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Research

The wisdom of hindsight: a comparative analysis of timelines of environmental governance of infrastructure across the Pan-Amazon

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ABSTRACT. The planning and implementation of infrastructure projects is a long-term enterprise that involves debates over the many positive and negative impacts. Previous work has examined questions about conditions for effective environmental governance of infrastructure, but has typically focused on individual projects and short time frames. We therefore pursued an historical approach to environmental governance of infrastructure projects across multiple cases, taking up examples of highways and dams in the Amazon. Through multi-stakeholder workshops, conservation partners developed historical timelines of events concerning governance of infrastructure in four regions within the basin. Timelines permit analysis to identify periods of particular dynamism, improvements and declines in governance effectiveness, identification of influential stakeholders and events, and conditions that define the effectiveness of governance. We conclude with lessons within and across cases about conditions and strategies for effective environmental governance of infrastructure.

Key Words: *Amazon; Bolivia; Brazil; Colombia; governance; infrastructure; Peru; timeline*

INTRODUCTION

The planning and implementation of infrastructure projects is a complicated and often protracted enterprise that transpires over long periods of time. The planning process has numerous steps, and during and after construction, infrastructure generates a complicated mix of positive and negative environmental, social, cultural, and economic impacts. During that time, competing stakeholder groups often mobilize and engage in political contention (e.g., Min et al. 2018, Perz 2018, Schapper et al. 2020). Consequently, infrastructure projects often have complex trajectories over time, which frequently take the form of a sequence of advances and setbacks, and even stoppages and restarts.

These shifting fortunes reflect the politics surrounding the central question of the governance of infrastructure (e.g., McCormick 2007, Perz et al. 2008, Wong 2017). Infrastructure planning is often not transparent for stakeholder groups who will be impacted, which reflects power inequalities (e.g., Howe and Kamarrudin 2016, Valverde and Moore 2019, Mendoza and Cruz 2020). Stakeholders therefore seek to intervene at various stages in the process as a means of influencing decisions about infrastructure and its impacts (e.g., Doria et al. 2018, Mendoza et al. 2007, Qiao, et al. 2018). We adopt a position that governance of infrastructure is effective for these stakeholders if they can influence the process to secure decisions against construction that have significant environmental impacts, or at least measures to mitigate negative impacts. What constitutes effective environmental governance will be geographically differentiated and change over time, and perhaps be different for different kinds of infrastructure and biophysical conditions and socio-environmental vulnerabilities. The challenge to effective governance, however, is that decisions can later be reversed, which results in non-linear trajectories over time.

In the Amazon basin, there have been many cases of infrastructure projects without transparent planning and implementation, which has made the governance of project impacts the focus of long-term debate. Highways such as the Cuiabá-Santarém, the Inter-Oceanic, the Marginal de la Selva in Colombia, and the proposed road across Isiboro Sécure National Park and Indigenous Territory, more commonly referred to as TIPNIS, have all involved polemics over their impacts (e.g., Alencar et al. 2004, Perz et al. 2012, Achtenburg 2013, Dominguez Ossa 2019). Similarly, hydroelectric dams including the Tucuruí, Jirau, Santo António, and Belo Monte have been the focus of competing claims that yielded histories of complications and stoppages, but which nevertheless advanced to implementation (e.g., Moretto et al. 2012, Athayde 2014, Fearnside 2014, Chen et al. 2015, Jiang et al. 2018, Santos et al. 2018).

Because infrastructure planning is an extended process, and because stakeholders often seek to intervene in that process, a comparative historical approach to infrastructure governance is especially vital (e.g., Isaacman and Sneddon 2000, Frankopan 2015, Petroski 2016, Sinha 2017). Whereas previous work on the trajectories of infrastructure has usually focused on individual projects, a comparative approach permits identification of similarities and differences across cases. Historical comparisons thus allow delineation of insights about trajectories among cases, and thereby afford broader lessons about the factors that influence the abilities of stakeholder groups to effectively intervene in the process of infrastructure governance over time.

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To pursue a comparative analysis of the histories of infrastructure and its governance, we focus on four geographic areas. Each encompasses a mosaic of protected areas and indigenous lands where states and banks are pursuing infrastructure planning and implementation, and where other stakeholders have mobilized in opposition. The four cases are the Peruvian department of Loreto, the Upper Madeira watershed at the Brazil–Bolivia frontier, the BR-319 highway corridor in southern Amazonas and northern Rondônia in Brazil, and the Colombian Amazon. These cases present contrasts because they occur in different countries, but they carry the key similarity that governance of infrastructure involves debate among similar sets of stakeholders.

To pursue our historical comparative analysis, we feature the use of timelines, which are valuable tools for organizing events chronologically. We employ a conceptual approach informed by environmental governance as applied to infrastructure. We draw on a theoretical framework for timelines based on stakeholder analysis to feature contesting stakeholders, combined with work on social-ecological systems that highlights cross-scale processes and non-linear dynamics over time. We then employ timelines as an analytical tool to visualize historical moments when events and processes facilitate or hinder effective governance. Because infrastructure is currently in debate in our cases, a focus on timelines permits an historical perspective on the conditions affecting the effectiveness of governance in the past, with implications for present and future prospects for governance. Timelines also permit a cross-scale analysis of stakeholders operating on different levels as they seek to influence governance of infrastructure.

We begin with a background discussion of the concept of environmental governance. We apply our understanding of that concept to the governance of infrastructure. We then feature an analytical framework for understanding infrastructure governance in terms of historical timelines featuring stakeholders operating on various scales. Their actions result in events that occur in sequences and cascades that may improve or worsen conditions for infrastructure governance over time. We then offer a methodological discussion of the "Governance and Infrastructure in the Amazon" project (giamazon.org), which involved workshops with in-country partner organizations. We discuss our analytical strategy, which featured development of participatory timelines and interpretations of events as they influenced the effectiveness of governance of infrastructure. In the results, we present the timeline for each case, featuring historical moments when the effectiveness of governance of infrastructure improved or worsened. We then make comparisons among the cases in terms of the temporal distribution of events in terms of their scales and types. In the discussion, we identify key insights and lessons about the changing conditions for effective governance of infrastructure over time, and in the conclusion, we suggest possible avenues for future research.

THEORETICAL FRAMEWORK

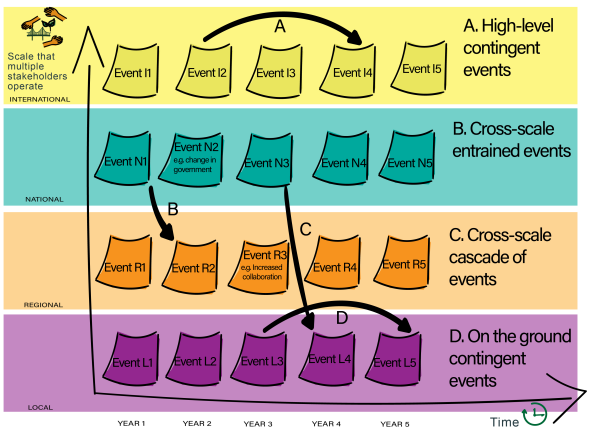
Environmental governance is a concept that has emerged in response to limitations of state-based regulatory approaches, and refers to multi-stakeholder processes for decision making about environmental management (Batterbury and Fernando 2006, Wilkinson and Pikett 2009, Hyle 2016, Burch et al. 2019). Infrastructure governance represents an application of environmental governance as a shared decision-making process by the state and other stakeholders, applied to environmental questions where civic society actors assume a significant role (Lemos and Agrawal 2006).

The relative power of governments, construction companies, non-governmental organizations (NGOs), and communities can define their degree of influence over decisions about infrastructure (Batterbury and Fernando 2006, Lemos and Agrawal 2006). But power is not determinant, nor is it static. Governance approaches have shifted from the usual top-down centralized strategies to more decentralized, community-based, or polycentric approaches (Carlisle and Gruby 2019, Morrison et al. 2019, Ostrom 2010, Pattberg and Wilderberg 2016). This is because top-down approaches tend to reflect power inequalities among stakeholders, undermining inclusiveness in governance processes and the legitimacy of outcomes. A key challenge has been to manage inequalities over time in governance processes, especially as powerful stakeholders resist relinquishing authority over decisions to allow influence by opposed stakeholders.

This is particularly important in long-term processes, such as the trajectories of infrastructure projects. Planning for infrastructure involves complex dynamics of contention among stakeholders concerning environmental impacts. Questions therefore arise as to how infrastructure governance plays out with regard to the different stages of infrastructure trajectories over time, from planning to construction to subsequent impacts.

We therefore offer an analytical framework that draws on stakeholder analysis (e.g., Reed et al. 2009) and work on cross-scale processes in social-ecological systems (e.g., Garmestani and Benson 2013) as they relate to events in historical time. The construction of a timeline involves the identification of key stakeholders, including governments, corporations, communities, and others, all of whom operate on specific scales ranging from the local to the regional, national, and international. The actions of stakeholders constitute events, such as policy changes and implementation, steps in planning or building infrastructure, and protest actions, which define the key moments in a history (Fig. 1).

Fig. 1. Analytical timeline.



In turn, key events in a timeline can be viewed in light of their importance for changes in dynamics over time. Some key events themselves constitute changes in stakeholders, like elections that change governments (Event N2 in Fig. 1); others may involve changes in relationships among stakeholders, such as increased collaboration in a network that results in more effective governance (Event R3 in Fig. 1). Events may be important as processes, i.e., sequences where one event entrains subsequent events, which can happen at the same scale (i.e., arrows A and D in Fig. 1) or across scales (i.e., arrows B and C in Fig. 1). Examples include a policy change to establish a protected area that then slows the advance of a regional deforestation front, or exempting an infrastructure proposal from an evaluation required by law to speed up the planning process and begin construction (arrow B from N1 to R2). Via processes, the significance of scale also becomes important as in cross-scale cascades of events, such as where a national policy change impacts the legal status of an indigenous territory or makes a locally important economic activity illegal (arrow C from N3 to L4).

Processes as cascades of events are especially important to identify in timelines, because they lead to contingencies, which can involve continuities or changes in trajectories of governance. Contingencies bring up issues of learning and memory. Learning from a previous event may prevent, or alternatively, encourage its repetition, depending on stakeholder memory. International banks that see their funded projects generate major environmental problems may impose stricter environmental impact assessments later, or refuse funding for projects in the same region (arrow A from I2 to I4). Similarly, local organizations that fail to stop one project may change their strategies of resistance later (arrow D from L3 to L5).

For present purposes, we are concerned with events in timelines as they bear ramifications for governance of infrastructure. Thus, it is important to grasp what events will improve or worsen the conditions for infrastructure governance. State policies that strengthen enforcement of protected areas and collaboration among stakeholders for monitoring of local forests can be interpreted as events that improve effectiveness of governance. The election of authoritarian governments hostile to conservation and the breakdown of coordination among stakeholders sharing monitoring responsibilities serve to undermine governance effectiveness. Cascades of events can thus serve to improve or worsen effectiveness of governance of infrastructure. Of particular interest are historical moments when one or more events catalyze a non-linear change in those conditions, such that they shift from favorable to unfavorable or vice versa.

In that context, we frame our inquiry around the following guiding questions as applied to the timelines generated in our workshops: (1) What stakeholders exert the most influence over conditions for governance of infrastructure? (2) What scales do influential stakeholders operate on with regard to governance of infrastructure? (3) What events improve or worsen conditions for effective governance of infrastructure? (4) What events define moments when conditions for governance of infrastructure exhibit non-linearities?

STUDY CASES

In the Amazon, national governments have sought to implement large-scale infrastructure projects. The planning of such projects has, however, often involved minimal participation by stakeholders in order to rapidly advance to construction, which has led to significant negative social and environmental impacts. Infrastructure projects have threatened the livelihoods of resource-dependent local communities, thus undermining indigenous cultures as well as threatening forest cover, watersheds, biodiversity, and ecosystem services (Suáarez et al. 2009, Finer and Jenkins 2012, Asner et al. 2013, Barber et al. 2014, Laurence et al. 2015, Alamgir et al. 2017).

In 2000, infrastructure planning in the Amazon entered a new phase with the advent of the Initiative for the Integration of Regional Infrastructure of South America (IIRSA). The IIRSA brought governments and banks together to advance transboundary infrastructure projects (Killeen 2007, Perz et al. 2008). The master logic of IIRSA was to complement extant infrastructure within countries by improving cross-border road links, energy production, and port facilities for increased trade, thus impelling economic development. Brazil acted as a regional leader in IIRSA, which amounted to an internationalization of Brazil's infrastructure strategy. In Brazil, consecutive governments have promoted large-scale infrastructure projects to advance industrial mining, timber extraction, agricultural production, and electricity generation (Fearnside 2015, Randell 2016, Bebbington et al. 2018).

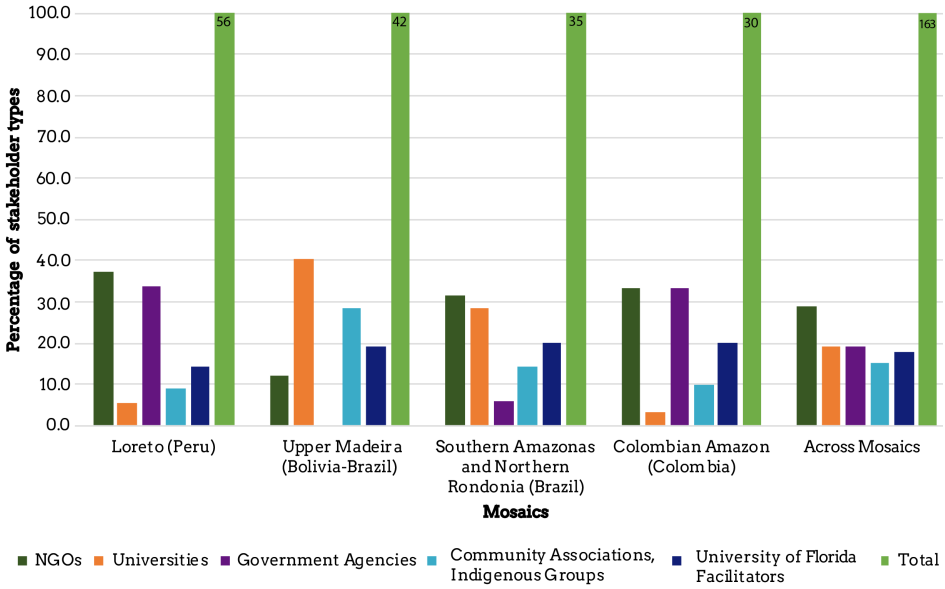
The international coordination of infrastructure projects across the Amazon has meant a top-down approach. Many projects are thus planned without consulting local peoples beyond legally required information sessions. Consequently, the governments, development banks, and construction companies that advocate large-scale infrastructure may face significant opposition during implementation. Indigenous peoples, other local communities, conservation NGOs, and scientists have often mobilized to resist large-scale infrastructure projects (Athayde 2014, Chen et al. 2015, Fearnside 2014, Jiang et al. 2018, Santos et al. 2018).

The emergence of public contestation represents a key shift in the trajectories of large-scale infrastructure projects. This raises questions about the effectiveness of resistance to top-down planning processes to achieve environmental governance. Although there are many cases of projects that meet resistance, and even instances where projects were paused or canceled, many projects were reinstated and pushed ahead to completion. A high-profile example is the Belo Monte dam, first advanced in the 1980s and stopped, but resurrected in the 2000s and now completed (Athayde 2014, Fearnside 2014). Such examples confirm that the trajectories of large-scale infrastructure projects may be highly non-linear. In that regard, it becomes important to consider the historical trajectories behind infrastructure projects, especially moments when prospects for environmental governance improve or worsen.

In order to identify these moments across cases and regions, we focus on four mosaics in the western Amazon: (1) the Peruvian department of Loreto, (2) the Upper Madeira watershed at the national frontier between Bolivia and Brazil, (3) southern Amazonas and northern Rondônia in Brazil (adjacent to the Upper Madeira mosaic), and (4) the Colombian Amazon.

Loreto has historically been somewhat isolated from the rest of the country due to the lack of a complete road from the regional

Fig. 2. Percentage representation of different stakeholder types at timeline workshops, Amazon governance and infrastructure cases.



capital of Iquitos to the national capital, Lima, and other cities. Loreto nonetheless developed an ecotourism economy and has a significant mosaic of protected areas and indigenous lands. However, Loreto is now the target for a waterway (hidrovía) and road projects.

The Upper Madeira mosaic encompasses a binational frontier spanning the states of Pando and Beni in northern Bolivia and Rondônia in western Brazil. Key to this area is the Madeira River and its tributaries, which are the sites of planned or implemented hydroelectric dams of the Madeira Complex. Whereas the Santo António and Jirau dams were constructed in the 2000s, the Binacional (Ribeirão) is in the concluding stages of being inventoried, and Cachuela Esperanza is in the planning stage.

Southern Amazonas and northern Rondônia constitute a very complicated mosaic. First, the area includes numerous types of protected areas and multiple indigenous lands. Furthermore, multiple highways pass through this area, including the BR-319 from Manaus via Humaitá to Porto Velho, the Transamazon (BR-230), which runs east–west through Humaitá and Lábrea to Boca do Acre, and the BR-364, which runs through Rondônia to Porto Velho and then west toward Acre. These highways pass through or near many protected and indigenous lands.

The Colombian Amazon covers the lowlands of Colombia to the south and east of the northern Andes. This mosaic encompasses the Colombian departments of Amazonas, Putumayo, Caquetá, Guainía, Guaviare, and Vaupés, as well as parts of Cauca, Meta, and Vichada. Key to understanding Colombia's recent history is to recognize that the armed insurgency against the Colombian state, which endured until the 2010s, hindered infrastructure projects and extractive activities. The cessation of the insurgency in 2016 has led to a new context where the Colombian state promotes infrastructure projects in the Amazon, while private interest groups enter the lowlands seeking to claim land, clear forests, and extract natural resources.

METHODS

To evaluate trajectories of environmental governance of infrastructure in the four mosaics, we pursued data collection to permit the construction of timelines. These are useful analytical tools for examining sequences of events as a means of interpreting change over time. In this case, we focus on events concerning environmental governance in specific mosaics of protected areas and indigenous lands in the Amazon where major infrastructure projects were proposed by governments and banks. The events concern actions by stakeholders on various levels of scale, from the local to the international. Of particular importance are events that may improve or hinder the effectiveness of environmental governance, particularly as it relates to infrastructure development.

With funding from the Gordon and Betty Moore Foundation, the Tropical Conservation and Development Program of the University of Florida pursued the Governance and Infrastructure in the Amazon (GIA) Project. A key GIA activity was to organize a stakeholder workshop in each of the four Amazon mosaics, which occurred between May and August of 2019. The number of workshop participants ranged from 30 to 56 and included a mix of participants from government agencies, NGOs, universities, and local communities, including indigenous groups (Fig. 2; see also Append. 1, Table A1.1). We identified representatives of organizations with long experience working on infrastructure and related social-ecological issues in their respective mosaic. We thus selected stakeholders that represented diverse institutions that have been engaged in environmental

governance over a sustained period of time. Their memories of events represent a collective repository of diverse types of institutional knowledge and learning.

In each workshop, we implemented activities to facilitate an exchange of this knowledge about governance and infrastructure. One of the activities involved the construction of timelines, over the period of an hour, of key events that stakeholders deemed relevant to governance of infrastructure. We pursued a participatory approach to the construction of timelines by asking workshop participants to identify key events (Esterberg 2002). Specifically, we provided the participants with cards on which they noted one event per card, and then placed their cards on a large poster on a wall with a timeline of dates.

Participants initially worked individually to identify events. We then asked participants to stand back from the timeline in order to collectively reflect on the events posted. That led to discussions about the events indicated. As the participants dialogued, they often identified events not yet indicated in the timeline, which led to additional postings. They also pointed out patterns in the events posted, by way of characterizing underlying processes. Participants observed that timelines had certain time periods where more events occurred. Participants also pinpointed certain events as key contingencies that influenced the trajectories of subsequent processes. Finally, participants observed that certain periods involved improvements or steps backward in the effectiveness of governance of infrastructure. This led to the identification of events in sequences and cascades that constrained or enabled effective environmental governance of infrastructure in the four mosaics over time, as perceived by different stakeholders.

The participatory approach to the construction of workshop timelines comes with some caveats. One is that timeline content reflects the composition of workshop participants, which differed across mosaics (Fig. 2). To the extent that different types of organizations were represented, or participant cultures or personal experiences influenced what they considered as important events, timelines may differ. For example, there were no government representatives in the Upper Madera workshop, whereas in the Peru and Colombia workshops, there were several governmental representatives. A second caveat is that timeline methods varied somewhat among workshops. In the Colombian workshop, participants worked from an initial timeline developed by an inter-ministerial working group, but in the other workshops, participants developed their timelines without prior templates. A final caveat is that the workshop participants had limited time to develop their timelines, so the resulting chronologies are suggestive rather than definitive histories.

From the workshop timelines, the GIA team created timeline figures in a common analytical format. Whereas workshop timelines varied in terms of the timescales represented, the analytical timelines all focus on the 20-year time period from 2000 to 2019. Although we recognize that infrastructure projects often have deeper histories, the 20-year timeframe made the timelines more analytically tractable. The GIA team also differentiated events based on the scale on which they operated, from the local to the regional, national, and international. Finally, the GIA team adopted a coding scheme to differentiate among distinct types of events, including public policies, infrastructure projects, infrastructure impacts, environmental setbacks, and protest actions. These steps resulted in timelines that were more readily comparable in terms of the timeframes as well as the scale and types of events.

Given the participatory approach to the creation of the timelines, we adopted an inductive analytical approach to interpreting the timelines. This honors the contributions of the workshop participants, who selected certain events for inclusion in the timelines, and thus allows the data in each timeline to drive interpretation, as opposed to a deductive approach informed a priori by theory (Eisenhardt and Graebner 2007). We therefore initiated our analysis by interpreting individual timelines, and then moved to a comparative analysis. In the first step, we identified time periods with higher densities of events as well as events and processes that denoted improvements or worsening of conditions for effective governance of infrastructure. In the second analytical step, the team compared the timelines by noting differences in the time periods with more events, the scales on which key events were occurring, and moments of improvement or worsening of conditions for effective governance. From the comparative analysis, we gleaned broader insights about governance of infrastructure over time to identify lessons about infrastructure trajectories and the conditions under which effectiveness of governance improves.

RESULTS

We present our findings in two parts. First, we present each of the four timelines as individual case studies, noting key events (and their scale and type) as well as important contingencies that influenced subsequent trajectories of events. Using those observations, we then develop an interpretation of changes in the effectiveness of governance over time, calling attention to historical moments where conditions improved or worsened. Second, having discussed each timeline individually, we offer a comparative analysis among the timelines, noting similarities and contrasts in distributions of events in terms of their years of occurrence, scales, and improvements or declines in effectiveness of governance.

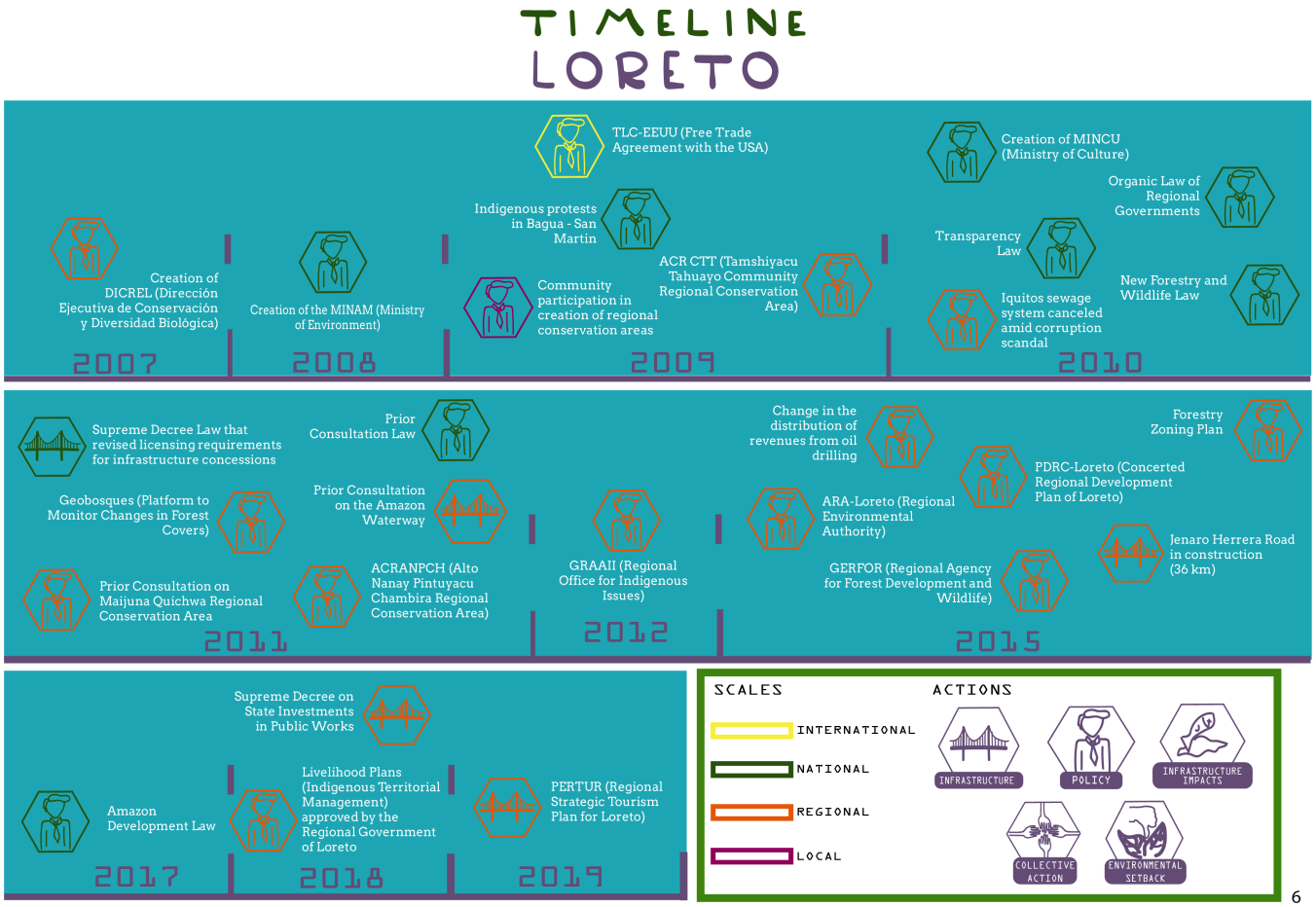
Loreto, Peru

The Loreto workshop timeline had few events until 2007, followed by numerous cards provided by participants from then up to 2016. We therefore focus primarily on that period in our discussion (Fig. 3).

Although it falls outside the 2000–2019 period, for Loreto, a key national event occurred in 1992: the coup that concentrated power in the Fujimori administration. Under Fujimori, Peru went through a political crisis, such that local and regional governance mechanisms were paralyzed. After 2000, decentralization proceeded, which was important for regional governments, including in Loreto. Loreto had its first regional government from 2003 to 2006, but little of participant interest occurred during this time in terms of governance.

By 2007, diverse stakeholders had mobilized in Loreto and were increasingly working together. These stakeholders included NGOs, governmental agencies, universities, and indigenous peoples and other community associations. Together, they identified a common objective: to improve regional governance capacity. Diverse stakeholders therefore began providing the

Fig. 3.. Analytical timeline infographic, Loreto, Peru.



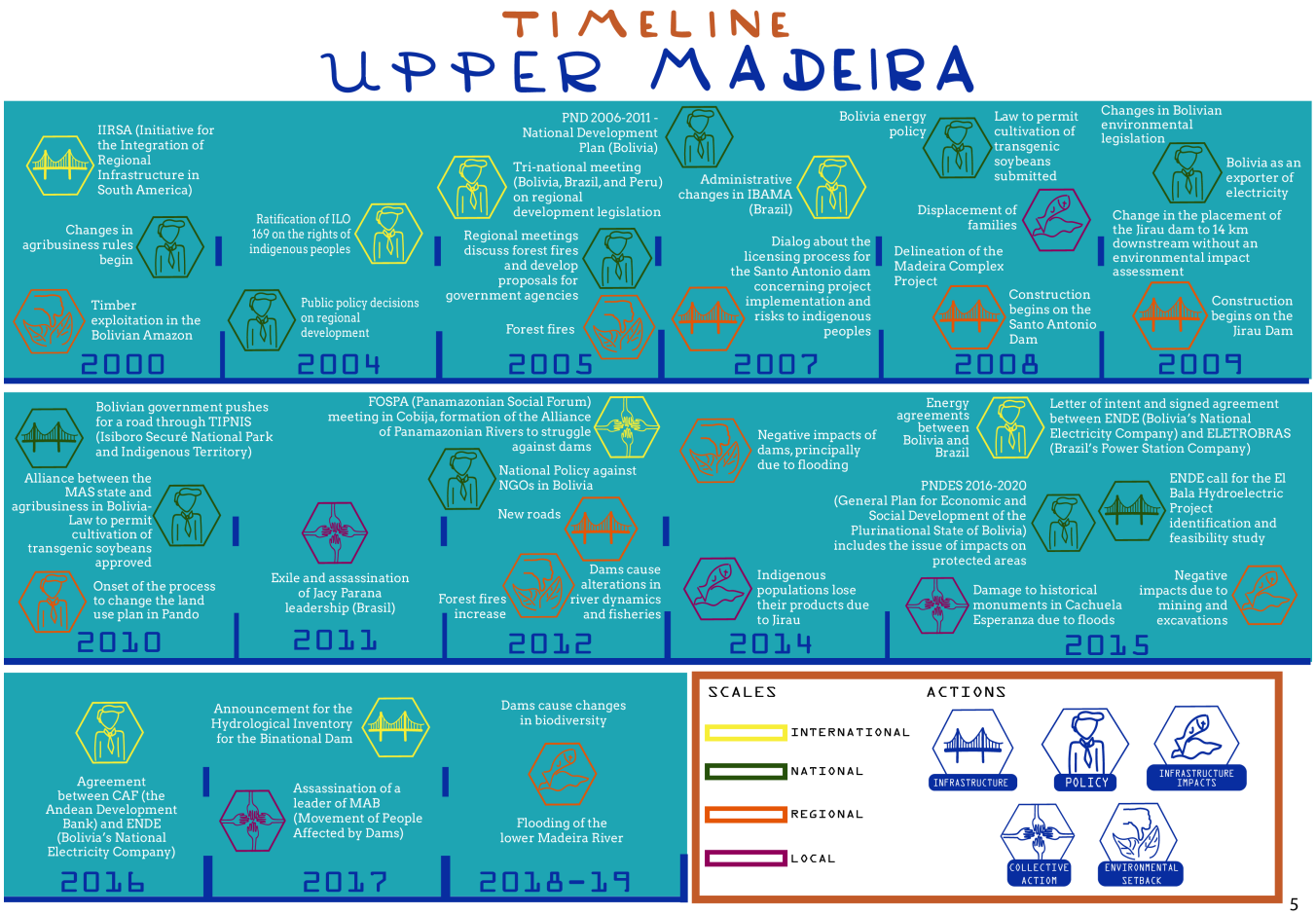
Regional Government of Loreto (GOREL) with technical support for environmental governance in Loreto. Active collaboration among stakeholders led to the identification and implementation of conservation and sustainability initiatives for Loreto. By 2016, GOREL exerted greater authority over Loreto than 10 years earlier. Because many stakeholders provided valuable input and capacity to that end, workshop participants felt that governance had become more effective in Loreto.

This is because numerous institutional changes occurred during 2007–2016, especially at the regional and national levels. The GOREL administration from 2007–2014 explicitly sought to reconcile conservation and development. Thus, GOREL pursued a policy that promoted regional conservation areas (RCAs). In 2007, the Executive Directorate for Conservation and Biodiversity (DICREL) was established as a regional office to protect the biological diversity of Loreto via RCAs and other planning mechanisms (Agrobiodiversity Areas, Climate Change Regional Plan, etc.). Since 2007, GOREL has established several RCAs in Loreto, including the Tamshiyacu Tahuayo Communal RCA (2009), the Alto Nanay Pintuyacu Chambira RCA (2011), and Maijuna Kichwa RCA (2016). A key element in the creation of RCAs was the implementation of prior consultations (*consultas previas*) with potentially impacted communities as part of the planning process.

These improvements in governance were also possible due to events occurring at the national level during 2007–2016. The Government of Peru created the Ministry of Environment (MINAM) in 2008 and the Ministry of Culture (MINCU) in 2010 to oversee resource management and indigenous rights, respectively. In 2010, the national government also approved laws clarifying mandates for Regional Governments, as well as protection of wildlife and native plants, and requirements for governmental transparency. In 2011, the Government of Peru added proposals to revise environmental and social evaluations of hydroelectric projects. It also passed the prior consultation law and a supreme decree law that tightened licensing requirements for infrastructure concessions. These moves increased access to processes of environmental governance by diverse stakeholders.

In 2015, new changes began to push back against the improvements in environmental governance in Loreto. At the regional level, elections changed parties in power in GOREL. The new GOREL administration reduced funding and technical support for the regional conservation system. Rural communities and NGOs pushed GOREL to continue support for

Fig. 4. Analytical timeline infographic, Upper Madeira, Bolivia and Brazil.



environmental governance, but found limited sympathy. At the national level, the Government of Peru advanced major infrastructure projects in Loreto, including the Genaro-Herrera hydroelectric facility and the Iquitos-Saramiriza highway, as well as the Amazon waterway project. Each involved top-down processes and poses threats to environmental conservation in Loreto.

The Loreto timeline thus indicates significant changes in the conditions for effective governance during the 2000–2019 period. Due to the authoritarian government of Alberto Fujimori in the 1990s, 2000–2007 constituted a period of inactivity for environmental governance in Loreto. The period from 2007 to 2016, however, involved partnerships between GOREL and other stakeholders, as well as changes at the national level, which yielded numerous advances in regional environmental governance. However, the period since has seen more worrisome changes, both in terms of a GOREL administration that was less sympathetic to environmental governance and in terms of national infrastructure projects planned for Loreto.

Upper Madeira, Bolivia and Brazil

Figure 4 presents the timeline infographic from participants in the Upper Madeira workshop. Infrastructure became a locus of regional change in 2007 after the auctioning of the Santo António Dam in Brazil, part of the IIRSA Peru–Brazil–Bolivia development hub. Workshop participants placed most of their cards in the years since 2010, and most of those cards focused on infrastructure planning, construction, and impacts.

Many events are policy changes related to infrastructure in Bolivia and Brazil, many of which focus on energy. Closely related are many key moments in the trajectories of specific infrastructure projects, notably the Santo António and Jirau dams. Another important topic concerns the changing role of NGOs in the region, both as allies of local peoples and generators of knowledge about dams and their impacts. The advance of hydroelectric projects alongside the work of NGOs thus led to another focus of the Upper Madeira timeline, namely the dissemination of information critical of dams, contrary to official statements about their benefits. This focus on negative impacts reflects the participation of stakeholders in the Upper Madeira GIA workshop who have been directly impacted by infrastructure.

A significant issue in the Upper Madera timeline is that the mosaic is a binational region where national policies must be coordinated via international agreements. The timeline thus shows numerous policy decisions (bureaucrat symbol) at the national (green) and

international (yellow) levels, which often seek to advance infrastructure and/or undermine criticism and public participation in planning. Examples in the 2000s include shifts in the Government of Bolivia's energy policy (2008) and Bolivia's strategy to become an energy exporter (2009); examples in the 2010s include the Government of Bolivia's policy to curtail NGO independence (2012), top-down infrastructure plans (2014, 2015), and Brazil–Bolivia agreements (2015–2017, yellow). Those events tended to transpire alongside infrastructure planning itself (bridge symbol) at the national level (green). The other international event involved grassroots collective action: the Pan-Amazon Social Forum (FOSPA) event in Cobija, Bolivia (2012) to form the Pan-Amazonian Rivers Alliance, which seeks to protect rivers from dams.

At the regional and local scales, workshop participants emphasized the implementation of dams (bridge symbol, red) and their negative impacts (fish and thumbs down symbols, red and purple). Examples of such impacts include displacement of families (2008), loss of agricultural production (2014), and declines in fisheries (2018). Participants also noted flooding events on the Madeira River (2014, 2018). At the local level, participants highlighted threats and assassinations of local activists, including a prominent leader of the Brazilian Movement of Dam Affected People (MAB) in 2016.

From the Upper Madeira timeline, it is clear that the trajectories of energy infrastructure are of critical importance in the region, in terms of policy, infrastructure itself, its impacts, and collective action. Of the 49 events listed, 26 are related to energy development in general, of which 21 are directly related to specific dam projects. This likely reflects the discourse of the Government of Bolivia, which promotes the country's energy resources as the future "battery of South America." As the timeline makes evident, multiple hydroelectric projects of the Madeira Hydroelectric Complex are moving forward.

The Upper Madeira timeline also makes clear that workshop participants were well aware of the negative impacts of dams. However, key to understanding the Upper Madeira timeline is that the Santo Antônio and Jirau dams are not viewed negatively by their governmental advocates, who continue to pursue hydroelectric projects in the Madeira watershed. The many negative impacts visited upon local communities, and the threats and violence against activists who speak out, suggest that there is a combination of pressure on local peoples and a need to find more effective avenues for bottom-up communication to reach national governments. The many top-down processes featuring agreements, policies, and infrastructure, and the numerous observations of negative impacts make evident the importance of cross-scale processes operating in the Upper Madeira.

Southern Amazonas–Northern Rondônia, Brazil

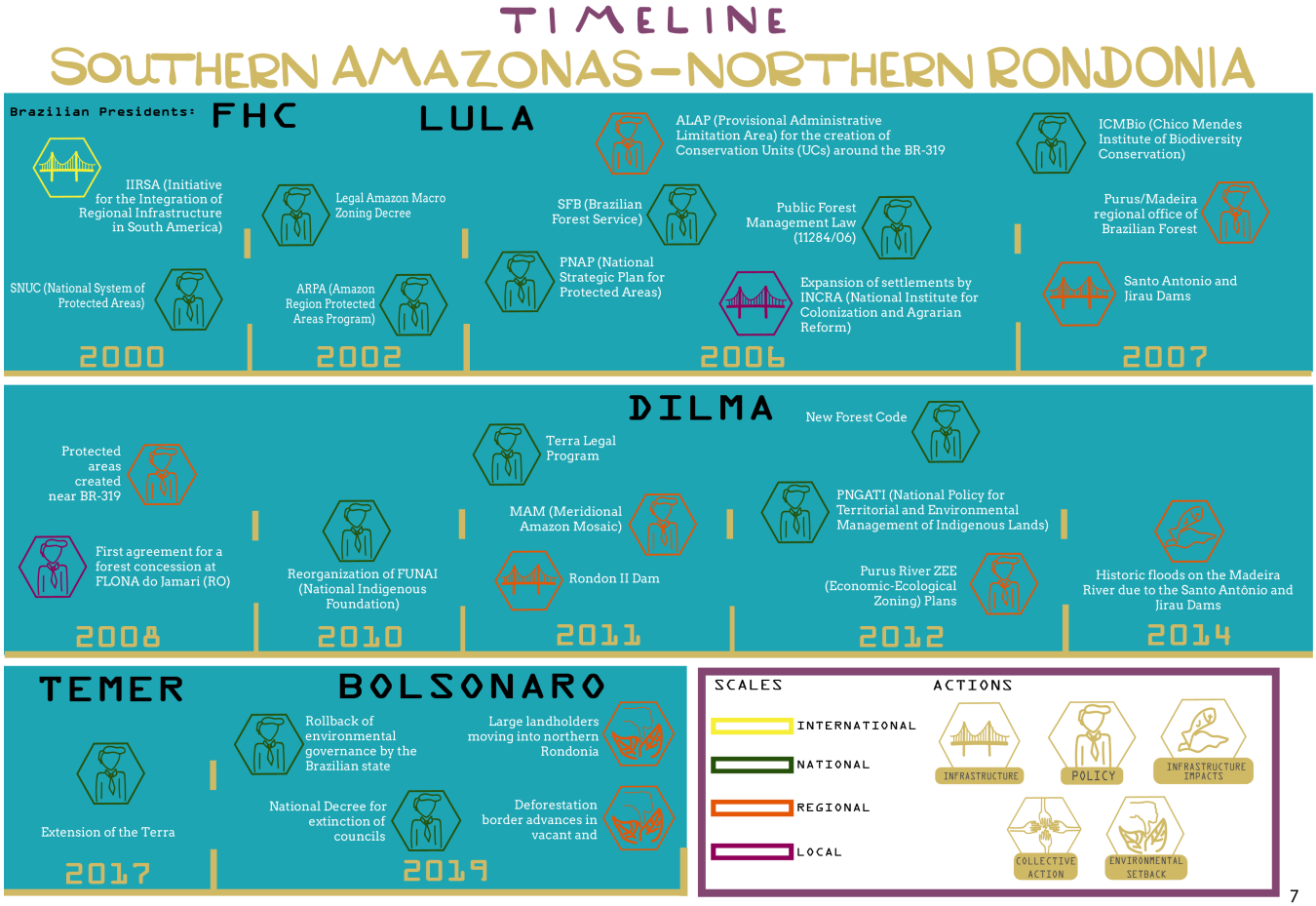
Figure 5 presents the workshop timeline for the southern Amazonas–northern Rondônia region, situated downstream from the Upper Madeira mosaic in the Madeira watershed. Figure 5 indicates that participants reported many policy changes (bureaucrat symbol) as being relevant to governance of infrastructure. In terms of the scale of events, national events (green) were most frequently reported. In southern Amazonas–northern Rondônia, policy making by the Brazilian federal government has played a major role in the governance of infrastructure. Similarly, a key international event is the creation of IIRSA via Brazilian governmental leadership.

This timeline indicates numerous policies promulgated at the national scale across several presidential administrations. Participants recognized that over many years, the federal government under Presidents Lula and Dilma enacted policy changes to strengthen environmental governance, such as implementation of the National System of Protected Areas in 2000, which influenced various other changes that followed, including the Amazon Region Protected Areas program (ARPA) in 2002, the National Strategic Plan for Protected Areas (PNAP) in 2006, and the Public Forest Management Law (2006). In addition, the indigenous affairs agency FUNAI was restructured in 2010. These changes helped strengthen environmental governance in protected areas, sustainable use reserves, and indigenous lands in southern Amazonas–northern Rondônia. In the 2010s, other policies were promulgated by the federal government, such as the new Forest Code (2012) and the National Policy for Territorial and Environmental Management (2012). That said, there were also policy moves that undermined environmental oversight, such as the separation of the Chico Mendes Institute for Biodiversity (ICMBio) from the environmental enforcement agency IBAMA in 2007, seen by many as resulting from IBAMA's initial rejection of the Jirau and Santo Antônio dams.

The election of Jair Bolsonaro in 2018 led to major changes that undermine governance of protected areas and indigenous lands. This is especially occurring in environmental agencies over which the Bolsonaro administration has control, such as the Ministry of Environment, IBAMA, and ICMBio. Bolsonaro's appointments of military personnel to key positions has been crucial for changes in environmental agencies (Fearnside 2019). Other changes have transpired via presidential decrees, such as reduction of councils and the transfer of environmental agencies to the Ministry of Agriculture (Abessa et al. 2019) and cuts in science funding (Magnusson et al. 2018). Bolsonaro also routinely uses presidential speeches to menace conservation NGOs (Fearnside 2019).

Participants also noted numerous events and changes at the regional level, many of which resulted from national policies and which involved infrastructure impacts. Before the period of this timeline, the federal government had advanced infrastructure projects in southern Amazonas–northern Rondônia, notably highways (BR-319, BR-364, BR-230, and BR-317) and dams (Samuel). As noted above, in the 2000s, the Brazilian federal government approved construction of the Santo Antônio and Jirau dams on the Madeira River. The federal land agency INCRA created new agricultural settlements, while IBAMA helped create new protected areas. There were also regional events beyond infrastructure projects. In 2014, a major flooding event occurred, as water was held behind the Santo Antonio and Jirau dams, which then flooded the BR-364 to the west (Fearnside 2014). Other environmental problems ensued in 2019 when the Bolsonaro administration indicated it would not act against illegal appropriation of public lands, emboldening deforestation in protected areas. Similarly, Bolsonaro did little to prevent or fight fires in the southwestern Brazilian Amazon (Brando et al. 2020).

Fig. 5. Analytical timeline infographic, southern Amazonas-northern Rondônia, Brazil.



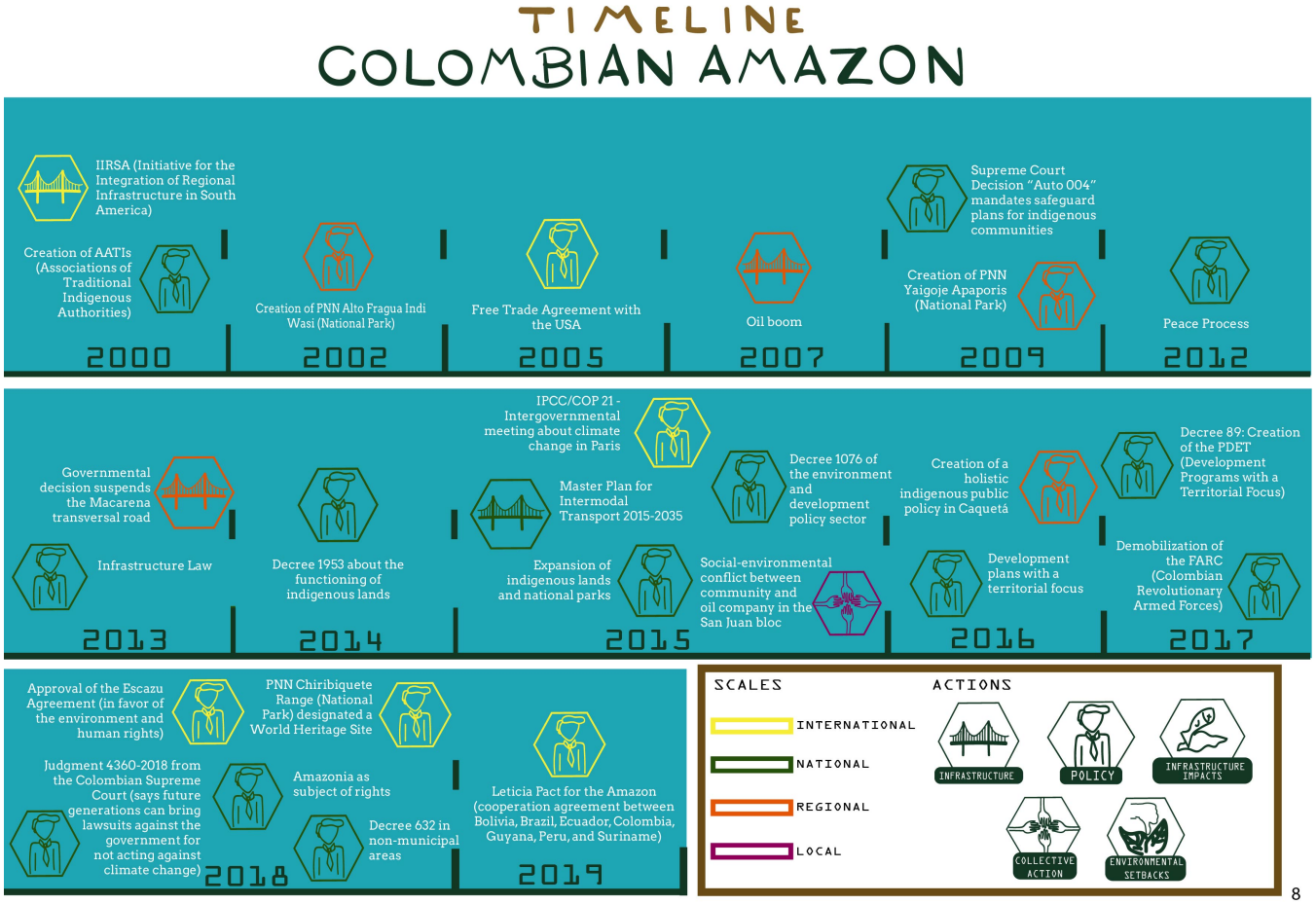
A key message from the southern Amazonas–northern Rondônia timeline is that Brazil's federal government has played an overwhelmingly important role in terms of environmental policy changes and infrastructure promotion. This makes it important to recognize the shifts from one presidential administration to another. Although many policies regarding the governance of protected areas and indigenous lands were strengthened under Lula and Dilma, the Bolsonaro administration has aggressively sought to undermine environmental governance. In contrast, all of these administrations sought to advance infrastructure projects. This conjuncture prompted some participants to criticize the deactivation of the *Aliança dos Povos da Floresta* (a key network for environmental governance) under Lula and Dilma, and suggested its urgent reactivation to face the setbacks under Bolsonaro.

Colombian Amazon, Colombia

The Colombia timeline built on a previously prepared timeline created by the inter-ministerial environmental technical group between the Ministries of Environment and Transportation and complemented by the Foundation for Conservation and Sustainable Development (FCDS) and other NGOs. The inter-ministerial timeline featured important events related to governance and infrastructure in the Colombian Amazon, especially steps toward guidelines for green infrastructure in Colombia. In the Colombia workshop, participants therefore sought to complement the inter-ministerial timeline. Figure 6 presents the timeline infographic from the Colombian GIA workshop.

The Colombia timeline makes evident that events affecting environmental governance in the Amazon were limited in the 2000s but accelerated in the 2010s. Although IIRSA went forward in 2000, the impact of international processes (yellow icons) in the 2000s was limited due to the persistence of armed conflict. The onset of the peace process in 2012 was followed by an array of policy initiatives. In terms of environmental governance, the 2010s witnessed Decree 1953 about indigenous lands (2014), the expansion of protected areas and indigenous lands (2015), the creation of the Serrania de Chiribiquete protected area, and the Supreme Court decision allowing lawsuits about climate change (2018). At the same time, infrastructure initiatives went forward, with the promulgation of the infrastructure law (2013), followed by the Intermodal Transportation Plan (2015). Although it was not noted in the workshop, in January 2018, President Juan Manuel Santos declared that Colombia would not move forward

Fig. 6. Analytical timeline infographic, Colombian Amazon, Colombia.



with construction of the Marginal Highway, which would have crossed a large part of the Colombian Amazon. Nonetheless, workshop participants noted that with the demobilization of the insurgency in 2016, pressure has risen on forests and peoples in the Colombian Amazon, which drives concern about unprecedented threats to protected areas and indigenous peoples.

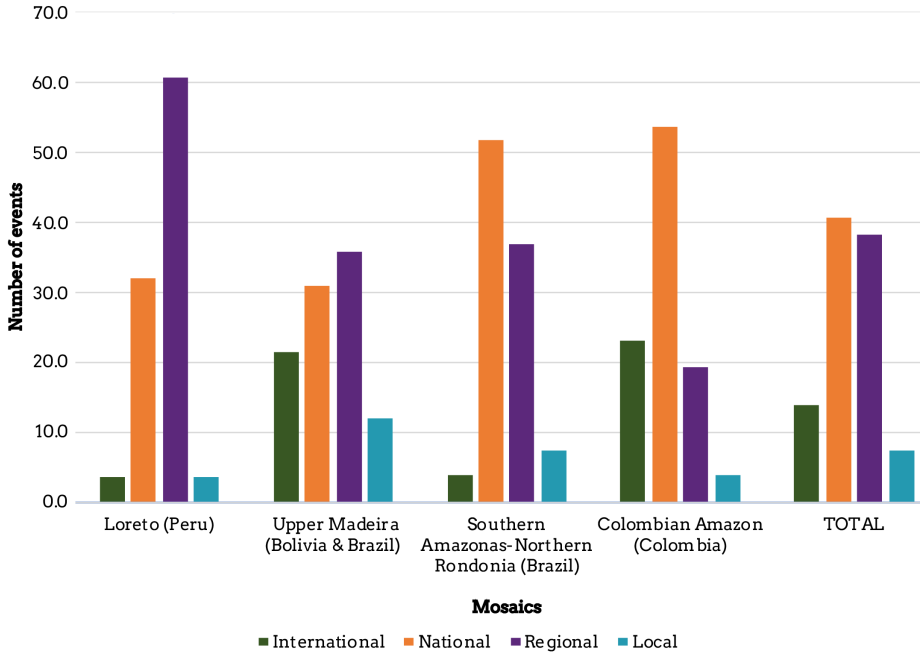
Comparative Analysis

The four case studies discussed above permit comparisons to reveal broader insights. Figures 7, 8, and 9 offer comparisons based on an analysis of the events identified by participants in the four workshops, broken down by (1) scale of operation, (2) type of event, and (3) 5-year time period of occurrence. In terms of the total number of events noted in the timelines, participants in three of the four workshops had similar numbers of 25–30 in Loreto, southern Amazonas–northern Rondônia, and Colombia, whereas participants in the Upper Madeira noted over 40. We therefore present percentages to facilitate comparisons.

Figure 7 shows that the distribution of events noted by level of scale varied considerably among workshops. Overall, roughly 40% of events occurred at the national level and another 38% at the regional level, with only 14% of events being international and 7% local. National events predominated in southern Amazonas–northern Rondônia (52%) and Colombia (54%), a reflection of the importance of the national governments in those countries, whereas regional events were most commonly reported in Loreto (61%) and the Upper Madera (36%), a reflection of collaborative efforts at regional governance in those mosaics. International events were more commonly reported in the Upper Madera (21%) and Colombia (23%); the first case reflects the binational frontier and international negotiations for infrastructure, whereas the second indicates local–international alliances for indigenous and climate justice. Local events were also more common in the Upper Madeira (12%), a reflection of grassroots mobilization.

Figure 8 presents events by type of event and case study. In terms of the types of events highlighted by workshop participants, overall, policies dominated (67%), distantly followed by infrastructure (19%), environmental setbacks (7%), and infrastructure impacts and collective action (4% each). However, there was substantial variation among the cases. Whereas policies represented 74% or more of the events noted in Loreto, southern Amazonas–northern Rondônia, and Colombia, they encompassed only 43% of events in the Upper Madeira. Interestingly,

Fig. 7. Percentage of events indicated by scale of process, Amazon governance and infrastructure case studies.



participants in that workshop reported roughly the same number of policy events (18) as in the other three workshops (20–23), so the differences in percentages indicate that Upper Madeira participants indicated more of the other types of events, which is what Fig. 8 confirms for infrastructure (24%), infrastructure impacts (10%), environmental setbacks (14%), and collective action (10%). Thus, the importance of public policies was recognized everywhere as central to governance of infrastructure, but more attention was devoted to other kinds of events in the Upper Madeira, possibly due to broader university and community participation in that workshop (Fig. 2).

A final set of comparisons concerns the distribution of events over time in the four study cases, shown in Fig. 9. We subdivided the 20-year time period encompassing 2000–2019 into four equal time periods. Figure 9 shows that workshop participants indicated relatively few events during 2000–2004 period (10%), with more during the next two periods, 2005–2009 and 2010–2014 (28% each), and yet more events during the most recent period (33%). Although that might reflect recentness effects on the memories of workshop participants, the distribution of events differed among the mosaics. Participants in the Loreto workshop reported no important events during 2000–2004, whereas the other three cases all had roughly 12–15% of the events in that period. There were also differences in 2005–2009, which was a more important period in the Upper Madeira (36%) and southern Amazonas–northern Rondônia (36%), due to licensing and construction of dams in the first, and road improvements and policy changes about land in the second. Similarly, there were important differences in the 2010–2014 period, in which Loreto experienced numerous important events (43%) tied to improvements in regional environmental governance. Although the 2015–2019 period was the most important overall, that reflected the numerous important events in Colombia (58%) beginning with the cessation of insurrection; in no other case was the most recent period also the period with the most events reported.

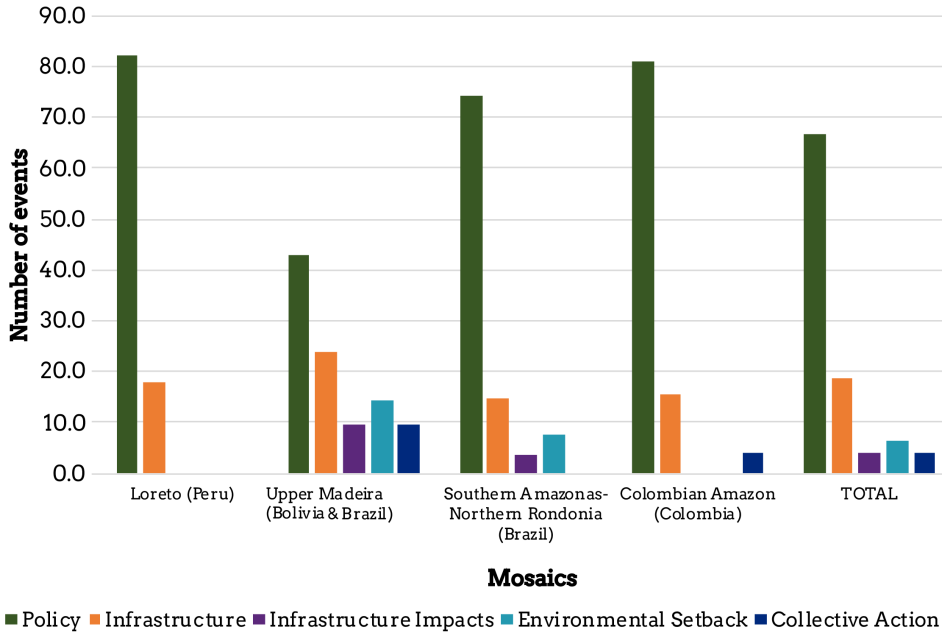
Figures 7–9 thus make evident that the dynamics of the governance of infrastructure have important similarities and differences among different parts of the Amazon. National and regional processes tend to predominate, as do public policies, and events in more recent time periods. That said, there are important differences, such that some cases constitute examples where international and local events also gain importance, as well as infrastructure, its impacts, environmental setbacks, and collective action. Furthermore, the distribution of important events varies considerably, such that the Upper Madeira and southern Amazonas–northern Rondônia are examples of long-term processes of governance of infrastructure, whereas in Loreto that became important in the early 2010s, and in Colombia, those issues have become much more dynamic since 2015.

DISCUSSION

A review of the foregoing timelines permits reflections on lessons specific to each region, as well as identification of broader conclusions. To begin with specific lessons, each case leads to a distinct interpretation about the trajectories of infrastructure governance, based on the perspectives shared by workshop participants.

The case of Loreto shows that diverse stakeholders can identify shared goals to support a regional government in advancing environmental governance. That said, Loreto also shows that

Fig. 8. Percentage of events indicated by type of event, Amazon governance and infrastructure case studies.



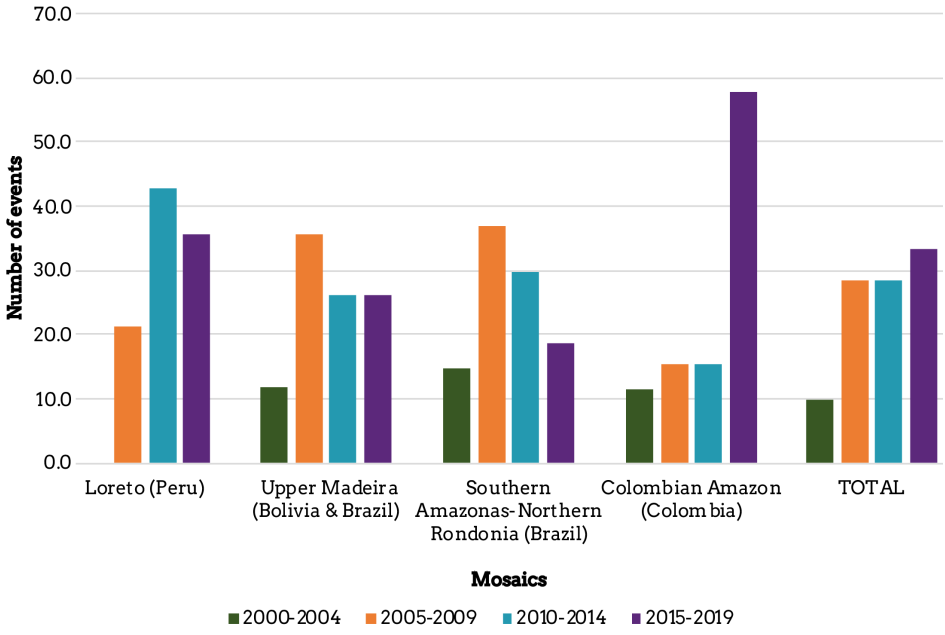
changes in regional government can be undermined via budget cuts by unsympathetic administrations. The Upper Madeira case showed that grassroots stakeholders can mobilize and coordinate action, even across national boundaries and languages, in response to large-scale infrastructure. In the case that mobilization cannot stop infrastructure plans from going forward to construction, resistance can produce information documenting negative impacts, and that may be important in contesting future projects. The case of southern Amazonas–northern Rondônia in Brazil showed how strong states can create complicated landscapes by promoting infrastructure projects while also establishing protected areas and indigenous lands. The result is a highly fragmented landscape with high potential for conflict among stakeholders. Despite large policy shifts in the environmental sector among presidential administrations, Brazil has consistently promoted infrastructure in the Amazon. In Colombia, since the cessation of the insurgency, the country has entered a period of mixed policy signals of promoting infrastructure and fostering economic activity in the Amazon while also seeking environmental conservation and protection of indigenous territories.

Underpinning these lessons learned in each region is a recognition of the caveats that emerged in the participatory construction of the timelines. As previously mentioned, some timeline content likely reflects the composition of workshop participants, which varied among workshops (see Fig. 2). One the one hand, future work should seek a more balanced representation of stakeholders. On the other, the inclusion of powerful voices from government or private project developers could have the unintended effect of silencing historically marginalized indigenous, grassroots, and other voices. It should also be noted that top-down processes (at the national or international level) emerged as salient in the Loreto, Southern Amazonas–Northern Rondonia, and Upper Madeira timelines despite considerable variation in the number of participants representing different stakeholder groups. Although this outcome may be expected in the Upper Madeira timeline, which had no government representatives and significant grassroots participation, it was also true in Loreto, which had significant participation by government agencies (more than one-third) and little participation from grassroots groups.

Moving beyond case-specific interpretations, we turn to broader insights and a discussion of implications for the practice of governance that emerged from two or more of the four cases. The role of the state is generally central, but relying on state agencies for long-term conservation faces the peril that elections change regimes and may lead to significant modifications in policy agendas and state support for environmental governance. In contrast, governments tend to seek to advance infrastructure projects regardless of political ideology. Conservation strategies that lead to more durable outcomes, such as designation of protected areas and indigenous lands, thus constitute a crucial strategy in regional environmental governance.

All four timelines show significant nonlinearities in the conditions for effective environmental governance, which poses challenges to the sustainability of governance of infrastructure. Loreto showed that periods of political authoritarianism can give rise to stakeholder collaboration and improvements in environmental governance during redemocratization, as was the case in Brazil in the late 1980s (Hochstetler and Keck 2007); southern Amazonas–northern Rondônia showed that the opposite sequence can occur, as in Brazil since 2018. Furthermore, Loreto

Fig. 9. Percentage of events indicated by time period, Amazon governance and infrastructure case studies.



and southern Amazonas–northern Rondônia showed that improvements in environmental governance can be followed by setbacks. It is therefore vital to ask about how alliances and networks can sustain themselves, especially if key members leave government and thus lose the insider's influence on policy making and rule implementation. The Upper Madeira and other cases show that protest can influence public discourse about infrastructure, but in this case, that was not enough to stop infrastructure projects. A major question, then, is whether and how environmental governance networks can change tactics after political changes present obstacles. One avenue is thus to remobilize networks for protest. In Brazil, environmental leaders who gained government positions under Lula and Dilma in the 2000s and 2010s then left in 2018, and took outside positions as critics of the Bolsonaro administration (Serafim 2019). During the southern Amazonas–northern Rondônia workshop, participants similarly argued for the reactivation of the *Aliança dos Povos da Floresta* to contest the Bolsonaro government.

The findings from the timelines set the requirements for effective environmental governance in historical context and call attention to the importance of recognizing stakeholder dynamics over time. As infrastructure planning occurs over years, the many events occurring during the process can affect whether prospects for effective governance improve or worsen. Although the findings show that state policies are central, the timelines also indicate that other stakeholders can strengthen governance under certain conditions. Those conditions include (1) decentralization of policy processes, which make regional and local stakeholders more important, as in Loreto during 2007–2016 and the Upper Madeira since 2010; (2) supportive governmental agencies, as in Loreto when GOREL had a sympathetic administration and in some respects in southern Amazonas–northern Rondônia under Lula and Dilma; (3) recognition of common interests, as in Colombia about protected areas and indigenous lands and green infrastructure and among stakeholders in Loreto; and (4) cross-scale collaboration, especially as seen in the Upper Madeira, but also in other mosaics as local and regional stakeholders have sought to engage national governments. As the timelines made clear, these conditions appear and disappear over time, which makes recognizing them crucial for effective strategy to improve governance.

By contrast, the timelines also made evident the conditions under which the effectiveness of governance can be reduced. Those conditions include (1) lack of transparency, as when state decisions about projects are made without adequate prior consultations, as in the Upper Madeira in the 2000s; (2) governments that impede public participation or accounting for scientific findings and make infrastructure decisions for political reasons, also as in the Upper Madeira in the 2000s; (3) changes in government environmental policies after elections, notably in Brazil since 2018 but also in Loreto since 2015; and (4) political leaders who are hostile to social inclusion and environmental conservation, most notably as in Brazil since 2018. The conditions that hinder effectiveness of governance often appear quickly and need to be anticipated, but may not persist.

The final lesson stemming from our analysis of timelines is that conditions for effective governance can shift in both directions over time, including significant reversals going from one direction to the exact opposite. The timelines for Loreto and southern Amazonas–northern Rondônia both encompassed swings from one direction to the other and then back. It remains to be seen if

the recent shift toward infrastructure investments and extractive activities in Colombia will yield mitigation actions such as green infrastructure, or if mobilization against planned dams in the Upper Madeira will lead to cancelations or significant steps for impact mitigation. In any event, effective environmental governance requires long-term conservation strategies that anticipate non-linearities via a combination of weathering difficult moments and staying prepared to take advantage of auspicious moments.

CONCLUSION

The comparative timeline analysis shows how political regimes at the national and regional levels influence the effectiveness of environmental governance over time, which in multiple cases was improved only to be later undermined. Such findings generate additional questions for future inquiry that highlight the utility of examining continuity and change over long time periods in a comparative perspective across cases where infrastructure is in debate. In the aftermath of an historical transition, such as the cessation of insurgency, how can proposals for green infrastructure and bottom-up governance models effectively influence policy? Can alliances of stakeholders who came together to support a sympathetic government for environmental governance sustain their collaborative ties when governments change? A better understanding of how stakeholder networks and tactics change with changes in governments and trajectories of projects can shed light on the complex dynamics involved in shifts from advances to setbacks and vice versa. It is also necessary to understand the priorities of stakeholders in power to identify pathways toward more inclusive governance.

In applying the concept of environmental governance to infrastructure, comparisons of timelines also demonstrate how dynamics of governance vary among specific projects. Top-down infrastructure planning is difficult to contest, particularly when conducted internationally between governments, which raises questions about how the effectiveness of bottom-up communication strategies can be improved. As efforts at regional infrastructure development and integration are ratcheted up in many regions of the world (e.g., IIRSA (discussed here), the Meso-American Integration and Development Project in Central America, and China's Belt and Road Initiative supporting infrastructure across Asia, Africa, and Latin America) these questions take on increased significance and urgency.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12683

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Data Availability:

Data/code sharing is not applicable to this article because no data/code were analyzed in this study.

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APPENDIX 1.

Table A1.1. Organizations represented by workshop participants, by mosaic, including governmental agencies, indigenous and community associations, non-governmental organizations, and universities. Each organization was represented by one or more participants in the workshops.

Organization	Loreto (Peru)	Upper Madeira (Bolivia and Brazil)	Southern Amazonas-Northern Rondonia (Brazil)	Colombia
Governmental Agencies	DIRCETURA - Dirección Regional de Turismo y Artesanía		SEMA - Secretaria de Estado do Meio Ambiente de Boca do Acre	Ministerio del Ambiente
	GOREL		IDAM - Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas	Ministerio de Transporte
	Gerencia de Planificación y Presupuesto			Instituto Sinchi
	SERNANP - Servicio Nacional de Áreas Naturales Protegidas			Fondo Acción
	GERFOR - Gerencia de Desarrollo Forestal de Flora y Fauna Silvestre			Gobernación del Guaviare
	DECDB - Dirección Ejecutiva de Conservación y Diversidad Biológica			CorpoAmazonia - Corporación para el Desarrollo Sostenible del Sur de la Amazonía
	GRAI - Gerencia mosaical de Asuntos Indígenas			CDA - Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico
Number of participants	19	0	2	10
Percentage of participants	33.9	0.0	5.7	33.3
Indigenous/ Community Associations	Coordinadora Regional de Pueblos Indígenas de San Lorenzo, CORPI SL	Comité de Protección Cachuela Esperanza	STTR - Sindicato dos Trabalhadores e Trabalhadoras Rurais de Lábrea	Resguardo Indígena de Yunguillo
	Comité de Gestión del Área de Conservación mosaical Alto Nanay Pintuyacu Chambira	Pescador de comunidade de Porto Velho	ASAEX - Associação dos Seringueiros Agroextrativistas da Reserva do Rio Ouro Preto	Representante Pueblo Inga
	Consejo Comunal de la Reserva Nacional Pucacuro	OCMA - Organización Comunal Mujer Amazónica	OCMA - Organización Comunal de la Mujer Amazónica	Veeduria Carretera Mocoa
		OPIPAM - Organização do Povo Indígena Parintintin do Amazonas	APIJ - Associação do Povo Indígena Jiahui	
			OPIPAM - Organização do Povo Indígena Parintintin do Amazonas	

(con'd)

			KANINDÉ - Associação de Defesa Etnoambiental Kanindé	
Number of participants	5	12	5	3
Percentage of participants	8.9	28.6	14.3	10.0
Non-governmental Organizations	WCS - Wildlife Conservation Society	WCS - Wildlife Conservation Society	ACT - Amazon Conservation Team	TNC - The Nature Conservancy
	DAR - Derecho, Ambiente y Recursos Naturales	FCDS - Fundación para la Conservación y Desarrollo Sostenible	IDESAM - Instituto de Conservação e Desenvolvimento Sustentável da Amazônia	Gaia Amazonas
	CSF - Conservation Strategy Fund	IMV - Instituto Madeira Vivo	IPÊ - Instituto de Pesquisas Ecológicas	FCDS - Fundación para la Conservación y el Desarrollo Sostenible
	SPDA - Sociedad Peruana de Derecho Ambiental	CEDLA - Centro de Estudios para el Desarrollo Laboral y Agrario	IEB - Instituto Internacional de Educação do Brasil	WWF- World Wildlife Fund
	CEDIA - Centro para el Desarrollo del Indígena Amazónico	IEB - Instituto Internacional de Educação do Brasil		ACT - Amazon Conservation Team
	TNC - The Nature Conservancy			Fondo Acción
	NCI - Naturaleza y Cultura Internacional			
	Field Museum of Chicago			
	WWF - World Wildlife Fund (Brazil)			
Number of participants	21	5	11	10
Percentage of participants	37.5	11.9	31.4	33.3
Universities	PUCP - Pontificia Universidad Católica del Perú	UNIR - Universidade Federal de Rondônia	UNIR - Universidad Federal de Rondônia	Universidad del Rosario
	UTEC - Universidad de Ingeniería y Tecnología	USP - Universidade Federal de São Paulo	UEA - Universidade Estadual do Amazonas (Humaitá)	
		IEE -Instituto de Energía y Medio Ambiente	UFAM - Universidade Federal do Amazonas	
		UAB-JB - CIRA - Universidad Autónoma del Beni José Ballivian		
		UAP - Universidad Amazónica de Pando, Área de Ciencias Biológicas y Naturales		
		FAUNAGUA - Instituto de Investigaciones Aplicadas de los Recursos del Agua		

(con'd)

		IHH - UMSA - Instituto de Hidráulica e Hidrología		
Number of participants	3	17	10	1
Percentage of participants	5.4	40.5	28.6	3.3
Number of UF Facilitators	8	8	7	6
Percentage of UF Facilitators	14.3	19.0	20.0	20.0
Total Number of Workshop Participants	56	42	35	30
Percentage Total	100.0	100.0	100.0	100.0