WHITE PAPER

From Knowledge to Action: Strengthening the Science–Policy Interface for the Future of the Amazon

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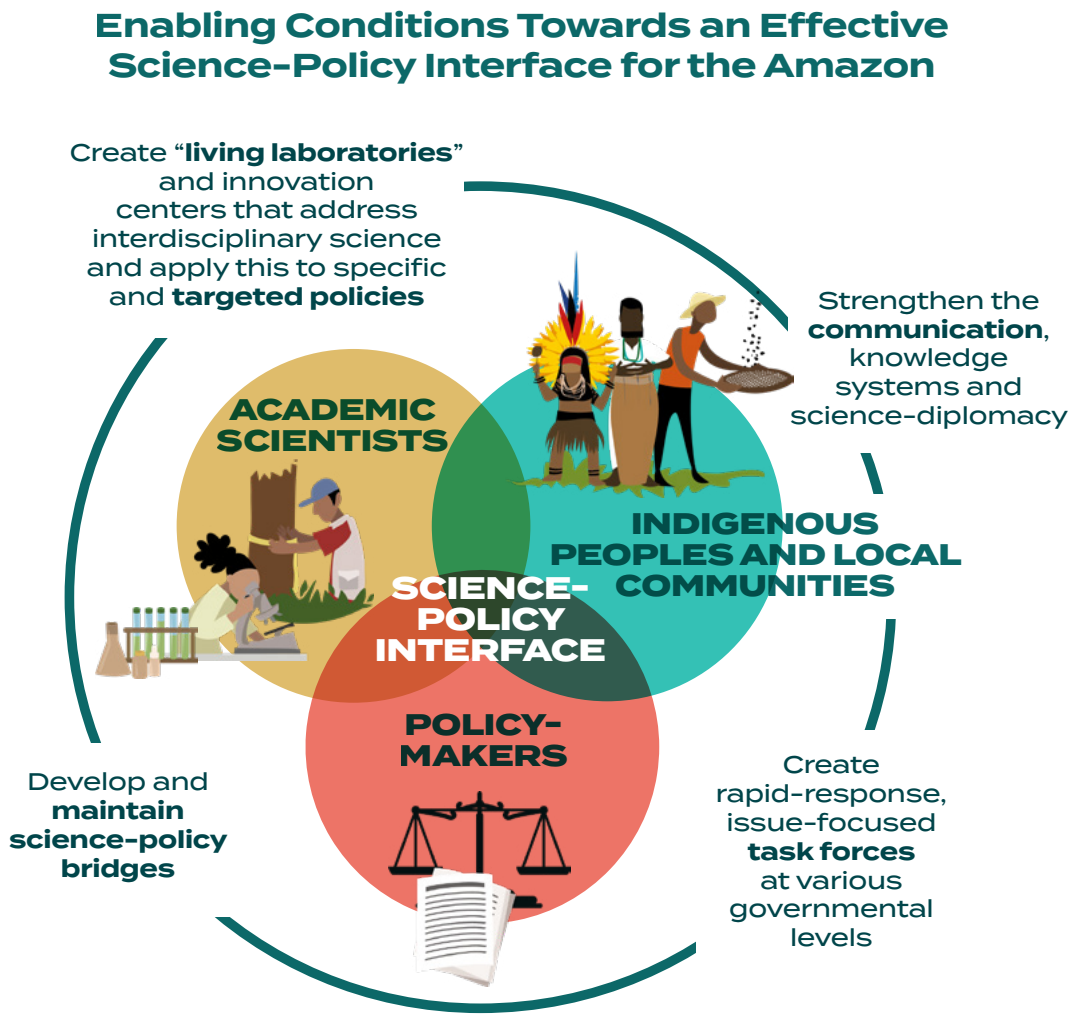
Executive Summary

The future of the Amazon will depend not only on what we know about the forest and the people who live there: it will depend also on how effectively scientists, policymakers, and Amazonian communities translate knowledge into policy action. Deforestation, climate change impacts and risks, and expanding illegal and extractive economies—all shaped by economic and political interests—are driving the region toward ecological and sociocultural thresholds. If we reach these thresholds, the Amazon could shift to a degraded, savanna-like ecosystem and lose its capacity to regulate climate and sustain biodiversity. These changes will have profound cultural and global consequences.

The challenge in addressing this situation, however, is not a lack of knowledge. Academic research, alongside Indigenous and local sciences and knowledge systems, has already provided critical insights into risks and pathways for resilience across the Amazon. The central barrier, rather, lies in ensuring that this knowledge comes together to inform timely, legitimate, and durable policy decisions that will transform scientific knowledge into practical and concrete societal solutions. However, scientists, policymakers, Indigenous Peoples, and Local Communities often operate within different institutional structures. They also have diverse incentives, interests, time horizons, communication practices, and knowledge frameworks. These differences weaken trust, limit evidence uptake, and undermine policy effectiveness—all of which are critical for protecting the Amazon and the people who depend upon it.

Based on expert consultations, in this paper we propose several practical pathways for strengthening the science–policy interface while taking the different realities of Amazonian countries into consideration. The pathways we recommend fall into four distinct categories: (1) establishing context-specific science–policy bridges that can serve as sustained spaces for dialogue; (2) creating rapid-response expert task forces to support decision-making; (3) strengthening science communication and diplomacy; and (4) developing living laboratories and innovation centers for experimenting and learning from potential solutions. We also assert that an effective science–policy interface must be inclusive, intercultural, multilevel, agile, and transboundary. This interface must also be grounded in trust, which is built through sustained engagement, humility, and mutual learning.



Graphical Abstract

Recommendations to strengthen the science-policy interface in the Amazon based on expert consultations.

1. The Urgent Need for an Effective Science–Policy Interface in the Amazon

The survival of humanity and the existence of Amazonian forests are inextricably linked [1–4].

The Amazon is a socioecological system and living territory with over 48 million inhabitants, and it plays a crucial role as a global climate regulator[1,5,6]. Yet climate change, deforestation, and forest degradation are continually shifting Amazonian forests closer to ecological "tipping points"[3]: conditions under which forests begin to emit more carbon than they absorb and reduce how much water they recycle. Currently, cumulative deforestation and forest degradation have taken place across approximately 35% of the Amazon. This is fragmenting the Amazonian biome and pushing it closer to these critical tipping points[5,7-10]. Deforestation and forest degradation are also exacerbating climate vulnerability by reducing essential ecosystem services such as water recycling, rainfall, and local food security[11,12]. Furthermore, alongside local and regional impacts, crossing tipping points in the Amazon will have disastrous effects on global humidity and weather systems. This will translate into negative effects on air and water quality, food security and agricultural production, health systems, and the livelihoods of Indigenous Peoples and Local Communities[a 8,9,12-16].

Despite these impending ecological, economic, social, and cultural impacts, the Amazon is still largely treated as an inexhaustible extractive resource. As one expert notes "we must raise awareness and change the mindset that the Amazon is a resource available to everyone, that it can be extracted and left behind in a state of degradation."[b] But this mindset has a long legacy. Colonization, land settlement, and a weak government presence have historically been major factors influencing the region. Today, those living in the Amazon face unequal access to healthcare, education, employment, public services, and political participation. Illicit economies—involving activities such as land grabbing; illegal

a In this document we refer to Afrodescendant Peoples (such as *quilombolas* and maroons), traditional and local communities (such as rubber tappers or Brazil nut collectors) as "Local Communities".

b Quotes throughout this document are from 22 experts who were consulted on the science–policy interface (see section "Consulting Diverse Experts on Improving the Science–Policy Interface" and table S1). Quotes are shared anonymously, data is available upon request.

agricultural expansion, mining, and logging; and drug and wildlife trafficking—also increasingly undermine the region's sociocultural and ecological integrity[17-19]. These political and economic dynamics undergird deforestation across the Amazon, operating as interconnected systems with multifaceted consequences: biodiversity loss, degradation of ecosystem services, displacement of Indigenous Peoples and Local Communities, increasing urban and rural violence, and heightened vulnerability to climate-related disasters[20].

This complex political, legal, and economic context affects inhabitants across the Amazon, including Indigenous Peoples (more than 400 ethnic groups, with and without recognized collective titles), Local Communities, and urban populations[5,6,21-25]. Over 75% of Amazonians live in the region's fragile cities with high poverty levels. Those who remain in the Amazon's rural and forested territories reside in an "ecosystem of illegalities." [17-19]. The region is one of the most dangerous places in the world for Indigenous Peoples and local community leaders, as well as journalists and allies, working to document and confront the region's myriad challenges[c 26,27].

To address these issues, a successful science–policy interface in the Amazon must be based on inclusive, intercultural principles, and it must be grounded in a broadened understanding of what constitutes legitimate science. Local, subnational, and national government agencies in the Amazon face the difficult task of crafting and sustaining policies that simultaneously address illegality, poverty, inequality, and conservation. Furthermore, the Amazon's vast size and logistical isolation adds to the complexity of policy enforcement [28].
Legal frameworks exist but are frequently undermined by political turnover, regulatory shifts, corruption, enforcement gaps, and competing economic priorities.
At the same time, while scientists generate critical insights into the Amazon's ecological, social, and economic systems, these insights too often fail to influence decision-making on the ground[29-30]. This gap cannot be explained solely

c Global Witness documented 196 killings of land and environmental defenders in 2023, of which 85% occurred in Latin America, 55.10% of them in the Amazonian countries of Colombia (79), Peru (4), and Brazil (25).

by failures in communication or knowledge transfer. The science–politics interface is also a space where certain forms of knowledge are systematically legitimized while others remain marginalized, limiting the effectiveness and justness of the responses formulated[31]. Overall, Indigenous and local sciences and knowledge systems[32-33] are frequently neglected, but they have played an increasing role in initiatives promoting regional sustainability. By identifying and promoting individual and collective actions, these initiatives reveal significant potential to transform production systems, strengthen value creation, expand market access, and reconfigure governance arrangements, contributing simultaneously to improved living conditions and to environmental sustainability[34]. However, their contribution remains underutilized when it is not recognized and meaningfully integrated into formal knowledge production and policy formulation processes.

The disconnections between academic scientific knowledge, policymaking, and local conditions reflect broader systemic challenges. The reality is that scientists and government leaders too often engage not with each other, but solely within their own circles. Scientists often engage primarily within their disciplines, while policymakers focus on agency agendas, leading to fragmented approaches that fail to address the Amazon's complexity. The primary current challenge does not lie in the absence of knowledge but in the conditions under which different forms of evidence are recognized, mobilized, or ignored in decision-making processes[35]. Meanwhile, we are losing the Amazon, with consequences that affect us globally.

2. Consulting Diverse Experts on Improving the Science–Policy Interface

This white paper uses expert consultations to gain insights and propose pathways forward for creating a stronger science–policy interface. The science–policy interface is defined as "the social process through which scientists and other knowledge holders interact with policy-makers and other stakeholders to exchange, co-produce, and apply relevant knowledge for decision-making" [36]. We consulted with 22 individuals from across the Amazon: scientists, government leaders (at subnational,

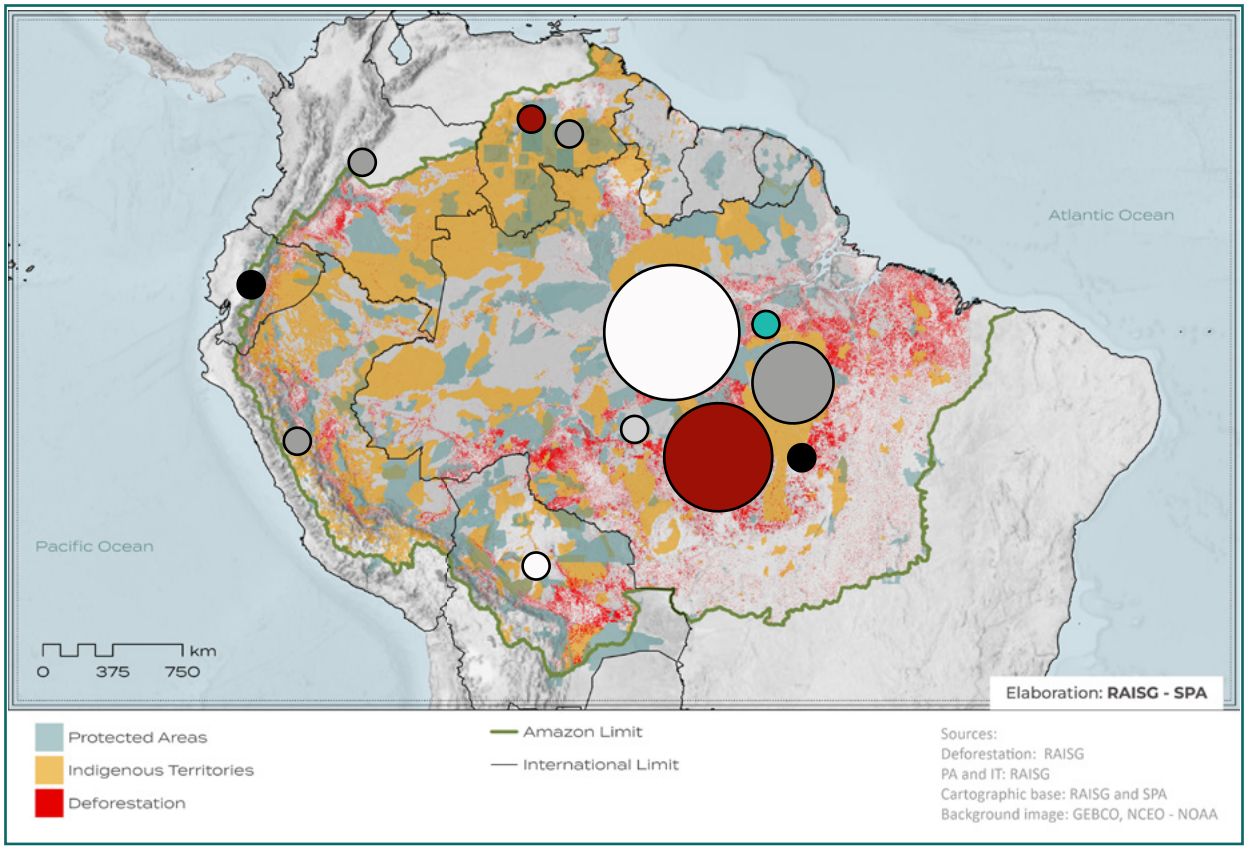


Figure 1. Overview of the actors from the expert consultation and their respective sectors (academia, government, intergovernmental, and Indigenous and civil society) and their country of origin. The background shows the Protected Areas, Indigenous Territories and deforestation levels in the Amazon (map created by RAISG)[20].

national, and international levels), and Indigenous and local community leaders (some of whom are also government officials and/or scientists). We used a semi-structured, open-ended consultation methodology that focused on three core questions: (1) What does the science–policy interface mean to you and your work in the context of the Amazon?; (2) What would a successful (effective) science–policy interface look like in practice?; and (3) What are the specific/concrete pathways or enabling conditions that can move us toward this more effective science–policy interface in the Amazon? We also drew on the expertise and experience of the ten coauthors of this paper, whose knowledge spans the Amazon region.

To analyze the consultation responses, we conducted qualitative thematic coding for the three primary questions. We arrived at four priority recommendations, which emerged from the analysis of the experts' responses as well as the practical experience of the paper's authors. To assess the frequency at which each recommendation was mentioned, we tallied the total number of experts who mentioned each of the four priority recommendations (Table S1). Additional themes emerging beyond the four main recommendations were also identified through an iterative coding process to ensure that the themes were representative of the data and to further inform the points in this paper. Finally, to identify key characteristics of an effective science–policy interface, we triangulated insights from the consultations with insights from the existing literature[2,30,37-46]. Based on the findings, we propose pathways and enabling conditions for strengthening the science–policy interface across the Amazon, which are outlined in the sections that follow.

3. Understanding the Disconnection Between Science and Policymaking

> *"This interface is not an academic luxury–it is about legal certainty and effectiveness. It is what separates an ideological decree from a public policy that stands the test of time."*

The science–policy interface is not a linear pipeline that neatly leads from evidence to decision-making. The relationship between evidence and decision-making can rather be characterized as nonlinear, relational, trust-based, and context-dependent. It is important to consider that academic scientists, policymakers, Indigenous Peoples and Local Communities, and urban populations operate within distinct contexts shaped by their diverse political and socioeconomic realities. Thus, building a robust science–policy interface across the Amazon must begin by paying attention to challenges related to timing, translation, relationships, and accountability.

Timing. Scientific production is often a long-term process, while policy production often takes place in the shorter-term context of political

terms. In contrast, policy processes that can transcend electoral cycles and lead to implementation of state policy should be rooted in broad-based consultation systems, which demand both time and context-specific engagement mechanisms. As one expert characterized the problem, "science often arrives fragmented or late, while policy decisions move quickly under political and economic pressure."

Translation and relationships. Beyond this, scientific and policymaking organizations, as well as Indigenous Peoples and Local Communities, often "speak different languages," requiring mechanisms for translation among them. As one expert noted, "Writing a strong scientific paper is rarely sufficient to influence policy outcomes." While science is structured and hypothesis-driven, Indigenous and local sciences and knowledge systems are holistic and deeply interconnected with the natural world. This leads to a twofold challenge: a challenge of effective translation, when scientific frameworks fail to capture the nuances of ancestral practices, and a challenge of equitable relations, when hierarchical gaps between academic sciences and Indigenous and local sciences and knowledge systems hinder true collaboration. When these gaps are not addressed, the knowledge and understanding we have about the Amazon is fragmented—and incomplete knowledge is hard to translate into specific policy agendas that reflect the diverse realities of this region.

Accountability. Furthermore, credibility and legitimacy demand accountability from all parties. The need for accountability in scientific research extends beyond academia and includes ensuring knowledge is accessible to and shaped by the broader public. One expert characterized the problem as the fact that scientific studies "remain shelved and without coherent action plans." Currently, the failure to turn existing knowledge into timely, legitimate policy decisions is a much greater problem than a lack of data or uncertainty in scientific models[47]. Academic scientists should be incentivized for producing policy-relevant research and for engaging in application and implementation of this research. At the same time, policymakers should be held accountable for integrating scientific evidence and diverse knowledge systems into the decisions they make and the technologies used for policy implementation. This will require clear feedback loops between science and policy, as well as communication approaches that make scientific insights accessible and usable beyond academic publications. Scientists and policymakers

can benefit from engaging trained communicators and intermediaries who help translate knowledge into actionable pathways and tools, bridging the gap between forward-looking scientific insights and the practical realities of implementation. As one expert noted, "Science diplomacy is a basic tool for effectively conveying scientific information to society and decision-makers."

Finally, we should recognize that entrenched power structures and economic interests often shape whether knowledge about the Amazon is applied or ignored. As one expert observed, "Many decisions affecting the Amazon are shaped less by evidence than by rhetoric, misinformation, and narratives advanced by the loudest and most powerful actors." Social media, for example, can be used to disseminate distorted or demonstrably false information and promote false scientific controversies. This weakens environmental governance[48] and leaves scientists facing a dual challenge: they must not only advance knowledge at the scientific frontier but also reaffirm well-established scientific facts in an increasingly polarized environment shaped by misinformation.

4. Supporting Durable Policy Development

> *"Ultimately, the interface only holds if everyday people come to see their own wellbeing—health, livelihoods, and stability—as inseparable from the Amazon's fate, regardless of where they sit on the political spectrum."*

The task of connecting knowledge systems, science, and policies is complicated by the political and institutional realities of governments and by socioeconomic pressures. Political will influences how concerns about poverty, conservation, and development are prioritized across the Amazon. Policymakers can favor the expansion of large-scale infrastructure and commodity production or create pathways for sustainable alternatives, such as socio-bioeconomy development[49]. Similarly, legal frameworks are often structured to prioritize extraction and short-term economic gains over longer-term sustainable development strategies. Furthermore, political actors often face distinct limitations. Elected officials strive to show results, and across the Amazon, poverty eradication and job creation are at the forefront of political agendas.

Beyond political pressures, elected officials, civil servants, and the

governments within which they work (local, subnational, and national) operate with significant budgetary, human capacity, and continuity constraints. This can lead to weak enforcement capacity and limited state presence across the vast territories that make up the Amazon. Illegal economies and organized crime compound these governance challenges. Moreover, environmental and human rights agendas frequently operate in parallel rather than in concert, despite the fact that ecological degradation and social vulnerability are inseparable in the Amazon[20].

The scientific community also operates with constraints. Deforestation and forest degradation are fundamentally driven by fast-paced economic systems and incentives[8]. But our understanding of the economics behind the decisions leading to forest loss and degradation often falls short compared to our vast scientific knowledge of what happens ecologically when we lose tropical forests. Furthermore, this knowledge is not always equally shared between populations. While Indigenous Peoples and Local Communities often have significant knowledge of the very real effects of forest loss and degradation, at the same time, as one expert observed of the general population "have a lack of a long-term vision and a lack of understanding or value of the ecological services that we gain from nature, because they actually don't cost anything." Scientific institutions and funding structures also often marginalize social sciences and applied, context-specific research[50].

Science, knowledge systems, and the policy interface must be tailored for both urgency and continuity. As one expert noted, "We need to have a well-prepared technical team that understands the specificities … And to combine Indigenous and local sciences with academic science is to shape public policy, a lasting public policy. May it have continuity, may it not be a government policy, but a policy of continuity … Governments come and go. But this policy has continuity because it is not a government program, but a public policy. It is a state policy." An effective science–policy interface must therefore be timely—meaning it can respond to urgent needs—and explicitly oriented toward the most pressing socioeconomic, environmental, and climate-related risks facing the Amazon. Key areas we must address include the drivers of forest loss and degradation, extractive activities, illegalities, violence, and the intersecting challenges of health, poverty, inequality, energy access, and education[7,51]. To address these

areas, the relevant communities must come together. As one expert stated, “Science and academia are always relegated to scientific citations of what should be done but isn’t; major research and key information for solutions remain in government archives or memoirs.”

5. Co-production of Knowledge with Indigenous Peoples and Local Communities

> *“That public policies reach the territories and serve the people who really need them, who are there in the forest, working and taking care of the climate, not only of Indigenous Territories, but of the planet, of the world.”*

Indigenous and local sciences and knowledge systems are often systematically excluded from formal policy processes[32], which can be traced back to colonial patterns of governance[52-54]. This exclusion occurs on local as well as international levels. International climate governance[d] can reproduce colonial hierarchies by influencing human–nature relations and climate authority, weakening linkages between knowledge systems, and excluding Indigenous Peoples and Local Communities as political actors; this can lead to prioritizing economic and geopolitical interests over climate justice[52,55].

Ongoing marginalization of Amazonian populations (e.g., through limited access to healthcare, education, land title, technology, and political voice) determines whose knowledge counts and who can act, who can produce science and who can produce policy. This divide is further widened by contrasting worldviews: while state institutions and environmental sciences often frame nature as an object of management, governed through the languages of property and markets, Indigenous and local sciences and knowledge systems understand nature as a living political and spiritual subject—endowed with agency, memory, and relational capacity[53,56]. As one expert noted, “We, the Indigenous Peoples, are talking about scientific, financial, and institutional connectivity, but beyond that, we believe that

d International climate governance refers to the structures, processes and actions through which private and public actors interact to address societal goals and includes formal and informal institutions and the associated norms, rules, laws and procedures for deciding, managing, implementing and monitoring policies and measures at any geographic or political scale, from global to local[68-70].

spirituality will help us overcome mistrust and ill will, and together see a living Amazon."

Effective policy design and implementation depends on alignment with local realities and coordination with existing agreements and plans[34]. Also, it is important to recognize that while much of academic science takes place in disciplinary silos, this is largely not the case with Indigenous and local sciences and knowledge systems. Thus, combining Indigenous and local sciences with academic science can lead to solutions and pathways with better integration across sectors such as health, nutrition, air and water quality, cultural diversity, and spirituality, ultimately helping to shape more integrated policy development[56-58].

Solutions to the problems the Amazon faces require policies to be co-produced with Indigenous Peoples and Local Communities, not imposed upon them. As one expert noted, too often Indigenous Peoples "are treated as consultative rather than authoritative." Beyond their role as knowledge holders, Indigenous Peoples and Local Communities are political actors and priority audiences for scientific results and policy recommendations. Shifting to collaborative policy development requires strengthening participatory environmental governance to promote human and environmental health; this means ensuring that those most affected by environmental change are central to the decision-making processes[52,59,60]. As one expert asserted, "The challenge of how to include all populations in the expected benefits of sustainable development, without forcing the distortion of their cultural identity, is a duty of the State." To ensure this, however, governments need the human, financial, and technical support to develop and sustain inclusive and participatory processes.

For all these reasons, the knowledge of Indigenous Peoples and Local Communities must be considered on equal footing with academic sciences[53,56,61]. One expert asserted, "In an ideal scenario, Indigenous knowledge would be engaged in a dialogue, on an equal footing with academic science, where Indigenous experts and their traditional knowledge are truly considered experts … and this knowledge is on the same level of importance, to be considered perhaps even more important, in fact, because they are the people who are familiar with all the science that exists within that territory … through knowledge accumulated over millennia."

To make this shift happen, good-practice frameworks are needed to guarantee respect for Indigenous and local knowledge and protect the intellectual and territorial property rights of communities. These frameworks should ensure the full Free, Prior, and Informed Consent (FPIC) and participation of Indigenous Peoples and Local Communities in policy formulation, implementation, and monitoring. Although the principle of FPIC is recognized across the Amazon, its legal status, enforceability, and institutionalization varies substantially across countries. In practice, extractive activities frequently occur inside territories without consent. To be effective, good-practice frameworks should be adapted to local and national contexts, with structures that center diverse voices and territorial knowledge through shared spaces for dialogue and co-production of policies[57,62]. This requires interweaving academic sciences with Indigenous and local sciences and recognizing diverse knowledge systems as essential conduits for understanding and addressing Amazonian challenges[62-64]. Crucially, this approach must foster new forms of intergovernmental relations grounded in territorial governance. In such intercultural spaces, scientists, policymakers and community-level leaders can learn together about the context and timing relevant to one other's realities and develop translational and relational strategies that make sense to their different communities. One expert characterizes this as "reciprocity and respect … where … values of knowledge are respected, then there is enormous space for us to move forward."

6. Science and Knowledge Communication, Translation, and Trust

> *"There is a lack of mutual trust. Policymakers often see scientists as too slow, while scientists see policymakers as too short-term focussed. We need open data platforms where both can rely on the same information."*

The science–policy interface asks that we use science—our collective knowledge of both long-standing and emerging challenges in the Amazon—to drive effective and durable policies that can address these challenges. Science–policy translation occurs across contexts, populations, capacities, and scales. In some cases this may entail translating nuanced scientific knowledge into policy. In other cases, emerging scientific knowledge (such as innovation

and technological solutions) and policies (such as transborder wildfire management policies) can be translated, adapted, scaled, and replicated across the Amazon. As one expert notes, "You can't build technology inside offices… it has to be built with the community."[e] Therefore, effective policy developers must respect territorial realities and seek to transform abstract ideas into tools for effective implementation. Policy implementation is directly connected to factors such as land titling and legal recognition, dedicated budgetary support, and physical security[65]. Without translational interfaces that recognize such factors, policies will continue to operate in silos and fall short of their potential. This is where relationships among diverse actors shaping the Amazon enter the science–policy interface.

Expert consultations repeatedly emphasized that long-lasting, trust-based relationships are foundational for enabling scientists to reach policymakers and for policymakers to consider and integrate science into their work. One expert summarized it like this: "Impact comes from sustained engagement, repeated interaction, and continuous dialogue over years or even decades … but success ultimately rests on durable relationships between scientists, Indigenous and traditional people and policymakers." An effective science–policy interface requires moving beyond ad hoc engagement toward intentional structures and "tripartite dialogues" that connect academic sciences, Indigenous and local sciences, and policy knowledge systems through engaged and long-lasting relationships.

Relationships can be facilitated by what one expert characterized as "champions" within the scientific community: "leaders that are people who just know how to make things happen, who know how the interface works, and who know how to engage with politicians, people who spread the word and convince people that their scientific arguments are interesting." Champions may be governmental leaders, both short-term elected and appointed officials, or longer-term civil servants who listen to scientists and see the importance of this knowledge in aiding their daily problem-solving work of policy development. Champions also hail from the scientific community, including scientists who

e An example is SeloVerde, which emerged from an article published in Science that proposed a method to automatically enable traceability and check for farm-level compliance with environmental regulations and the rights of Indigenous Peoples, and which has now been adopted by seven different state governments, including four out of nine Brazilian Amazonian states[71].

ardently apply their work to inform policymaking challenges. And as one expert pointed out, Indigenous and traditional leaders are often uniquely positioned to serve as champions who occupy these knowledge–policy spaces: "Within Indigenous Peoples and Local Communities, you will find that a person holds both these spaces … the people who hold the knowledge are the people who are leading the communities."

The science–policy interface must also promote engagement across multiple levels, sectors, and borders. Science should inform decision-making not only at national and international levels but also at community, municipal, subnational (e.g., state/region/province/department), and territorial scales. Transboundary cooperation is essential to address shared challenges and implement evidence-based policies; these actions are crucial to break the cycle of damage and safeguard lives, livelihoods, and nature[66]. And while regional coordination is critical, effective policies must remain grounded in local contexts and be able to adapt to rapidly changing social, political, and ecological conditions across the region[34]. Translating global assessments into locally actionable guidance is essential for ensuring relevance and impact across governance levels. At the same time, local experiences and innovations must be scaled upward to inform regional and global policy debates. Scientists and policymakers alike must also work with civil society experts, industry, and private-sector actors to help define and support the broader goals of integrated conservation and a sustainable, climate-resilient trajectory across the Amazon.

7. Principles and Pathways: Facilitating an Effective Science–Policy Interface for the Amazon

> *"...the science–policy interface is the connective tissue that turns evidence into consequence—ensuring that research on the Amazon does not remain descriptive, but informs real decisions about land use, rights, and governance."*

A successful science–policy interface in the Amazon must be based on inclusive, intercultural principles. It also needs to be grounded in a broadened understanding of what constitutes

legitimate science. This interface must be tailored for both urgency and continuity, and it must promote engagement across multiple levels, sectors, and borders. Moving beyond sectoral silos toward coherent, socially and ecologically responsive frameworks is essential to successfully navigate the complexity of the Amazon, and for policy development to reflect the ecological and sociocultural connectivity of the Amazon. Regional coordination is critical, but effective policies must remain grounded in local contexts.

Taken together, attention to several dynamics—context, timing, translation, accountability, and sustained relationships across knowledge and governance communities—can drive the design of what a stronger science–policy interface can look like in practice. To translate these principles into practice, we here recommend four pathways, followed by additional recommendations specific to the science and policymaking communities.

PATHWAY 1: Develop and maintain science–policy bridges

Political leaders must view the scientific community as open, accessible, and responsive to helping solve their real-time challenges in the Amazon. At the same time, the scientific community should continue to connect its research and knowledge production to urgent economic, environmental, and social issues. This exchange—the uptake of scientific knowledge by policy-makers and the alignment of research with policy priorities — occurs within what we call bridges: structures for establishing trust and promoting knowledge exchange.

Science–policy bridges can translate and disseminate critical scientific findings (e.g., tipping point risks) to policymakers (congresses, ministries, and subnational governments). These bridges can also serve as mechanisms for incorporating policymakers' needs into research agendas by focusing on demand-driven approaches (concrete questions from governments and communities) and emphasizing co-developed solutions throughout policy formulation and implementation. There is no single or quick way to establish these bridges. They must be built and sustained over time, while providing structured and unstructured spaces for dialogue, trust-building, and cultivating champions across science–policy communities.

Considerations:

- **Design bridge structures to reflect governance scale and context**. Bridges will look different at local, regional, national, and international levels but should be intentionally designed and maintained, particularly during transitions to new political administrations. Engagement mechanisms may range from small, closed-door briefings and regular meetings to larger public dialogues at regional events or international fora such as Conference of Parties (COP).

- **Ensure that these bridges have explicit mechanisms for interweaving Indigenous and local sciences and academic science in policy development–and vice versa.** Governments should consider the priorities of Indigenous Peoples and Local Communities (e.g., briefings of Indigenous secretaries and ministries as well as translation of these communities' priorities to the scientific community for research uptake). Ultimately, policy design and implementation should be both evidence-based and culturally relevant, ensuring alignment with the lived realities of the peoples who sustain the Amazon biome and recognizing their autonomy.

- **Encourage policymakers to connect** with not only **urban** but also **rural** realities to understand complex social and conservation contexts firsthand.

- **Regularly evaluate and adapt bridge mechanisms.** As new political and scientific actors become involved, engagement processes should be reviewed and adjusted to remain effective and responsive to context and participants.

- **Integrate bridge structures with existing government monitoring and evaluation systems across agencies.** Use existing government systems and development planning spaces to shape the official policy vision, with explicit and coordinated work across the agencies, ministries, and secretariats responsible for the environment, agriculture, planning, finance, science and technology, and Indigenous Peoples and Local Communities.

- **Engage and support other leaders** (e.g., within civil society, industry and the private sector, and the philanthropic community) to foster research, knowledge production, technical assistance, and capacity building that will help with policy translation.

- Public investments, international cooperation, private sector engagement, and multilateral development finance should **prioritize funding for research and co-creation spaces that strengthen the interweaving of academic science** and Indigenous and local knowledge.

- **Ensure that participation provides value to those involved.** These spaces should facilitate meaningful exchange rather than creating additional burdens for already busy actors and should encourage engagement characterized by openness, humility, and a willingness to learn and adapt. This will help build relationships of trust that endure across political-administrative change.

- **Identify and support champions and cultural brokers who can connect scientific and political communities** at various levels (local, subnational, regional, countrywide, and international).
  These individuals or institutions have credibility across sectors and can translate between research and policy agendas. Examples include the Science Panel for the Amazon (SPA) and the Amazon Cooperation Treaty Organization (ACTO/OTCA) at the Amazon-wide level, the Governors' Climate and Forests Task Force at the subnational level, and trusted nongovernmental organizations in Amazonian countries.

- **Dedicate sustained financial and administrative support** to ensure these mechanisms remain functional across political and scientific leadership transitions.

- **Create environments** to strengthen these bridges and promote legitimacy, adoption, and lasting impact. For example, equip scientists to communicate their knowledge effectively through the media, thereby supporting social uptake; and train media professionals to engage with Indigenous and local knowledge in ways that are respectful, accurate, and non-paternalistic.

PATHWAY 2: Create rapid-response, issue-focused task forces at various governmental levels

"One important pathway is the existence of research groups focused on central and fundamental themes, producing knowledge oriented toward practical issues. These groups should be linked to formal public governance structures, where joint work between academia and government could achieve greater effectiveness. Knowledge and data management centers—functioning as "situation rooms"—could play a central role in this approach"

Governments often lack sufficient human, technical, and institutional capacity, particularly during periods of administrative transition, growing misinformation, and during urgent events. Establishing rapid-response, issue-specific task forces across different government levels—and, in some cases, across geographic borders—will help policy-makers and the general public navigate rapid decision-making processes and draw on the best available scientific evidence as real-time challenges emerge across the Amazon (e.g., droughts, floods, wildfires, narcotrafficking). These task forces can also give academics greater insight into the operational realities of the policy domain while using scientific knowledge to buttress the needs of policy-makers.

Considerations:

- **Utilize the deep expertise within universities, scientific institutions, Indigenous and local community leaders and organizations, and civil society.** Experts from these varied backgrounds can connect across government agencies (e.g., environment, planning, health, Indigenous affairs, regenerative agriculture) and across levels (local, subnational, regional, and national) to develop strategies for response, mitigation, and adaptation that effectively address urgent events.`

- **Build these response teams through relationships of trust and respect.** Establishing thematic teams at the onset of incoming political administrations can help ensure they are structured and ready to mobilize when needed.

- **Connect and leverage task forces through established research, practitioner, and policy networks** such as the Mancomunidad Regional Amazónica (Regional Amazonian Association, MRA) in Peru and the Amazonian Consortium in Brazil, as

well as broader Amazonia-wide networks, including the Governors' Climate and Forests Task Force, the SPA, the Association of Amazonian Universities (UNAMAZ), and ACTO/OTCA.

- **Ensure that the work of these task forces is connected to political commitments and frameworks developed at global climate, biodiversity and forest events** (e.g., climate and biodiversity COPs, the Kunming-Montreal Global Biodiversity Framework).

- **Ensure adequate, sustained financial and operational support for these rapid-response task forces.** Such support can be more agile, targeted, and time-bound than the longer-term investments required for bridge structures.

PATHWAY 3: strengthen science communication and science diplomacy—including academic science and Indigenous and local science and knowledge

"...you have scientists on one side, and you have policy-makers, decision-makers on the other side…key stakeholders can be the bridge between the two, people in communications, in press, in media, in public relations."

"Strategic interlocutors" can act as diplomats, helping to **translate science** into policymakers' terms and timelines and communicate the importance of policies that address the Amazon's needs to the broader public. These individuals can **facilitate intercultural exchange of knowledge**, ensuring that both academic science and Indigenous and local science are woven into policymaking processes.

Considerations:

- **Strengthen systems of communication** so scientific evidence is intelligible and compelling for policymakers, equipping policymakers with not only the data but also the delivery mechanisms to connect with the broader public.

- **Recognize—and use—the role of public opinion in shaping political action**. Strengthening science communication in the Amazon is essential to fostering an informed public that can support evidence-based decision-making. This is especially important for countering misinformation—both unintentional inaccuracies and disinformation (deliberate efforts to mislead for economic and/or power gains).

- **Support inclusive and transparent translation frameworks** where effective communication plays a central role. For example, this would include capacity-building for journalists to improve the quality and accessibility of public information.

- Place **strategic communication experts** into spaces with scientists as well as with policymakers, ensure that these experts have the needed **legitimacy and networking skills**, and **have them train scientists and government leaders** in effective communication strategies.

- **Protect civic space and information integrity.** A science–policy interface cannot function where intimidation, censorship, and disinformation dominate.

PATHWAY 4: Create "living laboratories" and innovation structures that apply interdisciplinary science to conservation and sustainable development policies in the Amazon

"We have to change this method of conducting research, in the laboratory, and develop more practical research for the community."

"Living laboratories" sites which can combine scientific methods with real-life application in communities across the Amazon, can support public policy development by systematically evaluating outcomes and refining policies based on continuous feedback from these "frontline" communities. These laboratories and centers should build on and strengthen existing initiatives—particularly those led by Indigenous Peoples and Local Communities and established research and innovation hubs[67] —

while creating space to expand and adapt to emerging challenges. These should be linked to the aforementioned agenda-setting bridge structures and rapid-response task forces. As such, they would function as spaces for interdisciplinary and intersectoral collaboration, anchored in concrete problem-solving and grounded in local realities.

Considerations:

- Focus on **specific local and regional needs** (e.g., socio-bioeconomies and renewable energy development).
- Focus on **both applied research and policy integration** for improving the alignment and relevance of policy-development initiatives.
- Provide **spaces for engagement among the scientific community, public sector, industry, banks, civil society, and technological leaders.**
- Provide **durable spaces** with staying power across political-administrative change.
- **Enable sustainable and climate-resilient investment opportunities** with clear, measurable returns—bridging scientific knowledge and policy action—while leveraging public sector engagement to reduce investment risk and ensure accountability to avoid greenwashing.
- **Connect with existing laboratories, centers, and networks** within and across the Amazon, such as Brazil's National Institute for Amazonian Research (INPA), the Museu Paraense Emílio Goeldi in Brazil, the Amazonian Scientific Research Institute (SINCHI) of Colombia, UNAMAZ, the Pan-Amazon Network for Bioeconomy, and the Bioamazonia Network, among others.

While the above recommendations pertain to both the science and policy communities, there are also recommendations that pertain to each of these areas and which, in turn, can serve to strengthen this interface.

Recommendations for the science community

"As scientists we need to learn how to communicate and we need to gain trust."

- Improve skills that often go beyond "doing science" to **build connections with Indigenous Peoples and Local Communities as well as with policy communities**. Develop structures to **reshape long-standing hierarchies of knowledge production** that have privileged natural over social sciences and academic science over Indigenous and local sciences—and connect knowledge production with the financial and research support it needs to succeed.

- **Acknowledge scientific production that is relevant to policy development** in job applications as well as tenure review and promotion processes, and reward Amazonian institutes and laboratories accordingly.

- **Promote transparency and translation of data for uptake across scientific communities and by policy developers**. This includes presenting findings in ways that non-disciplinary experts and non-scientists can understand and use. As one expert suggested, "Large scientific collaborations should … include dedicated teams responsible for engagement."

- **Foster collaborative and interdisciplinary research and teaching across scientific disciplines and geographic borders** (e.g., by creating structures of support and professional reward for this work).

- Support **scientific advocacy work,** including public science and engagement with media and social-movement actors, particularly on topics that connect to public concerns in the Amazon.

- **Promote public workshops and participatory processes** to present scientific information and findings in an accessible way, supporting the uptake of scientific evidence into decision-making.

Recommendations for the policymaking community

"At the national level, it is important to strengthen interinstitutional relationships with the Amazon and its governments, and to build public policies collaboratively with subnational actors."

- **Invest in technical staff and career civil servants** who have staying power across political administrative change, including ensuring institutional continuity across political transitions, supported by adequate remuneration and continuous capacity development to retain expertise within government. As one expert noted, "stable technical staff within government institutions are also essential, as they maintain institutional memory and continuity despite political turnover."

- Promote processes that enable **"co-designed research agendas"**—meaning governments outline their knowledge gaps (and/or scientists help them determine these gaps) and then work to fill them.

- Develop structures that **enable some government bodies and positions to remain fixed over time**, such as roles that integrate agencies and/or include the scientific community. For example, this can include maintaining a science advisory committee (akin to the aforementioned bridge structure) that has credibility, trust, and staying power across political administrations.

- Develop and strengthen **structures that encourage the durability of successful programs associated with policies** across administrations. This can encourage a focus on long-term impact rather than short-term political gain through "doing something new."

- **Strengthen interinstitutional relationships and build public policies collaboratively with subnational actors who** are more directly connected to local and territorial realities. These actors may also know more about scientific evidence that can both inform and be informed by context-specific knowledge and practices.

- **Identify and promote science–policy actions** (such as building scalable socio-bioeconomies and biobusinesses and delivering payments for ecosystem services) **that work to address urgent needs in the Amazon.**

- Promote **interagency interfaces** as well as **interfaces across different levels of government** to share knowledge, promote integrated policies, and encourage the interdisciplinary science necessary to buttress policymaking.

- **Enhance government monitoring and evaluation systems with academic research and with community-based research led by Indigenous Peoples and Local Communities.**

- **Institutionalize the standing of science and Indigenous and local knowledge in decision-making through legal requirements**, ensuring this knowledge is explicitly cited in laws, court rulings, licensing decisions, and financial risk assessments.

- **Connect policy actions to the commitments and outcomes generated from key international forums**, such as the United Nations Framework Convention on Climate Change COPs), the Kunming-Montreal Global Biodiversity Framework, and OTCA/ ACTO processes.

- **Hard-wire evidence into decision-making**, so that science and Indigenous and local knowledge must be formally addressed in policymaking spaces and processes (e.g., permitting, courts, and budgets) rather than treated as advisory.

- Academic scientists, Indigenous Peoples and Local Communities, and policy communities depend upon partnerships and collaborations to facilitate and integrate their work. It is critical that we recognize that supporting **the mechanisms necessary for a stronger science–policy interface requires sustained financing**—not only for producing scientific research but also for supporting meaningful participation and engagement with the work itself.

Together, these pathways offer a practical roadmap for strengthening the science–policy interface in the Amazon, one that is inclusive, credible, legitimate, and relevant, and capable of supporting transformative action at the scale and speed required.

8. Conclusions

The defining challenge of our time—the climate crisis and its cascading effects across ecological, socioeconomic, and political systems—places the Amazon at the center of debates regarding global stability. As one of the world's most critical socioecological systems, the Amazon plays an essential role in regulating climate, sustaining biodiversity, and supporting millions of livelihoods, even in adjacent regions beyond its limits. Addressing these interconnected crises requires not

only knowledge but also the ability to translate that knowledge into effective and timely action. At the core of this process lies the science–policy interface, and an effective interface requires the interweaving of Indigenous and local sciences and knowledge systems.

This paper offers a novel contribution by grounding its analysis in the perspectives of those directly engaged in science and policy processes across the Amazon. By listening to scientists, policymakers, and Indigenous and local community leaders, we have identified both the barriers that constrain action and the pathways that can better align knowledge production with decision-making. The findings underscore the fact that knowledge alone is insufficient—it must be translated into concrete societal solutions and policies that are legitimate, durable, and responsive to rapidly evolving challenges and realities across the Amazon. Strengthening the science–policy interface is therefore an urgent priority. And while numerous barriers to creating this interface exist, they are not insurmountable.

An effective science–policy interface must be inclusive, intercultural, multilevel, and agile. It must be grounded in trust built through sustained engagement, humility, and mutual learning. In this paper, we identify specific pathways to advance the science–policy interface: (1) developing and maintaining science–policy bridges; (2) creating rapid-response issue-focused task forces; (3) strengthening science communication and diplomacy; and (4) developing living laboratories and innovation centers focused on conservation and sustainable development. The future of the Amazon depends on our collective ability to come together.

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Supplementary Material

Table S1: Key priority areas represented in the 22 expert consultations, including the number of respondents who mentioned each priority area as being important and the total number of references to each priority area. References included any mention of the priority area (broadly defined), not only mentions that used our exact wording. Note that a larger number of respondents mentioned sustained financing, given that it was an explicit interview question, while we did not explicitly ask about the other priority areas in the interview questions.

Key priority area	Number of respondents who supported the priority area	Total number of references
1. Science–policy interface bridges	16	41
2. Sustained spaces for dialogue	13	47
3. Strengthened communication and science–policy diplomacy	11	26
4. Task forces responding to the needs of governments, Indigenous Peoples and Local Communities, and civil society, as well as rapid response mechanisms	13	23
5. Amazon innovation hubs where interdisciplinary science and Indigenous and local sciences and knowledge meets policy	13	31
6. Sustained financing	17	25

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