities in the Legal Amazon where more than half of total deforestation was taking place. Twelve were in the state of Pará, and São Félix do Xingu was at the top of the list. The consequences of being on this list included a ban on new licenses to expand pasturelands, an embargo on the sale of goods produced on illegally deforested areas, and reduced access to credit lines. This Priority Municipalities policy is estimated to have prevented over 1.1 million hectares of Amazon forest from being lost between 2008 and 2011.[27]

To leave the blacklist, municipalities were required to achieve three goals:

1. 80% of the private properties in the municipality must be registered in CAR. This documentation provides information about ownership, property size, status of forests and land use, and property lines.
2. The average rate of deforestation for a given year should be less than 60% of the average rate for the three previous years.
3. The municipalities must reduce their deforestation rates to less than 4000 hectares per year.

Shortly following the 2008 blacklist, the Federal Public Prosecutor (*Ministério Público Federal* [MPF]) and several NGOs worked together to pressure the beef sector to help end illegal deforestation. The MPF sued ranchers guilty of illegal deforestation and the slaughterhouses purchasing from them, as well as threatening boycotts and litigation of retailers purchasing from the slaughterhouses. The International Finance Corporation and Brazilian Development Bank withdrew financing for cattle operations and raised

requirements for traceability and legality. In response, in July 2009, the major meatpackers began signing Terms of Adjustment of Conduct (TACs) with the MPF. The TACs are legally-binding commitments not to purchase from properties with illegal deforestation; they were built on the Environmental Crimes Law of 1995 and the 2007 co-responsibility decree. In October 2009, Brazil's four largest meatpacking companies—Marfrig, Minerva, JBS, and Bertin—also signed the "G4 Agreement" with Greenpeace which committed them not to purchase from any properties deforesting after 2009 or that were not registered in CAR.[28]

Complementary actions that were not part of official federal policy also had an important impact, including commitments by municipal governments to reduce deforestation, environmental campaigns, and increasing support from civil society for sustainable production models.[29] Across Brazil, the implementation of PPCDAm coincided with a decrease in deforestation from its peak of over 2.7 million hectares in 2004 to less than 500,000 hectares lost in 2012. In the state of Pará, deforestation dropped by 50%, from an average of 595,000 hectares per year from 2001 to 2010, to less than 300,000 hectares per year from 2012 to 2016.

Based on the early implementation of CAR in Santarém, and shortly following the federal blacklist, TNC was invited by the Soy Association (Aprosoja) in the municipality of Paragominas—also one of the main deforesting jurisdictions on the blacklist—to help implement CAR with private landholders, in collaboration with the municipal government and Instituto do Homem e Meio Ambiente da Amazônia (Imazon).[30] Paragominas became the first municipality to successfully remove itself from the blacklist in 2010. Based on this experience, the state of Pará launched the Green Municipalities Program (*Programa de Municípios Verdes* [PMV]) in March 2011. The PMV was a state program for controlling and reversing deforestation funded largely by the Amazon Fund. The program helped remove municipalities from the blacklist by equipping them to create local pacts to reduce deforestation, to register local properties under CAR, and served as a focal point within the government to promote green development policies.[31] Each municipality choosing to participate signed an agreement with the state government to achieve zero illegal deforestation by 2020 and meet seven requirements.[32] By 2016, 71% of the private land area in Pará has been legally registered in CAR. In late 2016, the name of the Green Municipalities program was changed to the Sustainable Municipalities Program (*Programa Municípios Sustentáveis*), with 141 of Pará's 144 municipalities currently registered in the program. Its focus has shifted somewhat from removing municipalities from the blacklist to an increased focus on supporting infrastructure projects.[33] The Sustainable Municipalities Program fits under the umbrella of the Sustainable Pará program (*Pará Sustentável*) described in Section 4.

While Brazil has made significant progress on reducing deforestation and creating innovations for more sustainable land use, the command-and-control approach is showing its limitations, as deforestation rates have not declined significantly in several years. According to IBAMA, the main challenges to reducing deforestation in the Legal Amazon are the lack of human resources for oversight, the increased illegality due to local and national economic challenges, and the lack of resources of the state environmental agencies to exercise their functions. The economic crisis of 2015 has contributed to the stagnation of command and control and led to increased deforestation in 2016.[34]

Shifting political winds and ongoing development in the Amazon region means that pressure to convert and develop forests will continue. Political and socio-economic shocks coming from NGO actions (e.g. the Greenpeace reports and farm registry in CAR) and the pressure from federal enforcement have forced farmers, ranchers, companies, and municipalities to quickly adapt to a new way of operating. But while this enforcement provides a strong framework, it needs to be coupled with positive incentives and technical assistance to allow landholders in the Amazon to shift to economically-productive, sustainable land use paths that do not rely on continued deforestation. Some models are proving promising and are being embedded in state plans for sustainable development, but these will need on-going environmental enforcement to ensure a shared set of rules.

3. The Jurisdictional Program in São Félix do Xingu

3.1 Policy and Land Dynamics in São Félix do Xingu

São Félix do Xingu (SFX) in the state of Pará exemplifies the challenges of deforestation and land use in the Amazon. As the sixth-largest municipality in Brazil (at 8.4 million hectares, approximately the size of Austria), it has lost more forest (1.82 million hectares as of 2016) than any other municipality and continues to have the highest rate of deforestation in the state (24,000 hectares lost in 2017).[35] SFX has the largest cattle herd in Brazil (more than 2.3 million head), which places continuing pressure on the forest as ranchers move to clear ever more pasture. Land ownership is highly unequal: 75% of farms are less than 300 hectares but cover 18% of private lands, while 10% of properties are larger than 1000 hectares and cover 70% of the total private area.

Figure 3. Agriculture and forest matrix in São Félix do Xingu (Photo credit: Haroldo Palo Jr., 2010).

In SFX, the major dynamics surrounding deforestation in the Brazilian Amazon intersect. Over 70% of the municipal land area remains forested and consists of a complex patchwork of land use types that include federal conservation units, indigenous lands with federal protection, state protected areas, settlements, and private lands. SFX was emblematic of the federal government's plan in the 1960s and 1970s to develop the frontier. The construction of the PA-279 highway in the 1970s and 1980s brought waves of ranchers, small farmers from the northeast, miners, and speculators into conflict with indigenous peoples and traditional communities already living there. Unofficial roads cut into the forests, while deforestation and cattle herds were used for land grabbing and speculation. Many smallholders, unable to make a living, abandoned or sold their lands, leading to increasing land concentration. In the early 2000s, the establishment of protected areas and efforts to provide legal landholdings to smallholders improved the definition of land use boundaries, but a continuing tension has persisted between farmers (resentful of being portrayed as deforesters) and government efforts to crack down on illegal landholdings and protect vast areas of vulnerable forest.[36]

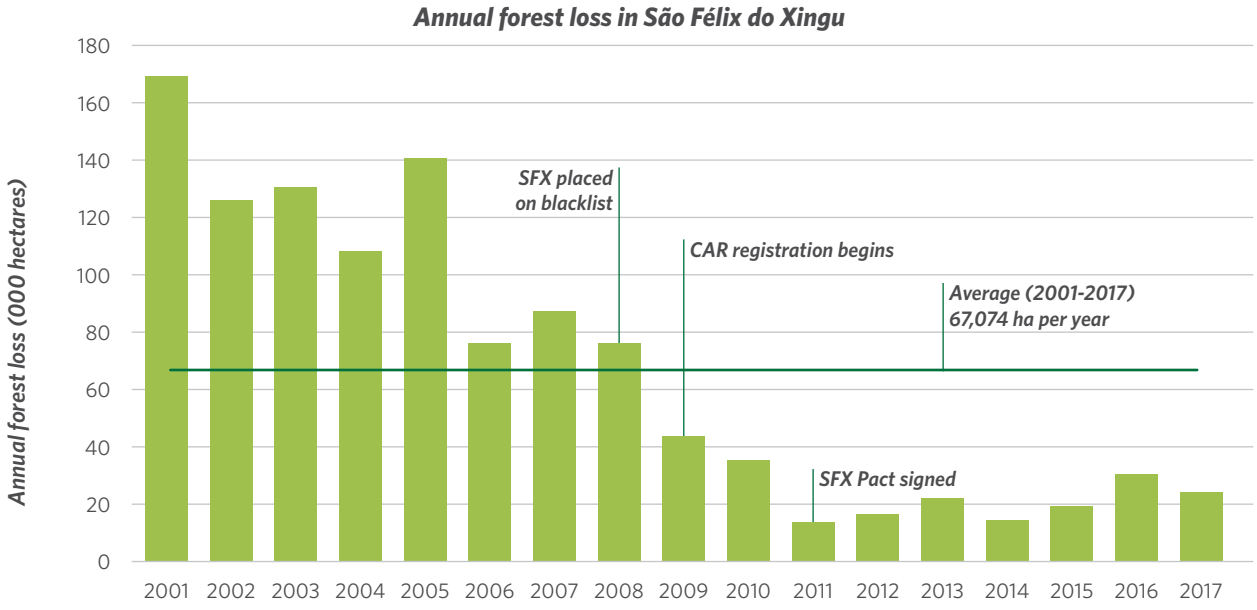


Figure 4. Annual deforestation trends in São Félix do Xingu municipality (PRODES).

3.2 Key events and first steps

In 2008, São Félix do Xingu was placed on the federal blacklist. The consequences were quickly felt due to enforcement actions (seizure of cattle illegally grazing in protected areas through the *Boi Pirata* campaign), negative publicity, and embargoes on large properties with high deforestation rates. Banks cut off agricultural credit to deforesters and the policy limited the municipality's authority to provide land use licenses.[37] Cattle slaughter decreased by 30%, although black markets to "launder" cattle from illegal properties emerged. These economic effects placed intense pressure on small and large farmers, companies, and on the municipal government to find a solution out of this new political reality. Yet within a few years of inclusion on the blacklist, deforestation in the municipality fell significantly, from 76,500 hectares lost in 2008 to 14,000 hectares lost in 2011.

As described in Section 2.2, beginning in 2009, the major meatpacking companies signed a series of legal agreements (TACs) with the Federal Public Prosecutor that committed them not to purchase from properties carrying out illegal deforestation. While negotiating these agreements, the major meat companies, the meat

producers' union, and the municipality of São Félix do Xingu asked The Nature Conservancy for assistance in reducing deforestation and removing the municipality from the blacklist, in part based on TNC's role in supporting the implementation of the CAR in Paragominas. A detailed land use map funded by the beef companies also provided the first detailed view of properties in São Félix at high resolution. But to stay in business, the beef companies needed help developing a solution to work with the government agencies and scale up CAR in the municipality. TNC brought representatives of the state and federal government agencies to a first community meeting in April 2009.

Francisco Fonseca, the sustainable beef manager for TNC's Amazon Program who facilitated the meeting, relates that the meeting quickly turned contentious: "Hundreds of farmers arrived and expressed their indignation at the government. They saw us first as a foreign NGO who only wanted to tell them to preserve nature and not provide solutions for production. They saw the absence of the government in the region as a major problem." Many farmers had also felt unfairly portrayed as villains in the news and were angry at federal agencies such as IBAMA and INCRA (National Institute of Colonization and Agrarian Reform) for cracking down on their ability to make ends meet without offering alternatives. Several brought signs of protest to the meeting that proclaimed, "We are not criminals," and "We are workers. We need to be respected."

Figure 5. São Félix do Xingu, April 2009 (Photo credit: Benito Guerrero, TNC)

Fonseca explained that the goal of registering farmers in CAR was not to punish them, but rather to bring people into legal compliance so they could access support programs. He explained that "CAR was linked to getting the embargoes removed and could help change the perception of the municipality in the media. We could create a task force to support CAR, and there would not be fines for those who join, but rather this would provide a path to legality. After much discussion, they decided to give us a vote of confidence. [The farmers] began to state their requests: they wanted less bureaucracy and greater speed for CAR, a path to land tenure regularization, and the physical presence of the public agencies in the municipality. At the end of the meeting, the people saw TNC as a facilitator and not as a spokesperson for the governments that the people didn't believe in." Additional meetings were scheduled in SFX and surrounding communities along with the federal and state agencies to make it clear that TNC was not a government authority, and to ensure that the agencies were also committed to meeting their obligations.

The first step to removing São Félix from the blacklist was to get 80% of private properties registered in CAR. With support from the Amazon Fund and the Norwegian government, TNC launched the first project in São Félix, "Legal é ser Verde" ("To be legal is to be green"), in July 2009.[38] In 2009, the Pará State Secretary of the Environment, the Institute of Lands of Pará (ITERPA), and IBAMA also opened offices in São Félix, and in 2010, the municipality of SFX signed a legal agreement with the MPF to end illegal deforestation.[39] These were complemented by a project supported by the Amazon Fund in 2010 to implement CAR (including SFX and 11 other municipalities in Pará); extensive communication efforts; improving governance capacity through an Environmental Observatory; and a comprehensive municipal pact (see Section 3.4). These collaborative efforts helped attract other partnerships and investment, such as from the federal Ministry of Environment (MMA). TNC and the state government worked to raise awareness in the MMA, which improved the targeting of resources for environmental governance and developing the SFX Municipal Environmental Observatory.

A path to land tenure security was the biggest factor bringing small landholders into the process. The meetings helped demonstrate to small farmers that they would not be fined through CAR, even if they had recently cut down forest (although future deforestation would now be monitored and penalized). The purpose of CAR was to help them develop a plan for meeting environmental requirements, improve management and productivity, and open a path for land tenure security. TNC also invited INCRA to work with them in São Félix on the Terra Legal (Legal Land) program, which helps registered landholders meet the requirements for legal title. With CAR in place, smallholders could access support on improving their productive practices and find new opportunities. Without it, their options would be limited.

Status of REDD+ in Brazil

While Brazil has been relatively slow in developing a national policy on Reducing Emissions from Deforestation and Forest Degradation (REDD+), it has committed to zero illegal deforestation by 2030 as part of its international climate commitments. Brazil is in favor of a non-market approach to REDD+, arguing that developed countries should provide direct funding for forest protection to developing countries. In 2008, Brazil established the Amazon Fund and signed a USD 1 billion funding agreement with Norway to create a system of payments for early performance. Funds are provided to a range of activities to help implement the Forest Code and CAR, support small-scale pilot projects, indigenous conservation initiatives, and protected areas management. Several Brazilian states have also worked to develop state-level REDD+ policies and pilot systems on their own, many of which are based on payments for forest ecosystem services.

3.3 Rationale and evolution of the Jurisdictional Approach

The growing interest in Brazil in REDD+ and results-based finance to support reductions in deforestation helped spur development of the jurisdictional approach in São Félix. The program acknowledged this new reality where illegal deforestation was no longer acceptable, but also recognized that farmers and communities needed support if they were to shift to sustainable forms of production. The hope was that REDD+ finance (whether as up-front investments or as payments for performance) could offer a meaningful incentive to support this transition.

São Félix do Xingu was an ideal location for a jurisdictional pilot project. The region contained high areas of standing forest and high biodiversity as well as the state's highest rate of deforestation. SFX was also a representative microcosm of the Amazon region, containing most major types of land ownership. While this would add coordination challenges, it would help test a model that could apply elsewhere in the Amazon. In addition, the jurisdictional approach had high support from the local government and a diverse set of civil society organizations who could lead and collaborate on key aspects of the program. Finally, if the program could demonstrate measurable emissions reductions, there was optimism that results-based financing would be available in the future to support multiple aspects of the program activities.

The jurisdictional focus of REDD+ was important for integrating multiple land-uses and stakeholders in one place. It helped bring together TNC's work with private lands, indigenous territories, and public protected areas. The program began developing the foundations of a shared understanding of the situation, as well a common platform for coordination, commitment, and accountability. Fund management experts from the Brazilian Biodiversity Fund (FUNBIO) were sought as partners to develop a funding mechanism to include participatory design of potential governance. By integrating the demands and contributions of major stakeholders that influenced deforestation and land use in the municipality, it became possible to develop focused solutions to address the situations of specific stakeholders without losing sight of the big picture.

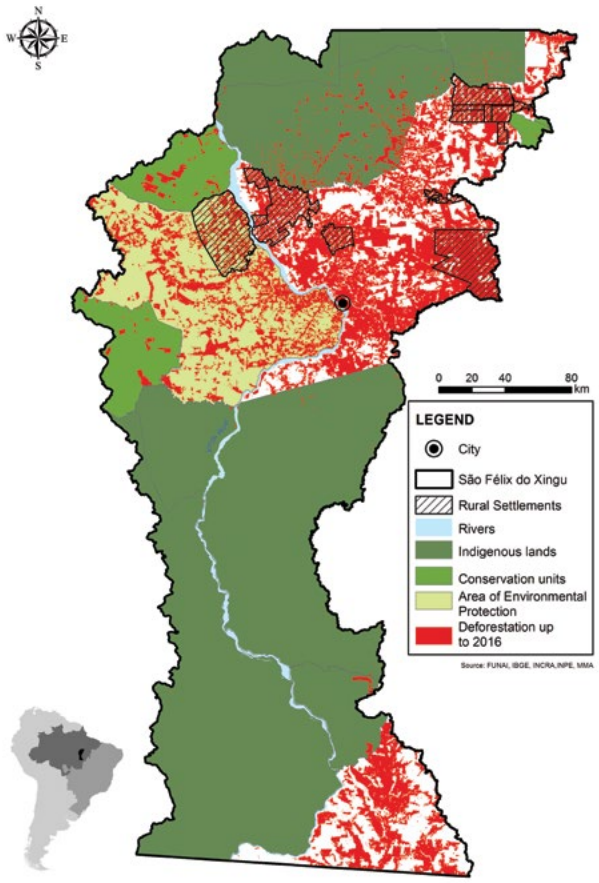


Figure 6. Land use, tenure, and deforestation in the municipality of São Félix do Xingu (TNC 2016).

For example, a distinct approach was needed for medium and large landholders (who had more access to capital and primarily raised cattle for meat) compared to small landholders (who lacked necessary land for profitable beef production but needed economic alternatives to deforestation). For this reason, cocoa agroforestry was developed for smallholders while sustainable intensification of cattle was developed for medium and large landholders. In both cases, support was conditioned upon being registered in CAR and committing to no further deforestation.

From the onset, it was important for the jurisdictional program to work at the municipal scale because it was the target of the federal blacklist. Municipal governments had to sign an agreement with the Federal Public Prosecutor that required them to convene stakeholders in their territory to end illegal deforestation and remove the economic embargoes. It was critical for TNC to work with the municipal government, which had legal responsibility for

registration of private properties in CAR, regulating land use licenses, and forging the Municipal Pact to end illegal deforestation. This jurisdictional approach helped secure the buy-in and acceptance of the key stakeholders, develop focused solutions, and led to the signing of SFX's Municipal Pact in 2011. This approach also focused on strengthening the municipal government's capacity to conduct monitoring, licensing, and enforcement.

The jurisdictional program within the boundaries of São Félix do Xingu is coordinated by the municipal government, which has shown increasing capacity and leadership. SFX continues to build upon the shared vision of the Municipal Pact through improved environmental governance and monitoring, CAR implementation, and a municipal low-carbon agriculture plan. TNC in turn has channeled more investments into actor-specific strategies, including multi-functional landscape approaches (e.g. working with indigenous territories) and sectoral approaches (e.g. cocoa and cattle). The cocoa and cattle strategies are expanding into neighboring municipalities with similar land and actor dynamics. This forms a southeast Pará "micro-region" that includes SFX and the municipalities of Tucumã, Ourilândia do Norte, and Agua Azul. Although they are not on the blacklist, these municipalities share agricultural and livestock transport networks, and cross many of the same indigenous territories, making them helpful in applying the lessons of SFX.

3.4 Jurisdictional-scale Interventions

The jurisdictional program began by focusing on several strategies to develop a functional collaborative structure at the municipal scale. These involved: developing a shared vision and governance structure, creating tools to understand and monitor land-use dynamics, and developing institutions to help mobilize resources.

3.4.1 Governance and Institutions: The Municipal Pact for Zero Deforestation

As part of the 2010 terms of agreement with the MPF, the municipality of SFX needed to forge a Municipal Pact for the End of Illegal Deforestation but faced a challenging set of skeptical stakeholders in a large geographic area. While other blacklisted municipalities in Pará basically rubber-stamped a generic agreement at their first meeting, stakeholders in SFX insisted that any pact would need to include commitments of support from all the relevant actors and agencies.

To obtain input from communities and work towards a multi-stakeholder pact, the Municipal Secretary of Environment (SEMMAS) led a four-month process. Financial support was provided by the national Ministry of Environment (MMA), the European Commission, and TNC. SEMMAS met with over 1800 people in 10 different communities to discuss the proposed pact. In each community, a draft Pact was presented and discussed, and the community members listed the resources they would need to effectively reduce deforestation. During the meetings, each community elected two representatives for the process: a smallholder and a large landowner. These community meetings were critical for large and small landholders to find common ground and agree on the principles of the Pact.

The principal barriers and concerns discussed during the negotiation process were issues that constrained farmers' livelihoods. Their main concerns and claims included the need for secure land tenure; technical assistance and credit to improve agricultural practices; environmental regularization in CAR; and improved infrastructure (e.g. electricity and roads).[40] Rural producers would only commit to zero illegal deforestation if the government also committed to fulfill its responsibilities.

According to the Secretary of Environment, these community meetings not only brought legitimacy to the Pact process through the collection of stakeholder input, but also helped bring diverse groups together to work toward a common goal. In the past, large ranchers and family farmers had difficulty even sitting at the same table due to ongoing and occasionally violent conflicts over land. Through the Pact process, representatives of these groups got to know one another on a personal level and gained understanding of the needs and perspectives of the other group, which was important to the success of the process.

After the community meetings were complete, SEMMAS and the Ministry of Environment held a meeting in August 2011 to review and sign the Municipal Pact for the End of Illegal Deforestation. The Pact was signed by 52 organizations representing government, local stakeholders, and NGOs. The objective of the Pact is to achieve zero illegal deforestation and support sustainable development. It includes commitments by the government to support landholders in securing land tenure and productive assistance; commits rural producers to work toward legalized, improved practices; and commits banks, the private sector, and non-governmental organizations to support the Pact with financial and technical assistance. In other clauses, rural producers commit to operate within legal parameters and to transform their production into a sustainable model.

The Pact also established a Commission coordinated by the municipality, formed with 22 signatories to oversee implementation, coordinate land registration, deforestation monitoring and reporting, and sustainable development support activities. Members of the Commission include the producers' unions, community associations, family farmer cooperatives, the municipal government, state and national agencies, TNC, and other NGOs such as Imaflora and the International Institute of Education of Brazil (IEB). The Commission has met every two months and includes several sub-commissions created as working groups to address the different categories of demands in the Pact.[41] A fund was established to support the Commission's activities.

In May 2012, the Pact was amended to include the endorsement of indigenous communities in SFX, the national indigenous affairs agency (FUNAI), and the national protected areas commission (ICMBio). They were not originally included in the pact because deforestation rates in their areas were considerably lower. As the jurisdictional program progressed, however, there was growing recognition that all the land use types and actors needed to be included. While challenges remain in maintaining regular participation of the indigenous representatives in the commission (due to their distance from the urban areas), the Pact set an important precedent that acknowledged that rural farmers and indigenous peoples needed to work together to solve the territorial challenge of deforestation.

The work of the Pact commission led to the creation of two permanent committees in SFX: one on environmental management (licenses and enforcement), and one focused on sustainable rural development and responding to climate change. With the efforts of this second committee, SFX has launched Brazil's first Municipal Plan on Low Carbon Agriculture (ABC). This plan is supported and recognized by the Federal Ministry of Agriculture, and will support restoration of degraded areas, permanent protection areas, and legal reserves on private land.[42,43] Most of the members of the Pact Committee now meet in this Low Carbon Agriculture Plan Management Committee. TNC continues supporting the municipal government in these plans with technical training on improved practices and acts as a liaison with state and federal public agencies to facilitate coordination.

The Pact process also recognized the importance of developing financial assistance to help producers shift to more sustainable practices, either through up-front or performance-based finance. To this end, TNC and FUNBIO (the Brazilian Biodiversity Fund) held several discussions to develop a jurisdictional REDD+ fund, initially conceived as the Fundo Terra Verde (Green Earth Fund). A key challenge discussed was how benefits would be distributed fairly and effectively to different actors, including large landholders, small land holders, or indigenous peoples. The fund ultimately decided to focus on small and medium farmers, those classified as family agriculture. However, due to perceived lack of appetite to finance endowment funds and perceived risk given the proposal to build local community-based governance, TNC ultimately reduced the ambition of the proposal and decided instead to create a small grants fund run by a local environmental organization, Instituto Internacional de Educação do Brasil (IEB). The small grants fund has provided up-front funding to local, smallholder initiatives, including two local NGOs working with farmers: Comissão Pastoral da Terra (CPT) and Associação para o Desenvolvimento da Agricultura Familiar do Alto Xingu (ADAFAX).

3.4.2 Understanding Landscape Dynamics: Rural Environmental Registry (CAR)

The Rural Environmental Registry (CAR) provides a critical tool for engaging private landowners in reducing deforestation and implementing the Forest Code. CAR is the beginning of dialogue between the state and the individual who claims to be the legitimate owner. It does not confer legitimacy on this claim but can begin a discussion of the environmental legal compliance. CAR acts as the identification card for the property and facilitates the landholder's ability to obtain legal title. It provides geographic information on the boundaries and area, name of the landholder, how much of the area is currently meeting environmental requirements (e.g. on permanent protection areas and legal reserve) and identifies deficiencies and needs to be able to bring the landholder into full environmental compliance.

Figure 7. CAR implementation workshop in northern Brazil (Photo credit: Henrique Manreza, 2012).

CAR registrations began as a voluntary process. An immediate and common reaction among landholders in SFX was the fear that registration would be used to issue environmental fines. However, this was not the policy objective, and both the government and public prosecutor in Pará provided guarantees CAR would not be used to fine if farmers entered the process of legal compliance. CAR does not prevent deforestation, but it increases transparency and hence risk of being caught. CAR can thus be used as criteria to direct further support or for verifying that agriculture and livestock products that are purchased are not produced on illegally deforested lands. At a farm level, CAR land registration maps can also be used to improve property management decisions, helping landholders decide which land can be left aside for recovery or restoration (e.g. to work towards compliance with the Forest Code) and which areas should be productively managed.

The landholder first registers in CAR through a self-declaration about which lands are degraded, which are deforested or used for production, and which are in permanent protection or the legal reserve. The government validates this information in the public system. Then the landholder needs to develop a land use plan to restore or manage areas as needed, and eventually receive a certificate of environmental compliance through the Environmental Regularization Program (PRA). The imposition of embargoes on products from properties lacking CAR helps level the playing field to prevent speculators and large landholders from undercutting legal producers by flooding the market with cheap meat produced from illegal deforestation and slave labor.

TNC successfully pushed for decoupling ownership from land registration in CAR—so landholders did not need legal tenure documents to register the land—and visited properties to help with the surveying and registration. From the start of the jurisdictional program, TNC focused on financial and technical support for CAR implementation, investing R$ 19.2 million, including a grant of R$ 16 million from the Amazon Fund (distributed among 12 Amazonian municipalities), and additional resources from USAID and the Vale Fund.[44] The "Legal é Ser Verde" project represented the first efforts to register private properties in SFX and was critical to earning the goodwill of producers to collaborate. To date, Pará has registered 66.1 million hectares of private properties (183,127 properties covering 71.2% of eligible areas) in CAR and SFX has registered 4.2 million hectares (7,857 properties covering 86.4% of eligible areas).[45] In São Félix do Xingu, CAR provided a common base of knowledge on conditions in the municipality, helping the Pact Commission identify the main actors affecting land dynamics, and how they could be supported in developing sustainable economic options. With the information from CAR produced by TNC, TNC was also able to help develop Plans for Restoration of Degraded or Altered Areas (PRADA) in partnership with the MMA and European Union.

There are some risks to self-registration, as some landholders have deforested in anticipation of registration in the CAR.[46] But overall CAR has helped reduce deforestation from cattle supply chains. After 2009, meatpackers agreed not to purchase from properties with illegal deforestation or that lacked CAR. This policy helped reduce the percentage of beef coming from properties exhibiting recent deforestation from 36% in 2009 to just 4% in 2013. The percentage of beef-supplying properties with CAR registration also went from 0% in 2009 to 60% in 2010 and reached 95% by the end of 2013.[47] The most recent audit report in 2016 shows a slight rise, with 18% of animals in Pará coming from properties showing "irregularity,"[48] but these are still significant decreases from the start of the program in 2009.

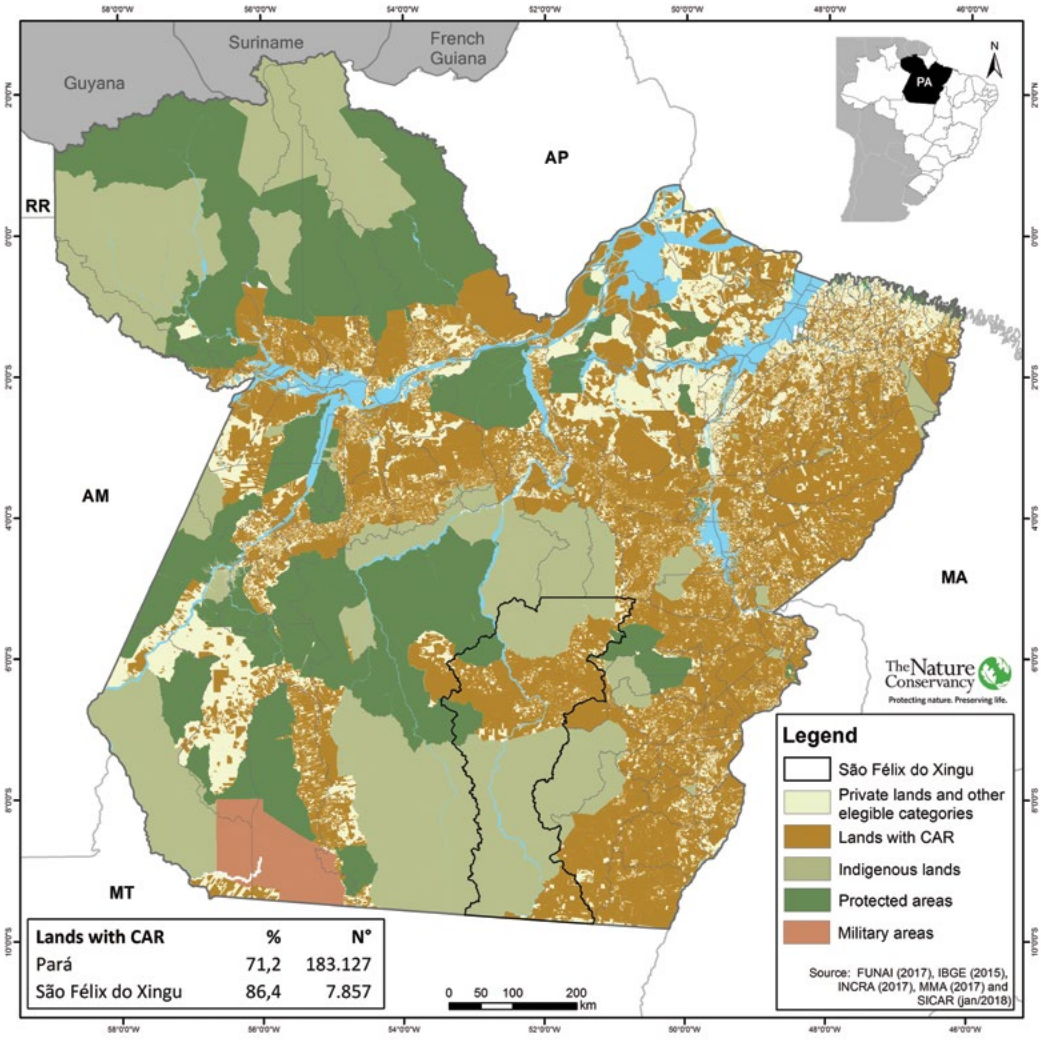


Figure 8. Extent of CAR implementation in Pará and São Félix do Xingu as of 2018 (TNC 2018).

3.4.3 Monitoring and evaluation

The Environmental Observatory of São Félix do Xingu was established in 2013 as a key instrument for supporting the municipality's environmental agenda, with the support of TNC and the Ministry of Environment (MMA). Municipal technicians trained in São Paulo at the National Institute for Space Research (INPE), drawing on the TNC-MMA partnership. The Observatory compiles diverse data sets on properties and land uses in SFX, which allows improved planning and licensing processes for agricultural activities. The Observatory also is used to monitor progress toward the goals of the Pact and improve public communication of the activities being carried out by the municipal government. By linking to state-level data on CAR registrations and satellite data on deforestation from the national government, the Observatory permits more rapid collaboration and response to illegal deforestation activities.

Since the blacklisting in 2008, SFX has seen significant drops in deforestation (Figure 4). However, deforestation has also crept back up in the past few years, largely from increased deforestation in the Triunfo do Xingu Environmental Protection Area (APA) and associated

settlements. Regularization and control is impeded by land grabbing (*grilagem*) and the illegal purchasing of lands by outside actors who can expand cattle production more easily into settlement lands. This leads to re-concentration of property in fewer hands as well as ongoing rapid deforestation and degradation.[49] Continued progress will require adapting to continue regularizing the landholdings of farmers in this area, improve environmental enforcement and licensing, and provide sufficient sustainable alternatives and incentives to shift land use practices.

Because removal from the blacklist requires a total deforestation rate below 4000 hectares per year (regardless of the municipal land area), the large land area of the municipality represents a major hurdle, as 4000 hectares represents 0.05% of the municipality's land area. Furthermore, most of its lands are under the jurisdiction of the state or federal governments, and the municipal government has limited capacity to influence these areas. For this reason, the municipal government has been lobbying both the state and federal governments regularly to send enough personnel and resources to develop effective management plans for the APA Triunfo do Xingu (state jurisdiction), the indigenous territories (jurisdiction of the federal National Indian Foundation, FUNAI), and to get more support for land tenure regularization in the settlements on private lands (shared responsibility with ITERPA and INCRA).

3.4.4 Summary of jurisdictional-level efforts

The initial jurisdictional-scale work carried out in São Félix do Xingu was focused on the municipal boundary in response to the blacklist and the agreement with the federal public prosecutor to end illegal deforestation. This provided the push first to register lands in CAR, and secondly to develop a multi-stakeholder pact to help remove the municipality from the blacklist and end illegal deforestation. The Pact also helped make explicit the need to balance improved environmental governance with improvements in people's social and economic well-being.

As the effects of the blacklist have waned, the actors involved in the Pact have transferred much of their energy into the commission focused on implementing the SFX Municipal Low Carbon Agriculture Plan. Throughout, CAR has provided a foundation to integrate private landholders in as partners and underpins environmental legality as a pre-requisite to economic development. CAR provided an understanding of the municipality's land dynamics and landholdings and opened a path for landholders to access technical and financial support without being fined for previous deforestation. And although a REDD+ benefit sharing fund proved too ambitious to implement, the Pact process and a small grants program helped lay the groundwork for larger sectoral investments that followed. The experience of SFX demonstrates that developing a jurisdictional program is a dynamic process with programs and efforts that continuously evolve – in name, in function, in funding, and in composition of participating actors. The challenge for SFX is how to continue driving toward the fundamental goals for the municipality while both navigating and co-creating this dynamic landscape.

3.5 Sectoral interventions

To complement the jurisdictional-scale work—focused on a shared vision and governance platform, mobilizing resources, and understanding landscape dynamics—TNC developed two sectoral initiatives to address the needs of two sets of key actors in SFX contributing to the region's land dynamics. In the framework of systems change, these projects were meant to provide innovations to help transform specific sectoral regimes. The external shocks induced by the Forest Code enforcement and blacklisting arguably gave these sectoral initiatives a clearer opening for success.

Figure 9. Cattle ranching in São Félix do Xingu (Photo Credit: Kevin Arnold, 2015)

3.5.1 Sustainable Beef

Since the 1970s, livestock production has been one of the primary economic activities driving the occupation of the Amazon. With little to no investment required, and minimal labor costs, cattle ranching follows a typical trajectory: slash-and-burn of forest to establish pastures, followed by soil exhaustion, land degradation, and abandonment as ranchers move on to new forest areas, generally within 5-15 years of initial deforestation. Both small- and large-scale cattle operations in Brazil are typically low intensity and low productivity, supporting only one cow per hectare on average and producing 80 kg of meat—well below estimated potential of 300 kg per hectare per year. Cattle ranching continues to be primary direct cause of deforestation in the Amazon.[50]

Shortly after beginning work in SFX, TNC conducted a regional value-chain analysis of the cattle sector to understand who was having the biggest impacts on land use and deforestation in SFX and how to define the cattle strategy. This analysis found that 80% of the deforestation in SFX was occurring on just 20% of the largest properties. To have the biggest impact on deforestation would require dealing with those 20% of landholders. Most of the slaughterhouses purchasing from these properties were also concentrated in the neighboring municipalities of Tucumã, Água Azul, and Ourilândia, owned by a few of the largest beef producers in Brazil and the world. These include JBS and Marfrig (respectively the first and second largest meat companies in the world), and Frigol (a medium-sized company). These slaughterhouses typically stimulate production and sales of cattle in a 300 km radius, which is the average distance where they seek out producers from which to purchase animals. With this analysis, it was possible to target the cattle strategy to specific farms, slaughterhouses, and supply chain networks.

In 2013, with support from the Moore Foundation, TNC launched the Field to Table project in partnership with the municipal farming union of SFX, the Marfrig Group, and Walmart. TNC took a coalition-based approach that included the most relevant actors—both friends and antagonists—who could have the biggest impact on the beef supply chain. While initially TNC wanted a territorial approach with multiple companies, they were only able to raise funds for a sectoral approach with the Marfrig group. The aim of the project was to create a deforestation-free beef supply chain, building on the mutual interests of the different actors. This involved developing a jurisdiction-wide alliance of beef supply sector actors, involving the Brazilian Agricultural Research Corporation (EMBRAPA) and federal institutions; rancher unions in SFX; Marfrig; Walmart; and TNC functioning as the convener and backbone institution for this initiative.

The program's components have consisted of: developing a model for cattle intensification, developing a traceability and monitoring system, and developing efficiency and incentives to stimulate the productive chain. The sustainable intensification model was piloted on 16 demonstration farms covering 46,000 hectares; these farms slaughtered around 500 animals per month, yielding 70 tons of beef per month at retail. The model is based on EMBRAPA's good agricultural practices for sustainable livestock, which includes guidance on improving animal health, managing staff salaries and farm expenses, developing animal traceability, soil/pasture management (to improve grass and pasture quality), rotational grazing, and no-till farming. The monitoring system integrates CAR, deforestation, and animal traceability information, which allows meat buyers to verify that suppliers are operating in deforestation-free areas. TNC is also working with the Federal Public Prosecutor (MPF) in Pará to create monitoring measures for the beef supply chain and is studying improved rural credit schemes that can assist farmers in adopting sustainable intensification practices.

As of September 2017, the program has mobilized 43 farms that are now part of the Sustainable Beef Protocol. The intensification practices have improved the performance of the participating farms, including a 200-300% increase in meat production and improved animal handling practices. Producers understand they have committed to zero deforestation (to only intensify on land cleared before July 2008), restoring degraded areas, carrying out best practices, and developing the PRA for their properties.

The goal is to expand the market for sustainable beef throughout the southeast of Pará through jurisdictional hubs. The target area includes an additional 12 municipalities, where more than 90% of Pará's beef production originates, and which is sold to only around 13 slaughterhouses owned by the major companies. As before, this model targets areas with high deforestation, large herds, degraded pastures, and high potential to implement improved environmental enforcement (e.g. through CAR or Sustainable Municipalities Program).

The project has demonstrated notable economic success so far. Pilot farms have increased their number of animals per hectare by 54%, and intensification costs in the Field to Table program are lower compared to Mato Grosso or the rest of Pará state. Rebanho Xingu—the first deforestation free, sustainable beef produced by the initiative—arrived in Brazilian supermarkets in July 2016 and was in 12 supermarkets within three months. In addition, the program is testing mobile technical assistance units called Poupa Tempo ("Save Time"), which provide services in rural areas for paper work, land tenure, and facilitating credit programs. By the end of 2018, the program expects to expand intensification activities to over 300 farms (170,000 hectares); extend *Poupa Tempo*'s reach to Redenção and Marabá in Pará, and Araguaia in Mato Grosso; extend rural credit under Brazil's Low Carbon Agriculture (ABC) program to an additional 100 producers; and have 900 producers with Environmental Restoration plans.

However, the largest risk and uncertainty in implementing this sustainable cattle supply chain is getting farmers to accept loans and resources and invest the time and money to convert their systems. Despite high productive potential, ranchers face high risks in moving from extensive to intensive systems, including high upfront investments, more intense and skilled labor requirements, and low returns during the period of transition. Lack of land title means limited access to public credit programs.

Culturally, ranchers are not used to a disciplined productive system and calendar that must be followed to avoid productive loss; rather they tend to be independent and usually deal only with salt sellers and intermediaries. While overall economic productivity can be improved, relatively high interest rates, risk of failure, and the stigma around accruing debt can create barriers to cattle ranchers voluntarily choosing to intensify. Ongoing work will be needed to determine how to reduce these barriers so that sustainable intensification is both economically and socially viable, while continuing to lead to positive environmental outcomes. It is necessary to develop alternative collateral for loans and reassure investors as to risks and expected financial return to bring both sides to a common suite of solutions.

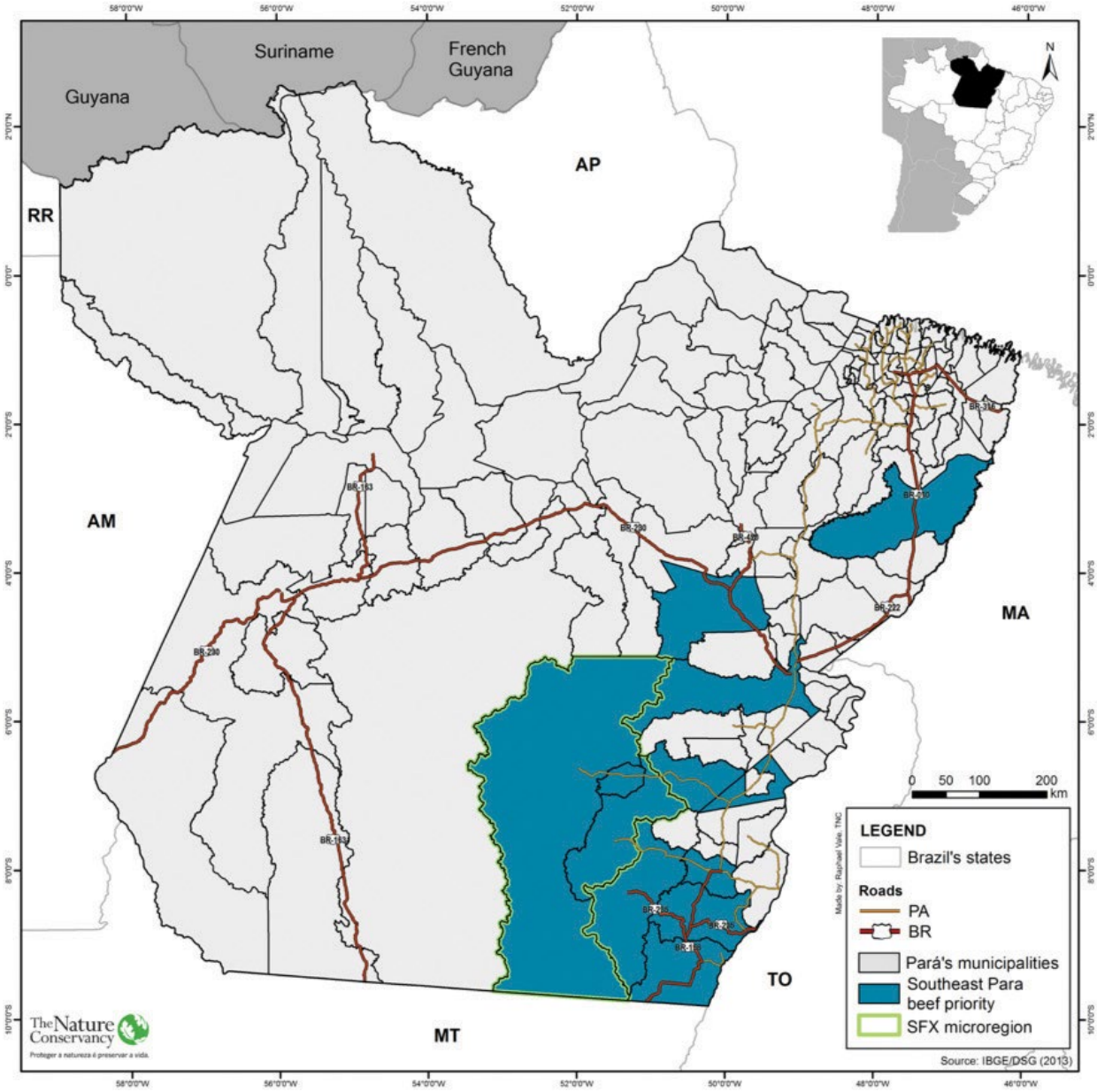


Figure 10. Zone of intervention for expansion of the Farm-to-Table Sustainable Beef Program in southeast Pará (TNC 2016).

3.5.2 Cocoa agroforestry for smallholder farmers

The strategy for cocoa agroforestry arose out of a careful understanding of the socio-economic situation of smallholder farmers in São Félix do Xingu. Small farms, defined as 300 hectares or smaller, make up 70% of the landholdings in SFX, but cover only 18% of the land area; currently, they are responsible for less than one-third of the total deforestation in the municipality. These smallholders generally raise small numbers of cattle for both meat and milk, as well as a mix of annual crops, and they frequently face economic and food insecurity. In the first few years after the blacklist, SFX saw significant reductions in deforestation, but mostly on large properties; deforestation from smaller properties decreased less quickly while their proportional contribution increased.[51]

Land dynamics in São Félix have favored land clearing and cattle ranching for establishing occupancy for large and small landholders. Without technical assistance and financial resources, the pastureland cleared by smallholders is more rapidly degraded and requires them to open new areas. Solutions proposed to reduce deforestation among smallholders have not typically offered economic alternatives for them to continue managing their land without leading to degradation. A clear opportunity was identified for cocoa agroforestry to serve both as an economically viable production model and as a forest restoration strategy, leading to a potential win-win.

In São Félix do Xingu, several factors favor a cocoa agroforestry model:

1. There is an excess of degraded pastureland that threatens smallholder food security.
2. There is a predicted supply gap for cocoa, leading to favorable expectations for suppliers on international and national markets.
3. The state of Pará is interested in developing the cocoa sector and aims to become the largest state producer of cocoa in Brazil by 2023.
4. SFX has the right biophysical conditions for cocoa: a humid tropical climate and high soil fertility in more than 60% of the non-protected areas in the municipality.

A cocoa agroforestry system (AFS) provides numerous environmental benefits due to its diversity and structure. Cocoa (*Theobroma cacao*) trees form the understory and are protected by a canopy of larger companion trees that can fulfill a variety of uses, such as for timber, fuelwood, fruits, and the maintenance of soil and water health. Crops included in these agroforestry restorations include cassava (*Manihot esculenta*), maize (*Zea mays*), and banana (*Musa* spp.). Timber species include mahogany (*Swietenia macrophylla*), copaiba (*Copaifera* spp.), and *andiroba* (*Carapa guianensis*). Carried out on degraded lands, cocoa agroforestry can contribute to significant carbon sequestration: up to 135 metric tons of carbon per hectare more than cocoa planted after forest clearing.

Figure 11. Cacao agroforestry in São Félix do Xingu (Photo credit: Kevin Arnold, 2015)

Since 2011, TNC has been working with smallholders on the Forest Cocoa Initiative. The program received financial support from Cargill and the Norwegian Agency for Development Cooperation and is built on a partnership with the Alternative Cooperative of Small Rural and Urban Producers (CAPPRU), the São Félix Municipal Bureau of Agriculture (SEMAGRI), and the Ministry of Agriculture's Cocoa Research and Technical Extension Agency (CEPLAC). This initiative promotes restoration of degraded pastures with new plantings using native cocoa trees. The purpose is to develop a cocoa supply chain that promotes sustainable economic development and food security for smallholder farmers, while restoring degraded lands and avoiding deforestation. Importantly, the cocoa agroforestry model provides small farmers with an economically-viable alternative to cattle ranching.

In the first few years, 61 pilot farms (average size of 79 hectares) were selected, based on availability of degraded pastureland and higher food security risk. Farmers had to commit to planting cocoa only on existing degraded lands, to register in the CAR, and provide all labor. The average area of the cocoa AFS was 3.9 hectares per farm. From 2012 to 2014, the project visited these 61 individual farms to provide technical assistance, complemented with group training events. Due to concerns about cost and scaling up, the program shifted to a model farm approach—called Productive Demonstration Units (PDU)—beginning in 2015. Three PDUs were selected based on farmers' leadership capacity and accessibility to other farmers. The PDUs act as schools and convening centers for technical experts, while also promoting greater social cohesion in neighborhoods.

To date, the Cocoa Forest Initiative has demonstrated high potential to improve socio-economic well-being of smallholder farmers, especially as an alternative to extensive cattle ranching. While cocoa takes 3-5 years after planting to produce fruit, farmers were able to generate short-term income by planting annual crops and fruit, such as cassava, maize, and banana (which also provides shade), leading to additional net income of US$ 3500 per hectare in the first year. The estimated net income potential for cocoa ranges from US$ 1800 - 2500 per hectare per year (estimated sales price of US$ 1.80 - 2.50 per kg and 1,000 kg per hectare). Cocoa leaves the land in better condition than before, sets up long-term diversified income for smallholder farmers, and generates jobs. The first 61 farmers in the pilot project were able increase their gross income by around 28% in 4 to 5 years, from R$50,000 at the beginning to R$64,000 once the cocoa agroforestry groves were established and producing fruit.

Cocoa agroforestry is poised to expand significantly in Pará over the next decade. As of 2017, the program has benefited about 100 farmers and plans to expand to 1,000 farms by 2020, working in the municipalities of SFX, Ourilândia do Norte, and Tucumã. Efforts are ongoing to find a dedicated cocoa buyer for the participating farmers. The state of Pará is also investing heavily into cocoa through their Pará 2030 plan. The goal is to have 40,000 hectares of cocoa in Pará by 2020 with 8000 families (estimate of 5 hectares of cocoa per farm), and help develop a vertical supply chain in Pará, where cocoa is grown, transported, processed, and turned into end products all within the state.

3.6 Multi-Functional Landscapes

The jurisdictional program has implemented several strategies at the landscape level in critical areas, focusing on specific legal land-tenure categories.

3.6.1 Protected Areas

The protected area in SFX that is most at risk is the 1.6 million-hectare Triunfo do Xingu Environmental Protection Area. The APA Triunfo do Xingu is classified as a "Sustainable Use" or mixed-use area that contains significant human occupation in addition to special ecological and cultural characteristics.[52] In 2016, it accounted for 57% of all deforestation in the municipality, although it makes up only 19% of the land area. Deforestation is driven primarily by the expansion

of inefficient ranching practices into unmanaged lands, lack of sustainable economic alternatives for the people living in the boundaries, and the lack of resources to enforce the protected area's boundaries and rules. It contains large areas of settlements and large company holdings (over 100,000 hectares) where extensive cattle ranching also causes large-scale deforestation.

In partnership with the state and municipal environmental secretaries and led by IEB, TNC supported the formation of a management council and a management plan as one of the working goals in the municipal pact.[53] Although the state of Pará has jurisdiction over APA Triunfo do Xingu, it only has one staff member present, and has not been able to develop an effective management plan to date. One priority for the state is to speed up the land tenure regularization process so residents have more security, to help reduce conflicts, and make it easier to control illegal deforesters. The municipality of SFX has become more proactive in recent years, regularly reaching out to the state protected areas agency (Ideflor-Bio) to raise awareness about the need to develop a more effective management plan.

3.6.2 Indigenous Territorial Management

In Brazil, TNC works with indigenous peoples to develop Indigenous Environmental and Territorial Management Plans (PGTAs). These plans support indigenous leadership, self-determination and decision-making on the restoration, conservation and sustainable use of their territories. PGTAs cover three major priorities: territorial control and protection; sustainable management of natural resources for food security, income generation, and conservation/sustainable use; and capacity building and strengthening of local institutions.

Figure 12. Land use planning with the Xikrin people in Pot-Kro Village near Rio Bacajá (Photo credit: Kevin Arnold, 2015)

In response to the demands of the Indigenous Peoples and motivated by promising initial outcomes of the first PGTAs, the Brazilian government established the first-ever National Policy on Territorial and Environmental Management of Indigenous Lands in 2012. Developed by a coalition of 150 indigenous groups, TNC, and other institutions, this policy officially recognizes the PGTAs while endorsing indigenous conservation, natural resource management, and restoration.

Since 2014, TNC has worked in partnership with Indigenous Peoples, the Brazilian government, the Global Environment Facility, and the United Nations Development Programme, to implement PGTAs in 32 indigenous lands across Brazil under the Indigenous Environmental and Territorial Management Project (GATI Project). In Pará, TNC is working in the Indigenous Territories of Trincheira Bacajá (community of Xikrin) and Apyterewa (the community of Parakanã), which both overlap the municipal boundaries of São Félix do Xingu. Efforts in these communities are still early, and the first actions are being taken to help these communities develop their PGTAs. Helping indigenous peoples manage and protect their land and solve their development needs is especially important in and around São Félix do Xingu, where they have maintained effective protection against deforestation but occasionally face illegal incursions and violence in their territories.

TNC is also working to integrate the indigenous peoples of SFX into the state and municipal land use planning and management processes. TNC helped bring several indigenous groups to the table for the São Félix do Xingu Municipal Pact. TNC is also helping the indigenous peoples set up a system to collect forest seeds and produce seedlings as a source of income (to use for restoration projects throughout the municipality), developing a business model for Brazil nut harvesting, and creating a learning network among communities to improve sharing of experiences.

TNC also recently developed a model for engagement between companies and indigenous peoples to safeguard territorial rights and ensure sustainable economic benefits for both sides. This tool is called the Proposal for Brazilian Guidelines for Good Corporate Practices with Indigenous Peoples.[54] It is meant to help indigenous peoples and companies be more educated about negotiations and agreements with each other, to help avoid conflicts and produce mutually-beneficial outcomes that respect indigenous rights. These guidelines are especially important as the government scales up the Pará 2030 plan and seeks to intensify several economic sectors, which increases the risk of development activities that can affect indigenous territories.

3.6.3 Summary: Linking Sectoral and Multi-Functional Approaches

Overall, the program, with official leadership from the municipality, has worked to ensure these different strategies are compatible and supportive of a cohesive whole. The order in which the strategies developed is important. It started from a jurisdictional approach centered around the blacklist which led to a broad multi-stakeholder Pact and identification of key issues within the municipality that needed their own specialized strategies (e.g. smallholder agriculture, large-scale cattle ranching, indigenous territories, and protected areas). These sector-specific strategies were developed to meet the needs of constituencies identified in the Pact and are built on the jurisdictional work on environmental governance (e.g. the CAR, SEMMAS, and the Environmental Observatory). At the same time, the sectoral-strategies are being scaled up beyond the municipal boundaries to address the networks and landscapes where they are relevant. Although the municipality does not need to manage the broader cocoa, cattle, or indigenous territory strategies directly, it can support its constituents engaged with these programs where appropriate.

3.7 Key Results

This section summarizes the most prominent results observed to date in the São Félix do Xingu jurisdictional program. As these results are intermediate, they demonstrate that jurisdictional-scale solutions take time and patience to achieve long-term impacts as part of a dynamic process.

3.7.1 Intermediate Results

3.7.1.1 Jurisdictional-scale Governance and Institutions

- The SFX Municipal Pact and the process that created it have led to notable improvements in the environmental capacity and collaborative environment in São Félix do Xingu, including building relationships and trust where there was previously conflict. Following the Pact, the municipality was able to strengthen the Secretary of Environment (SEMMAS) to improve environmental regulations, licensing, and monitoring. The blacklist led to an increased focus on registration of private lands in the CAR and creation of the Pact, which in turn led to an increased focus on supporting improvements sustainable production.
- Building on the framework of the original Pact, SFX has also created the country's first Municipal Plan on Sustainable Agriculture, a permanent committee on environmental management, and a permanent committee on sustainable rural development.
- The São Félix Municipality established its Environmental Observatory in 2013 as a key instrument for supporting its environmental monitoring, enforcement, licensing, and public communication efforts.
- To date, Pará has registered 71.2% of its private properties in the CAR, and São Félix has registered 86.4%. By 2013, 95% of beef supplying properties were registered in the CAR, compared to none in 2009.

3.7.1.2 Sector-specific governance and institutions

- In the cattle sector, TNC helped launch a sustainable intensification program that is gradually being scaled up and adopted by the state. Initially piloted on 16 demonstration farms covering 46,000 hectares, there are now 42 total properties participating with 47,000 cattle included. Farms have seen a 200-300% increase in meat production and have improved their animal handling practices. TNC has helped create 18 Environmental Restoration Plans for properties concentrating on cattle production. Pilot farms have increased animal stocking density by 54% without loss of more forest cover. At the state level, TNC is evaluating the costs of intensifying cattle production, comparing different traceability systems and studying potential rural credit schemes. TNC is also working with Pará's Public Prosecutor to create monitoring measures for the beef supply chain. And in 2016, the deforestation-free beef label, Rebanho Xingu, hit supermarket shelves.
- The Cacau Floresta program provided technical assistance to the first 61 farmers who were involved in the initial design and testing. In the third year, the program switched to a Productive Demonstration Unit (PDU) model with three farms serving as schools. The project now has 82 farmers participating. In 2016, the program established two new PDUs in the neighboring municipalities of Tucumã and Ourilândia do Norte. TNC is currently coordinating with several relevant government agencies including the Brazilian Agency dedicated to support small and medium businesses (SEBRAE), the national Cocoa Agency (CEPLAC), the national agency for technical support and rural extension (EMATER), and cocoa cooperatives to develop a more efficient support system, such as regional technical hubs.

3.7.2 Impacts

- In São Félix do Xingu, deforestation decreased by 80% in only three years from the time of the municipality's blacklisting, from 77,000 ha lost in 2008 to only 14,400 hectares lost in 2011. While deforestation has crept upward to 24,000 ha in 2017, this still represents around 36% of its average deforestation rate from 2001 to 2017 (67,074 ha per year).
- Economic benefits of cocoa to smallholders: The 82 farmers participating in the Cocoa Forest Initiative at the end of 2016 have restored a total of 312 hectares and sequestered 11,450 tons of carbon in one year. The first 61 pilot farmers were able to increase their gross family incomes by 28% (corrected for inflation) from R$ 50,000 in beginning 2013 and 2014, to R$ 64,000 approximately 4 to 5 years after planting. Farmers' real incomes increased by 28% even through the 2015 economic crisis and corresponding high inflation.
- Economic benefits to beef producers using sustainable intensification: while data are still being collected, based on the 16 demonstration farms, converting to sustainable cattle intensification is profitable only for farms with more than 400 hectares of pasture area. Nearly 2,000 hectares were restored and emissions reductions of 64,370 tons of CO_2 per year were measured
- Benefits to Indigenous peoples:
    - With TNC's support, the Xikrin people were able to organize and improve the collection and production of Brazil nuts, negotiate with buyers who pay a better price, and raise working capital. These actions allowed production to increase 150% in 2018 compared to the 2016 crop (from 7.7 tons to 20 tons) compared to the 2016 crop, and yielding a 73% increase in the price paid per kg by companies compared to the local market (from R$2.16 per kilo in the local Market to R$ 3.75 per kilo paid by companies)
    - TNC supported the Parakanã People, from Apyterewa Indigenous Lands, to start organizing and commercializing their Brazil nut production in 2018. The first results of the process yielded an increase of 56% in the price paid by companies compared to the local market. They did not reach the same price increases as Xikrin due to this being their first experience with the market.

4. Pará Sustentável

At the state level, Pará is currently developing a sustainable development plan under the name of Pará Sustentável (Sustainable Pará). The plan has been presented by Governor Simão Jatene to representatives of nearly 100 municipalities, business leaders, and civil society organizations over the past two years. Pará Sustentável aims to build upon existing environmental programs and policies in the state, including the Sustainable Municipalities Program (previously the Green Municipalities Program), and work collaboratively across the state to meet development and environmental goals.[55] The plan has three broad focal areas:

- ***Pará 2030***: an economic development plan to increase the state's per capita income, generate 3 million jobs, and achieve economic growth of over 5% per year, in part by increasing productivity and added value of existing economic activities in Pará.

- ***Pará Social:*** reduce poverty and inequality, promote health, culture, security, and improve the quality of life of the people of Pará
- ***Pará Ambiental:*** improve environmental governance, planning, and monitoring capacity to more effectively respond to deforestation and improve coordination with local authorities and communities.

The governor and allies from the original Green Municipalities Program are playing key backbone leadership roles in this initiative, with Imazon playing a key technical supporting role. By building in more explicit economic development goals that are tied to the state's existing environmental programs and progress, the state hopes to attract more investors and help increase the economic growth and vitality of the state.

To develop the plan, the state of Pará commissioned McKinsey consulting group to analyze the state's economic situation and evaluate opportunities for growth that would be compatible with the state's commitment to achieve net-zero deforestation by 2030.[56] This allowed the state to describe key sectors and convene multi-stakeholder working groups—involving civil society, the private sector, and researchers—around 23 priority opportunities, including several that have large land-use impacts, such as cattle, agriculture and forestry. These groups developed investment strategies, and highlighted issues around environmental governance that would need to be strengthened—such as land titling, credit access, and technical assistance—to ensure plans will not cause more deforestation.

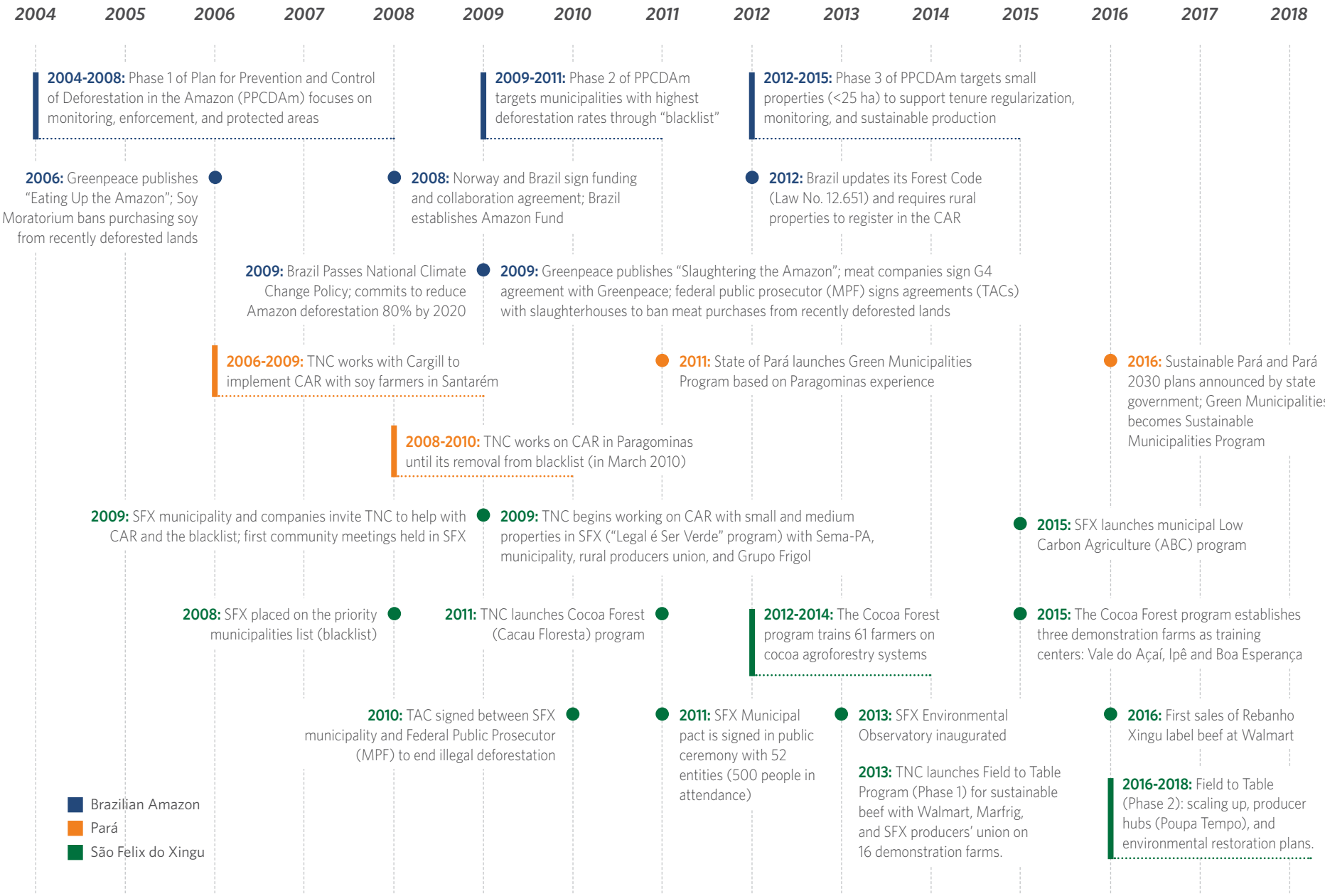
Upon invitation from McKinsey and the state government, TNC and the economic consulting firm Agroicone developed detailed sectoral analyses on cattle ranching, cocoa agroforestry, forest restoration, family farming, and grains—all areas where TNC's experience in Pará was strong—to demonstrate how the Pará 2030 plan can achieve zero net deforestation while meeting economic goals. TNC developed a financial plan for these eight productive chains in Pará 2030, including existing funding sources and gaps. TNC also reviewed how Brazil's Forest Code would impact the production chains under three scenarios: Business as Usual, Zero Net Deforestation, or Zero Deforestation. Key results of this study include:

- Mandatory forest restoration under the Forest Code would impact an estimated 1.89 million hectares—leaving Pará only 170,000 hectares short of reaching its goal of zero net deforestation.
- Sustainable agriculture and livestock farming tied to low carbon technologies offer promising avenues to free up existing ranchlands for agriculture rather than converting forests.
- Projected funding needed for the Pará 2030 plan under these scenarios ranges from approximately US$48 to US$53 billion. Of this total, approximately US$9.7 billion does not currently have an identified source of funding.

The jurisdictional approach in São Félix do Xingu and the Pará 2030 state development program have complemented and benefited from each other. From TNC's perspective, a jurisdictional program was created at the municipal level to integrate all major land use types and challenges present in Pará. The experience from this led to several focused sectoral programs that are being scaled up in the SFX region or are being adopted by the state for its development plan (primarily for sustainable cattle ranching, cocoa agroforestry, and engagement with indigenous territories). In the other direction, the Pará Sustentável plan helps improve the enabling conditions for supporting environmental governance throughout the state as well as improving the available of economic incentives and support for creating sustainable economic alternatives to deforestation.

Nevertheless, additional state support is needed in speeding up the land titling process in SFX and other municipalities to bring clarity and slow down deforestation in areas where it is not under control, as well as providing management support for the state protected areas.

Project Timeline



5. Lessons and Insights

1. The creation of the blacklist was a key factor—a shock to the system—that created the conditions for a departure from business as usual, where actors across the spectrum realized that production based on illegal deforestation was no longer viable. The negative publicity, the cutting reduction of credit, the carrying out of raids by the government, and the flurry of lawsuits toward landowners and companies dramatically pushed different types of actors to work together who were not accustomed to having to find common ground. In a sense, the blacklist created an enabling policy environment that facilitated buy-in from local actors and created a common objective to rally around, pushing past prior conflicts or histories to some degree.

2. A jurisdictional approach to sustainable development in São Félix was critical to integrate the full suite of relevant actors, leading to more effective results than working on different projects in isolation, and leading to more widespread changes and collaborative processes. The Municipal Pact formed the basis for collaboration, forcing different actors to understand and consider the interests of others, led to a shared vision, and created a framework for working together on those goals.

3. Strategies needed to be well targeted, first to identify the relevant land use and social dynamic, and then offer a strategy that was tailored to the needs of specific actors. Careful analyses of the deforestation and land dynamics help create an understanding of the major deforestation drivers, major actors involved, and how to work with them effectively. This led to development of sustainable cattle intensification for medium and large landholders, cocoa agroforestry systems for small landholders, and the recommendation for increased enforcement (carried out by the state) for non-tenant landholders and speculators causing a huge percentage of deforestation. At the same time, it was important for concrete benefits to materialize early to avoid meeting and training fatigue and loss of interest. It is important to plan activities that provide these benefits in parallel with the process to establish stakeholder engagement structures and processes.

4. It is possible to build trust among actors with a history of conflict or skepticism despite the challenge. Several factors in São Félix were essential:

    - A leveling shock event (blacklist) forcing all to adapt to a new reality.
    - A trusted and transparent facilitator to guide different stakeholders (TNC).
    - Finding mutual interests or win-win opportunities to form effective coalitions on specific issues (e.g. cattle intensification).
    - Buy-in from local government officials and local civil society leaders was critical to mobilizing broader support and creating partners to carry out specific components of the program.
    - Diverse stakeholders with conflicting interests require diverse incentives. Effort was devoted early on to determine the types of incentives that motivate different actors.

5. Command and control needs to be coupled with positive incentives to achieve resilient transformation. The Pact helped link the environmental governance agenda to a sustainable development agenda. To create partnerships and gain allies, it is essential to understand the needs and interests of other stakeholders. Francisco Fonseca observes that "there is not a green producer who is in the red." This means we cannot expect a farmer to support environmental enforcement if he or she is unable to earn enough money to feed their family and meet their needs. Improving people's lives helps them become partners.

6. Start with early adopters who are most ready and develop a pathway to gradually attract more people. The producers who respond to the earliest calls for sustainable intensification are those who already have experience with improved techniques and technologies. In both the cattle and cocoa systems, it was important to work early with the people who were ready to try something new, develop experience, increase technical assistance, and create examples and networks where producers can learn from peers in deciding whether to adopt, and accelerate a cultural transition in production.

7. Sectoral technical expertise and a neutral political stance allowed TNC to gradually scale up its role to supporting a jurisdictional coordination agenda in SFX and Pará. TNC began working on CAR and soy in Santarém in the west of Pará to support the soy moratorium, which developed its standing with government institutions and the private sector. Aprosoja invited TNC to work in Paragominas on CAR, which helped Paragominas leave the blacklist. This led to TNC being invited by the municipality of SFX and meatpackers to work in SFX on the CAR and the Pact. TNC had to learn and be flexible supporting the Pact process and to be clear it did not have a political agenda. Patience in building an understanding of actors and dynamics allowed it to develop more detailed solutions on specific issues.

8. International funding and support was necessary to jumpstart activities that supported the creation of a jurisdictional approach. Implementation of the environmental laws and programs on the books in Brazil was not fully possible without international assistance to finance existing strategies, particularly in the case of registration in CAR and piloting improved agricultural practices with groups of farmers. However, policy and programmatic clarity from the national and state level made it clear what activities needed to be funded, reducing risk of overlap and confusion. Having an organization on the ground acting as a coordinating backbone organization–whether a government agency, NGO, or academic institution—can greatly facilitate coordination among stakeholders as well as donors to make sure the necessary strategies are funded and to avoid overlaps or redundancies. There must also be acceptance of a certain percentage of experimentation and failure, and realistic expectations need to be set about what types of results to see and when. To greatly transform governance and sectors in any landscape or jurisdiction requires a decade or more of commitment and funding, to also build relationships and capacity.

9. It is important to empower the local actors to take a jurisdictional perspective to help support long-term impacts. SFX cannot reduce annual deforestation to below 4000 hectares without cooperation, because more than half of the deforestation occurs in protected areas and rural settlements that are under state and federal jurisdiction. This lack of land governance is one of the strongest underlying drivers of deforestation in Pará. An important development is that the municipal government of SFX is increasingly playing a convening and backbone role, going directly to state and federal agencies to solicit support and collaboration. A focus should be to strengthen the national land registry and Tenure Management System (Sistema de Gestão Fundiária, or SIGEF) and the Legal Land Program (Programa Terra Legal) to implement more efficient land tenure governance.

10. Political events outside of the jurisdiction have potential to derail or delay progress and cause uncertainty. Reduced budgets at the national level on environmental enforcement have allowed deforesters to adapt and reduce effectiveness of monitoring. State-level political uncertainty can also create doubts about the extent to which state environmental and development plans will be carried out. Considerations should be made about building in resilience to jurisdictional programs (and the sectoral programs they are linked to) to ensure funding, management, and coordination can continue even in the face of external political changes.

6. Conclusion

The jurisdictional program in São Félix do Xingu has taken an approach that has provided leadership on both sectoral-focused solutions as well as cross-sectoral solutions. The SFX program arose out of numerous initial conditions and challenges: the response to the blacklisting of the municipality forced diverse sets of actors to work together for the first time and forge a municipal pact. The shock of the blacklist and the pressure on the region's economic activities meant that not working together was not a realistic option. Into this space, the municipal, state, and federal agencies, private companies, farmers and ranchers, Brazilian NGOs and TNC stepped in to find a viable path to environmental compliance and sustainable productive options. Although initially developed with one eye to creating a jurisdictional REDD+ program, the program was really built on aligning the environmental governance agenda with a sustainable production agenda, which required "no-regrets" strategies that needed to be viable on their own. Each complementary strategy also had its own set of stakeholders and specific interests that needed to be engaged with in a unique way.

Several processes helped move these different working groups forward. The CAR registration process helped develop a shared understanding of the problem and bring most private landholders in SFX to a baseline where they could work toward environmental compliance, land tenure, and improved productive options. The Pact commission helped increase capacity for environmental monitoring and licensing, helped test solutions for farmers and ranchers, and supported infrastructure needs. In parallel, TNC worked with companies, local NGOs, and large and small producers to develop sustainable alternatives that would avoid more deforestation, yield positive environmental benefits, and improve incomes. The Field to Table cattle program was tailored to medium and large landholders, and the Cocoa Forest Initiative was tailored to small landholders, each program addressing specific needs and conditions of its beneficiaries. The backbone coordination led by TNC with the SFX municipality helped ensure that the strategies were complementary and did not compete, allowing multiple sources of funding from international, private, and domestic public sources to help drive these different programs forward. Meanwhile, a parallel program to support indigenous territorial development is helping to integrate indigenous people into targeted, mutually-beneficial arrangements with other stakeholders—for instance on Brazil nut harvesting and supplying seeds to support forest restoration.

To date, significant progress has been made on environmental governance capacity and on providing economically viable productive models. This required a coordination among focused programs for specific stakeholders but developed from a shared vision of where the municipality and the state wanted to go, helping to fit these pieces together. While major weaknesses and uncertainties remain—in governance, in providing access to credit and resources, in protected area management, and in recently increased deforestation rates—several viable paths forward have been developed that are worth continued investment and experimentation.

7. Annex: Annotated Bibliography

TNC Reports and documents

1. Carvalho, F. R. Cortez, A. Toniolo, M. Sztutman, and E. Barnes. 2013. "Central Xingu REDD+ Program and Fund: Designing a Benefit Sharing Scheme." Presentation. Available at: http://www.conservationgateway.org/Documents/Fernanda%20Carvalho_REDDEx2013.pdf.

   This presentation provides a brief overview of the original design of the SFX jurisdictional program, including the major strategies, key steps, timeline, and a diagram of the governance mechanism and fund that were proposed during the Pact formation and implementation process.

2. Cortez, R. 2012. Stakeholder Engagement in REDD+ in Brazil: From National Policy to Municipal Action. A case study of the Central Xingu REDD+ Pilot Program. Unpublished paper. The Nature Conservancy, Belem.

   This document provides detail on the stakeholder engagement process of the SFX municipal pact, including the policy context in which it developed, the unique geographical and social challenges of forging the pact in SFX, and the process of negotiating among complex set of stakeholder interests.
   It also describes the Commission, and offers lessons learned for this critical portion of the jurisdictional program.

3. Fishbein, G. and D. Lee. 2015. "Early Lessons from Jurisdictional REDD+ and Low Emissions Development Programs." Arlington, Virginia: The Nature Conservancy. Available at: https://www.forestcarbonpartnership.org/sites/fcp/files/2015/January/REDD%2B_LED_web_high_res.pdf.

   In recent years there has been increasing support for REDD+ and low emissions development (LED) at a jurisdictional scale. Jurisdictional efforts were designed to overcome the shortcomings of project-based approaches by working across land-use types and with multiple stakeholders to create models for national implementation. This study analyzes eight of the most advanced REDD+/LED initiatives worldwide—including a critical look at the success and challenges to date—to understand what is needed to succeed going forward. Jurisdictions studies include: Acre, Brazil; Berau, Indonesia; Ghana's cocoa ecoregion; Mai Ndombe, Democratic Republic of the Congo (DRC); San Martín, Peru; São Félix do Xingu, Brazil; the Terai Arc, Nepal; and the Yucatan Peninsula, Mexico.

4. Garcia, E., F.S.V. Ramos Filho, G.M Mallmann and F.G. Fonseca. 2017. "Costs, benefits and challenges of sustainable livestock intensification in a major deforestation frontier in the Brazilian Amazon." *Sustainability* 9 (1): 158. Available at: http://www.mdpi.com/2071-1050/9/1/158.

   This paper describes the cost-benefit analysis research carried out to prepare TNC's Field to Table Program. Working on 13 pilot farms in São Félix do Xingu, the study estimates that sustainable intensification of cattle is profitable in farms greater than 400 hectares and has potential to promote social and environmental benefits through improved farm capacity, employment, and carbon emissions reductions and sequestration.

5. Garcia, E., Fonseca, F. G., Freire, R. M., Mello, R. De, Souza, H., & Thompson, I. 2017. 4.5 Dealing with deforestation in the Brazilian Amazon. ETFRN News, 58, 143–149. Available at: http://www.etfrn.org/file.php/401/etfrn%20news%2058%204.5.pdf.

This paper provides a concise review by TNC staff of the jurisdictional program in SFX and a description of the main strategies carried out in SFX, including supporting the evolution from a command-and-control strategy to a green economic development strategy. The programs described include the Pact, Environmental Observatory, Sustainable Cattle, Cocoa Agroforestry, and support to the management of Indigenous Territories and public protected areas in the municipality.

6. Gomes, C.V., E. Garcia, E. Alves and M. Queiroz. 2015. Cocoa agroforestry system as an alternative for degraded pastureland restoration, food security and livelihoods development among smallholders in a Brazilian Amazon agricultural frontier. In: Kumar, C., C. Saint-Laurent, S. Begeladze and M. Calmon (eds.). Enhancing Food Security through Forest Landscape Restoration: Lessons from Burkina Faso, Brazil, Guatemala, Viet Nam, Ghana, Ethiopia and Philippines. Gland, Switzerland: IUCN, pp. 42–69. Available at: https://portals.iucn.org/library/node/45774.

This study provides a detailed and comprehensive description of the TNC-supported Cocoa Forest program for smallholder farmers in São Félix do Xingu. It provides background and context for the region, partners, the set-up of the program, and the shift from farm-based support to productive demonstration units. It also provides the measured benefits to farmers of adoption and lessons learned.

7. Griscom, B. and J. Kerkering. 2010. "Forest Carbon Emissions in São Felix Do Xingu Region, Para, Brazil." Unpublished report. The Nature Conservancy, Arlington, VA.

This study calculates the historic land use and forest emissions from São Félix do Xingu, identifying the balance of emissions from the major land tenure types present. The study was conducted to help develop the jurisdictional REDD+ program and prioritize areas for action.

8. Freire, R.M. and S. Begeladze. 21 December 2017. Supporting cacao production and restoration in Brazil. IUCN News. Available at: https://www.iucn.org/news/forests/201712/supporting-cacao-production-and-restoration-brazil.

This article provides an excellent non-technical overview of the Cocoa Forest program for smallholders in SFX, including essential background on deforestation, the ecology of cocoa agroforestry, the development and objectives of the Cocoa Forest Program, and a video that interviews technical staff and program participants.

9. Moretti, G. and L. Zumbach. 2015. Cadastro Ambiental Rural: Nasce a Identidade Do Imóvel Rural (Rural Environmental Registry: The Birth of Rural Property Identity). Executive Summary. The Nature Conservancy, Curitiba, Paraná, Brazil.

- Executive Summary: http://laconservationcouncil.org/publico/files/challenges/Food---TNC-CAR---Exec-Summary---2015.pdf.
- Full report: http://www.nature.org/media/brasil/cadastro-ambiental-rural.pdf.

The objective of this publication is to disseminate guidelines on Brazil's Cadastro Ambiental Rural (CAR). These guidelines are based on the methodology and technology developed by The Nature Conservancy (TNC) and partners in planning and implementing CAR. Considered more than a monitoring tool, CAR is now required by Brazil´s Forest Code and is understood to be a fundamental instrument for recuperating land lost to habitat conversion and designating it for environmental conservation.

10. Government of Pará. Green Municipalities Program. 26 August 2011. Pacto Municipal Para o Fim do Desmatamento Ilegal no Município de São Félix do Xingu (Municipal Pact for the End of Illegal Deforestation in the Municipality of São Félix do Xingu). Available at: http://www.municipiosverdes.pa.gov.br/files/03904afd76c716b7f27936188719a0f9/78f2e88f9ac886e342894969fcedc683/sao%20felix%20do%20xingu%20PACTO%2026-08-2011%20completo.pdf.

This link provides the original text (in Portuguese) of the SFX municipal pact signed in 2011, including the description of the Pact Commission, and supporting documentation of the process and commitments made under the Pact.

11. Schroth, G., E. Garcia, B.W. Griscom, W.G. Teixeira and L.P. Barros. 2016. Commodity production as restoration driver in the Brazilian Amazon? Pasture re-agro-forestation with cocoa (Theobroma cacao) in southern Pará. Sustainability Science, 11(2), 277–293. Available at: https://link.springer.com/article/10.1007/s11625-015-0330-8.

This research paper provides a description of the biophysical, social, and policy context of the potential for promotion of cocoa agroforestry systems in the state of Pará, as well as the initial development and results of TNC's Cocoa Forest program in São Félix do Xingu.

12. Smith, J. April/May 2016. Reforesting the Amazon. The Nature Conservancy Magazine. Available at: https://www.nature.org/magazine/archives/april-may-2016-issue-reforesting-the-amazon.xml.

Written for a general audience, this article describes TNC's work in the Amazon region, providing background on deforestation in the Amazon, and how TNC came to be involved in developing the jurisdictional program in SFX. It interviews farmers who have worked with TNC and describes TNC's sustainable cattle and cocoa agroforestry strategies.

13. Sztutman, M. 7 May 2013. "Amazon Native Lands: From Local Action to National Policies, Participation at the Core." Presentation. Available at: https://www.conservationgateway.org/Documents/Amazon Native Lands_Marcio Stutzman.pdf.

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14. The Nature Conservancy. 4 March 2013. TNC, Cargill, CEPLAC e CAPPRU lançam projeto Cacau Mais Sustentável em São Félix do Xingu (PA). (TNC, Cargill, CEPLAC e CAPPRU launch More Sustainable Cacao Project in São Félix do Xingu (PA)). Available at: https://www.tnc.org.br/quem-somos/sala-de-imprensa/tnc-cargill-ceplac-e-cappru-lancam-projeto-cacau-mais-sustentavel-em-sao-fel.xml?redirect=https-301.

This press release provides a brief announcement of the launching of the Cocoa Forest Program (or More Sustainable Cocoa Program) in SFX, describing the partners and numbers of farmers involved, as well as the goals of the first phase of the program.

15. The Nature Conservancy. 2018. Plano de Intensificação Sustentável Pecuária de Corte: Microrregião de São Félix do Xingu – PA (Plan for Sustainable Intensification of Beef Cattle: São Félix do Xingu, Pará Micro-region). Unpublished report. The Nature Conservancy, Belém, Brazil.

This report describes the proposed strategy for scaling up sustainable cattle intensification throughout the southeast region of Pará (building out from the work in SFX), prioritization of areas to support intensified production, financial and market analysis, and where it fits into the statewide Pará 2030 plan.

16. The Nature Conservancy. 26 December 2016. Carne Sustentável: Do Campo à Mesa - Agregando ganhos ambientais e sociais à produção (Sustainable Beef: From Field to Table—Adding up environmental and social wins to production). Available at: https://youtu.be/eeOAK7bS5_o.

A video (in Portuguese) that provides an introduction and overview of the Field to Table program on Sustainable Cattle, including interviews with key TNC staff and partners, and participant farmers.

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This fact sheet provides a concise overview of TNC's approach to supporting Indigenous Territorial Land Management and livelihoods support throughout Brazil. The document provides essential context and details on the process and objectives of developing territorial management plans (PGTAs), as well as a map of where in Brazil TNC is supporting PGTA development.

19. The Nature Conservancy. October 2013. Implementation of the Rural Environmental Registry (CAR) in Brazil. 2pp. Unpublished document. Available upon request.

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This five-minute video portrays the experience and perspectives of select farmers and ranchers in São Félix do Xingu who have participated in TNC's programs, describing the activities they have carried out and their vision for the future.

22. The Nature Conservancy and Agroicone. 2016. PARÁ 2030: Desenvolvimento de cenários de uso da terra e estimativa de custos de implantação da agenda de desenvolvimento verde no estado do Pará. (Pará 2030: Development of Land Use Scenarios and Estimates of Establishment Costs for the Green Development Agenda in the State of Pará). Unpublished analysis.

This study completed with Agroicone supports specific sustainable supply chain strategies for the state Pará 2030 economic development plan. Detailed analysis of different land use scenarios for the specific productive sectors in Pará, including smallholder agriculture, forestry, grains, oil palm, fruits, cocoa, cattle, and forest restoration.

23. The Nature Conservancy. 2015. Proposta de Diretrizes Brasileiras de Boas Práticas Corporativas com Povos Indígenas: Iniciativas Diálogo Empresas e Povos Indígenas (Proposal of Brazilian Guidelines for Good Corporate Practices with Indigenous Peoples: Business and Indigenous Peoples Dialogue Initiative). The Nature Conservancy, Belém, Brazil. Available at: https://www.tnc.org.br/quem-somos/publicacoes/boas-praticas-empresas-e-povos-indigenas.pdf.

This document describes a toolkit developed by TNC Brazil to guide companies, governments, and relevant supporting organizations in establishing good relationships and negotiations between companies and indigenous peoples in Brazil, ensuring the protection of their rights and territories, while also working to achieve mutual gains through productive agreements.

24. TNC and FUNBIO. 2013. Fundo para Redução do Desmatamento e Degradação Florestal: A Experiência de São Félix do Xingu (Fund for Reducing Deforestation and Forest Degradation: the Experience of São Félix do Xingu). Belém, Pará, Brazil. Unpublished report.

Report that describes the context of the SFX Municipal Pact and Commission, and the process that was carried out to design and develop the REDD+ benefit sharing fund in São Félix do Xingu (the Green Earth Fund), including the results of the multi-stakeholder consultations that were carried out.

25. The Nature Conservancy. 2013. Povos e Terras Indígenas: Promovendo Conservação e Etnodesenvolvimento (Indigenous Peoples and Lands: Promoting Conservancy and Ethno-development). https://www.tnc.org.br/quem-somos/publicacoes/portfolio-brasil-terras-indigenas.pdf.

This document (in Portuguese) provides an accessible overview of TNC Brazil's work to support Indigenous peoples and territories, including public policy, development plans, capacity building and governance, and promoting improved dialogues between business and indigenous peoples.

26. The Nature Conservancy. 2014. Sustainable Agriculture: Efficient and Responsible Use of Natural Resources. Brazil. https://www.nature.org/media/brasil/sustainable-agriculture-brazil.pdf.

This document provides an accessible overview of TNC's programs on supporting sustainable agriculture in Brazil, including essential context, promotion of sustainable supply chains, improved livestock practices, and environmental planning (particularly through the CAR).

27. US Agency for International Development. 29 October 2013. Final Performance Report. Sustainable Landscapes AID-512-A-11-00004. "REDD+ Readiness in Brazil (RRB)." Available at: https://pdf.usaid.gov/pdf_docs/PA00JM1P.pdf.

This document provides a summary of results of the USAID-Funded project REDD+ Readiness in Brazil, which was implemented by TNC in collaboration with Fundo Brasileiro para a Biodiversidade (FUNBIO), Environmental Defense Fund (EDF), Instituto Centro de Vida (ICV), and Instituto Socio-Ambiental (ISA). The project focused on increasing sub-national REDD+ readiness in the states of Mato Gross and Pará through support to civil society, state and local governments, development of land use and REDD+ plans, and exploring options for implementing improved land use practices.

Government reports

28. Agência Pará. 26 April 2017. Pará Sustentável cria cenário para o desenvolvimento econômico, social e ambiental. Available at: http://www.agenciapara.com.br/noticia/145946/para-sustentavel-cria-cenario-para-o-desenvolvimento-economico-social-e-ambiental.

This press release provides an overview and announcement by the governor of the state of Pará on the Sustainable Pará and Pará 2030 plans, including new institutional arrangements and activities currently being undertaken.

29. Agência Pará. 27 October 2016. Plano Pará Sustentável é discutido com empresários. Available at: http://www.agenciapara.com.br/Noticia/137696/plano-para-sustentavel-e-discutido-com-empresarios.

This press release describes how the government of the state of Pará is working to incorporate the participation of the private sector into the development of the Pará 2030 plan, and the objective of creating a multi-sectoral collaborative approach—between government, civil society, and companies—in carrying out the plan for sustainable development.

30. Anache, B., Pons, E. G., Ferreira, G. de L., Maia, H. T., & Lucini, J. 2017. Going Green Project: Effectiveness Evaluation Report. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and National Bank for Economic and Social Development (BNDES). Available at: http://www.fundoamazonia.gov.br/export/sites/default/en/.galleries/documents/monitoring-evaluation/impact-evaluations-ex-post/TNC_Going_Green-Effectiveness_Evaluation_Report.pdf.

This report presents the effectiveness evaluation report of the project supported by the Amazon Fund, called "Going Green," which ran from 2010 to 2014. The project was carried out by The Nature Conservancy and consisted of supporting the implementation of the CAR in twelve municipalities in the states of Pará and Mato Grosso, including five that were on the national priority municipalities "blacklist." The evaluation was carried out by a team of independent consultants under the coordination of BNDES and GIZ.

31. Governo do Pará. 29 June 2016. Pará 2030: Estratégias para o crescimento sustentável. Apresentação de lançamento. Available at: http://para2030.com.br/wp-content/uploads/2016/06/2016.06.29-Para-2030-Lancamento-Oficial.pdf.

This presentation presents an overview of the state's Pará 2030 plan, including context, broad goals for economic development, and the specific sectors to be targeted during the plan, including sustainable cattle, cocoa, and grains.

32. Governo do Pará. 2017. Programa Municípios Sustentáveis. Available at: http://municipiossustentaveis.pa.gov.br.

This is the official site for the state of Pará's Sustainable Municipalities Program, which evolved out of the original Green Municipalities Program. This site is useful for stay up to date on this environmental governance program that was initially focused on removing municipalities from the blacklist.

33. Programa Municípios Verdes 2017. Ficha Completa: São Félix do Xingu/Embargado. Available at: http://www.municipiosverdes.pa.gov.br/relatorios/ficha_completa/1507300.

This page (from the original Green Municipalities Program website) provides basic social, economic, and land use data about the municipality of São Félix do Xingu, including progress to-date on the original Green Municipalities goals to help get SFX off the blacklist; essentially this site functions as a Green Municipalities progress and data dashboard for SFX.

34. SEDEME. 22 December 2017. Sedeme apresenta resultados do Pará 2030. Available at: http://sedeme.com.br/portal/sedeme-apresenta-resultados-do-para-2030/.

This page provides a recent progress update on Pará 2030 from the state government.

35. Whately, M. and M. Campanili. 2013. Green Municipalities Program: lessons learned and challenges for 2013/2014. Governo do Pará, Belém. Available at: http://www.municipiosverdes.pa.gov.br/files/999816d7a617e650c796109566e1337c/c20ad4d76fe97759aa27a0c99bff6710/versao-ingles%20(1).pdf.

This document provides a helpful and comprehensive overview of the development of the Green Municipalities program, including how it was created based on the Paragominas experience, the program's major goals, and the composition and operation of the steering committee (where TNC participated). The report also provides data on each municipality in Pará, and progress achieved up to his point on the specific indicators and milestones set out in the Green Municipalities Program.

Third party literature and reports

36. Alencar, A., Pereira, C., Castro, I., Cardoso, A., Souza, L., Costa, R., Bentes, A. J., Stella, O., Azevedo, A., Gomes, J., Novaes, R. 2016. Desmatamento nos Assentamentos da Amazônia: Histórico, Tendências e Oportunidades (Deforestation in the Settlements of the Amazon: History, Trends, and Opportunities). IPAM, Brasília, DF, 93p. Available at: http://ipam.org.br/wp-content/uploads/2016/02/Desmatamento-nos-Assentamentos-da-Amaz%C3%B4nia.pdf.

This study published by IPAM describes the dynamic of deforestation in Amazonian agrarian reform settlements, which are granted to small farmers through public schemes of redistribution, but which often suffer from high tenure insecurity, low access to public services and resources, high rates of illegal sales and land grabbing, and higher rates of deforestation and degradation than neighboring private lands.

37. Arima, E.Y., P. Barreto, E. Araújo, and B. Soares-Filho. 2014. Public Policies Can Reduce Tropical Deforestation: Lessons and Challenges from Brazil. Land Use Policy 41 (November). Elsevier Ltd: 465–73. Available at: https://www.sciencedirect.com/science/article/pii/S026483771400146X.

This paper determines and quantifies the differential effects of enforcement on reducing deforestation and avoiding carbon emissions across municipalities in the Brazilian Legal Amazon using statistical analysis.

38. Assunção, J., Gandour, C., Pessoa, P., & Rocha, R. 2017. Property-level assessment of change in forest clearing patterns: The need for tailoring policy in the Amazon. Land Use Policy, 66 (January 2016), 18–27. Available at: https://www.sciencedirect.com/science/article/pii/S0264837716300060.

This study uses georeferenced data to measure the changes in deforestation patterns over time among small and large properties in the Amazon, demonstrating that deforestation was reduced more quickly in large landholdings, while smallholders' contribution has gradually increased as a relative proportion of deforestation (though still a smaller contribution than deforestation from large properties).

39. Assunção, J., & Rocha, R. 2014. Getting Greener by Going Black: The Priority Municipalities in Brazil. Technical Paper. Climate Policy Initiative, PUC-Rio, (August), 18. Available at: https://climatepolicyinitiative.org/wp-content/uploads/2014/08/Getting-Greener-by-Going-Black-Technical-Paper.pdf.

This paper provides a quantitative estimate of the effect of the Priority Municipalities Policy (the blacklist) on reductions in deforestation across the Legal Amazon. The study finds that increased monitoring and better enforcement were most effective in reducing deforestation without affecting credit concessions and economic growth, demonstrating that forest preservation and economic growth could occur simultaneously.

40. Azevedo, A. A., Rajão, R., Costa, M. A., Stabile, M. C. C., Macedo, M. N., dos Reis, T. N. P., ... Pacheco, R. 2017. Limits of Brazil's Forest Code as a means to end illegal deforestation. Proceedings of the National Academy of Sciences, 114(29), 7653–7658. Available at: http://www.pnas.org/content/114/29/7653.

This study tries to measure the limits to which the CAR has helped to reduce deforestation (initially a reduction is seen, but this effect diminishes over time) and whether reaching full compliance with the forest code is economically viable for landowners (on its own, forest code compliance offers few economic benefits, while full compliance and restoration of illegally cleared areas requires increased economic and market incentives).

41. Cavalcante, G.C., N.P. Cavalcante Maciel, and R.J. Coroa de Carvalho. 2013. "Diagnóstico Do Status Atual E Proposta de Reestruturação Organizacional Da Comissão Do Pacto Municipal Para O Fim Do Desmatamento Ilegal de São Félix Do Xingu/PA" 38. Available upon request.

This report, sub-contracted under the USAID-funded REDD+ Readiness in Brazil (RRB) project, provides an overview of the SFX Pact Commission process, including the major organizations and stakeholders involved, the structure of the Commission leadership and thematic working groups, major milestones carried out within those different thematic working groups, and recommendations for improvements to the commission governance structure.

42. Dienhart, Paul. (July/August) 2010. "Amazon Report: A Conservation Success." Cargill News. Available at: https://www.readkong.com/page/amazon-report-a-conservation-success-5719300.

An article that describes the early collaboration between TNC and Cargill in response to Brazil's Soy Moratorium. TNC and Cargill worked with the state government of Pará to develop an advanced satellite monitoring and land registration system to establishes normal environmental licensing for soy farmers, which helped reduce deforestation, allow farmers to sell their soy legally, and create a pathway for meeting compliance with the forest code.

43. Gebara, Maria Fernanda. "Sustainable Landscapes Pilot Program in São Félix do Xingu, Brazil." In: Sills EO, Atmadja SS, de Sassi C, Duchelle AE, Kweka DL, Resosudarmo IAP and Sunderlin WD (eds) 2014. REDD+ on the ground: A case book of subnational initiatives across the globe. Bogor, Indonesia: CIFOR pp. 106-123. Available at: https://www.cifor.org/redd-case-book/case-reports/brazil/sustainable-landscapes-pilot-program-sao-felix-xingu-brazil/.

This article reviews the jurisdictional program run by TNC in São Félix do Xingu, with a focus on the engagement and effect of the program on smallholder farmers. It provides useful policy and institutional context (on the creation of the blacklist, enforcement efforts, and registration efforts in the CAR). It also describes the main jurisdictional strategies carried out—territorial governance, conservation, improved practices, and increasing economic opportunities—and provides an initial estimate of changes in smallholder well-being in a few select communities in SFX.

44. Ferreira Neto, P.S.; da Silva, R.C. 2014. Processo de construção da sustentabilidade em São Félix do Xingu – PA. (Processo of Constructing Sustainability in São Félix do Xingu – PA). Belém, Brasil: Instituto Internacional de Educação do Brasil (IEB). 116 pp. Available at: http://iieb.org.br/index.php/download_file/2418/1587/.

This document describes the process carried out to systematize the process of creating sustainability in the municipality of SFX, focusing on the living history and experiences of the major civil society stakeholders involved. The document focuses on the period following the implementation of federal enforcement efforts and the blacklist, which placed SFX into crisis. It provides a chronological narrative of the major actors, discussions, challenges, and outcomes of the jurisdictional program from a local perspective.

45. Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., ... Cerrado, E. 2014. Brazil's Soy Moratorium. Science - Policy Forum: Environment and Development, 347(6220), 377–378. Available at: http://science.sciencemag.org/content/347/6220/377.

This research paper describes the background, implementation, and effects of the Brazilian Soy Moratorium, which was the first voluntary zero-deforestation agreement in the tropics on commodities. Pressure from NGOs and retailers compelled the major soy producing companies to promise not to purchase soy from recently deforested lands and led to increased enforcement and increased attention on registration of private properties in the rural environmental registry.

46. Hull, R.B., Robertson, D., Kimmel, C., McCutchan, B. 2014. "Collaborative Leadership for Sustainable Development in Global Supply Chains: Partnering Across Sectors to Reduce Amazon Deforestation." The Solutions Journal, Volume 5, Issue 4, July 2014, Pages 51-59. Available at: https://www.thesolutionsjournal.com/article/collaborative-leadership-for-sustainable-development-in-global-supply-chains-partnering-across-sectors-to-reduce-amazon-deforestation.

"This study describes a collaborative effort to limit deforestation while increasing production of soybeans by promoting compliance with existing laws and regulations. Collaborators included the Nature Conservancy, Cargill, farmers, government agencies, and other stakeholders. A key message is that organizations from different sectors can achieve direction, alignment, and commitment of goals and resources to create novel solutions to complex problems."

47. Latawiec, A. E., Strassburg, B. B. N., Valentim, J. F., Ramos, F., & Alves-Pinto, H. N. 2014. Intensification of cattle ranching production systems: socioeconomic and environmental synergies and risks in Brazil. Animal, 8(08), 1255–1263. Available at: https://doi.org/10.1017/S1751731114001566.

This paper provides a helpful, comprehensive overview of the context and challenges of sustainable cattle intensification in Brazil as one way to increase productivity while preventing additional deforestation. The paper describes the main techniques used in Brazil for sustainable intensification, and the primary needs and barriers—including technical, financial, and policy—needed to lead to more widespread adoption and improved land use outcomes.

48. Piketty, M-G., R. Poccard-Chapuis, I. Drigo, E. Coudel, S. Plassin, F. Laurent, and M. Thâles. 2015. "Multi-Level Governance of Land Use Changes in the Brazilian Amazon: Lessons from Paragominas, State of Pará." Forests 6 (5): 1516–36. Available at: http://www.mdpi.com/1999-4907/6/5/1516.

This paper provides a helpful detailed narrative of the challenge of multi-level governance that emerged from the experience of Paragominas, the first "Green Municipality." In response to the blacklist, Paragominas launched the first multi-stakeholder Pact to address deforestation. The paper argues that the multi-level governance mechanism that emerged is not successfully leading to improved land use intensification, reforestation, rehabilitation of degraded lands; the paper argues for a broader territorial approach that can overcome the barriers that landholders face and provide more effective positive incentives for adopting and implementing improved and more sustainable land use practices.

49. Schmink, M., Hoelle, J., Gomes, C. V. A., & Thaler, G. M. 2017. From contested to "green" frontiers in the Amazon? A long-term analysis of São Félix do Xingu, Brazil. Journal of Peasant Studies, 6150, 1–23. Available at: https://www.tandfonline.com/doi/full/10.1080/03066150.2017.1381841.

This paper provides a comprehensive history on the settlement of the Amazonian frontier with a focus on São Félix do Xingu from the 1970s to the present day, analyzing the gradual evolution of the frontier and source of environmental conflicts over the succeeding decades using a political ecology framework. The paper describes the perspective of local stakeholders in São Félix do Xingu, and analyzes the greening of the policy discourse, recent positive social and environmental developments, and persistent contradictions and uncertainties.

50. Schneider, C., Coudel, E., Cammelli, F., & Sablayrolles, P. 2015. Small-scale farmers' needs to end deforestation: insights for REDD+ in São Felix do Xingu (Pará, Brazil). International Forestry Review, 17, 124–142. Available at: http://www.bioone.org/doi/abs/10.1505/146554815814668963.

This paper examines the perspectives of smallholder farmers in São Félix do Xingu on deforestation and what would be needed for them to transition to more sustainable alternatives. This social science research was conducted in the context of TNC's jurisdictional program and found that differentiated benefit programs would be important to address the needs of smallholder farmers.

51. Sousa, R. da P., da Silva, R. C., Miranda, K., & Neto, M. A. 2016. Governança Socioambiental na Amazônia: Agricultura familiar e os desafios para a sustentabilidade em São Félix do Xingu - Pará. (Socio-environmental governance in Amazonia: Family agriculture and the challenges for sustainability in São Félix do Xingu – Pará). Belém, Brasil: Instituto Internacional de Educação do Brasil (IEB). 116 pp. Available at: http://www.iieb.org.br/files/5614/6504/5733/Livro_SFX_WEB_reduzido.pdf.

This document analyzes the current state of family farming in São Félix do Xingu, their socio-economic conditions, and describes the range of organizations and strategies active in the region that are working to address their sustainability challenges.

52. Zwick, S. and C. Calderón. 9 February 2016. The Difficult Birth of Brazil's First "Green Municipality." Part 1 of 3. Ecosystem Marketplace. Available at: http://www.ecosystemmarketplace.com/articles/paragominas-the-green-revolution-that-almost-wasnt/.

53. Zwick, S. and C. Calderón. 5 March 2016. Brazil's Green Municipalities: What Works? What Doesn't? Why? Part 2 of 3. Ecosystem Marketplace. Available at: http://www.ecosystemmarketplace.com/articles/brazils-green-municipalities-what-works-what-doesnt-why/.

54. Zwick, S. and C. Calderón. 29 March 2016. How One Brazilian Governor Hopes to Replicate "Green Municipalities" Across the Amazon. Part 3 of 3. Ecosystem Marketplace. Available at: http://www.ecosystemmarketplace.com/articles/replicating-brazils-green-municipalities-across-the-amazon/.

This series of three articles provides an excellent narrative on the origin, implementation, and challenges of the Green Municipalities program, starting from the implementation of Brazil's federal programs to slow deforestation, to the necessary formation of the municipal pact, to how the state of Pará created the Green Municipalities Program as a jurisdictional model for multi-stakeholder collaboration that could be replicated to more rapidly assist municipalities with the wide range of challenges they faced from the blacklist.

Endnotes

1 In this paper, the Brazilian Amazon refers to the "Brazilian Legal Amazon," which is a political-geographic region composed of the western territory of the state of Maranhão and the entire territory of the states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins (see Figure 1).

2 There are currently an estimated 343,000 indigenous peoples from over 200 ethnic groups living in the Brazilian Amazon. Their 419 indigenous territories in the Brazilian Amazon cover 117 million ha, or 14% of Brazil's total territory. See Instituto Socioambiental (2017). Terras Indígenas no Brasil. https://terrasindigenas.org.br/pt-br/brasil.

3 Simões AJG, Hidalgo CA. 2011 The Observatory of Economic Complexity. Brazil. http://atlas.media.mit.edu/en/profile/country/bra/.

4 Butler, Rhett. 26 January 2017. Calculating Deforestation Figures for the Amazon. Mongabay. https://rainforests.mongabay.com/amazon/deforestation_calculations.html.

5 Wri, Cait. 2014. Climate Analysis Indicators Tool: WRI's Climate Data Explorer. Washington, DC: World Resources Institute. Available at: http://cait2.wri.org.

6 Nepstad, D. C., Stickler, C. M., & Almeida, O. T. 2006. Globalization of the Amazon soy and beef industries: Opportunities for conservation. *Conservation Biology*, 20(6), 1595–1603. https://doi.org/10.1111/j.1523-1739.2006.00510.x.

7 Chomitz, KM and Thomas TS 2001. Geographic patterns of land use and land intensity in the Brazilian Amazon. World Bank. http://documents.worldbank.org/curated/en/102381468769744789/Geographic-patterns-of-land-use-and-land-intensity-in-the-Brazilian-Amazon.

8 INPE and EMBRAPA. 2016. Avaliação da dinâmica do uso e cobertura da terra no período de 10 anos nas áreas desflorestadas da Amazônia legal Brasileira: 2004-2014. https://ainfo.cnptia.embrapa.br/digital/bitstream/item/152807/1/TerraClass.pdf.

9 Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., Walker, N. F. 2015. Brazil's Soy Moratorium. *Science*, 347 (6220), 377–378. https://doi.org/10.1126/science.aaa0181.

10 System for Greenhouse Gas Emissions and Removals Estimates (SEEG). 2016. http://seeg.eco.br/en.

11 Schroth, G., Garcia, E., Griscom, B. W., Teixeira, W. G., & Barros, L. P. 2016. Commodity production as restoration driver in the Brazilian Amazon? Pasture re-agro-forestation with cocoa (*Theobroma cacao*) in southern Pará. Sustainability Science, 11(2), 277–293. https://doi.org/10.1007/s11625-015-0330-8.

12 Instituto Nacional de Pesquisas Espaciais. Projeto PRODES: Monitoramento da Floresta Amazônica Brasileira por Satélite. Apresentação Geral. http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes.

13 Assunção, J., Gandour, C., Pessoa, P., & Rocha, R. 2017. Property-level assessment of change in forest clearing patterns: The need for tailoring policy in the Amazon. *Land Use Policy*, 66:18–27. https://doi.org/10.1016/j.landusepol.2017.04.022.

14 PRODES. http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes.

15 Fearnside, Philip. 18 April 2017. Business as Usual: A Resurgence of Deforestation in the Brazilian Amazon. Yale Environment 360. https://e360.yale.edu/features/business-as-usual-a-resurgence-of-deforestation-in-the-brazilian-amazon.

16 PRODES Satellite data : http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes.

17 Hecht, S. and A. Cockburn. 1990. The Fate of the Forest: Developers, Destroyers and Defenders of the Amazon. Harper Collins, New York.

18 Fearnside, P. M. 2005. Deforestation in Brazilian Amazonia: History, rates, and consequences. Conservation Biology, 19(3), 680–688. https://doi.org/10.1111/j.1523-1739.2005.00697.x.

19 Kolk, A. 1998. From conflict to cooperation: international policies to protect the Brazilian Amazon. World Development, 26(8), 1481–1493.

20 Assunção, J., & Chiavari, J. 2006. Towards efficient land use in Brazil. The New Climate Economy. The Global Commission on the Economy and Climate, 1–28. https://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2016/04/Towards-Efficient-Land-Use-Brazil.pdf.

21 Arima, E. Y., Barreto, P., Araújo, E., & Soares-Filho, B. 2014. Public policies can reduce tropical deforestation: Lessons and challenges from Brazil. *Land Use Policy*, 41, 465–473. https://doi.org/10.1016/j.landusepol.2014.06.026.

22 Clendenning, A. 24 March 2007. Brazil Shuts Down Cargill's Amazon Port. Associated Press. http://www.washingtonpost.com/wp-dyn/content/article/2007/03/24/AR2007032401357.html (accessed 20 May 2018).

23 Dienhart, Paul. July/August 2010. "Amazon Report: A Conservation Success." Cargill News. https://www.readkong.com/page/amazon-report-a-conservation-success-5719300.

24 Presidency of the Republic of Brazil. Law No. 12.651 of 25 May 2012. http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm.

25 Soares-Filho, B., Rajão, R., Macedo, M., Carneiro, A., Costa, W., Coe, M., … Alencar, A. 2014. Land use. Cracking Brazil's Forest Code. *Science* (New York, N.Y.), 344(6182), 363–364. https://doi.org/10.1126/science.1246663.

26 This co-responsibility decree held companies liable for environmental crimes committed by their suppliers and pushed the private sector to become much more engaged in environmental compliance.

27 Assunção, J., & Rocha, R. 2014. Getting Greener by Going Black: The Priority Municipalities in Brazil. Climate Policy Initiative, PUC-Rio. https://climatepolicyinitiative.org/wp-content/uploads/2014/08/Getting-Greener-by-Going-Black-Executive-Summary-English.pdf.

28 Gibbs, H. K., Munger, J., L'Roe, J., Barreto, P., Pereira, R., Christie, M., … Walker, N. F. 2016. Did Ranchers and Slaughterhouses Respond to Zero-Deforestation Agreements in the Brazilian Amazon? *Conservation Letters*, 9(1), 32–42. https://doi.org/10.1111/conl.12175.

29 Nepstad, D., McGrath, D., Stickler, C., Alencar, A., Azevedo, A., Swette, B., … Hess, L. 2014. Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains. *Science*, 344(6188), 1118–23. https://doi.org/10.1126/science.1248525.

30 An excellent retelling of the experience in the municipality of Paragominas is found in: Zwick, S. and C. Calderón. 9 February 2016. The Difficult Birth of Brazil's First "Green Municipality." Part 1 of 3. Ecosystem Marketplace. http://www.ecosystemmarketplace.com/articles/paragominas-the-green-revolution-that-almost-wasnt/.

31 Whately, M. and Campanili, M. 2013. Green Municipalities Program: lessons learned and challenges for 2013/2014. Governo do Pará, Belém. http://www.municipiosverdes.pa.gov.br/files/999816d7a617e650c796109566e1337c/c20ad4d76fe97759aa27a0c99bff6710/versao-ingles%20(1).pdf.

32 The Green Municipalities requirements consist of: (1) sign a Local Pact to stop illegal deforestation; (2) establish a working group or commission; (3) conduct field verifications of reduced deforestation; (4) reduce municipal deforestation rate to less than 4000 ha per year; (5) register 80% or more of private lands in the CAR; (6) remove the municipality from the MMA blacklist; (7) establish and strengthen capacity of municipal environmental agency.

33 Governo do Pará. Programa Municípios Sustentáveis. http://municipiossustentaveis.pa.gov.br/programa-municipio-sustentavel.php. Accessed 18 April 2018.

34 IBAMA. 2015. Relatório de Gestão Exercício 2015. http://www.ibama.gov.br/phocadownload/auditorias/relatorio_gestao/2015-ibama-relatorio-gestao.pdf.

35 INPE. Observação da Terra. PRODES Municipal. http://www.dpi.inpe.br/prodesdigital/prodesmunicipal.php.

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