Manaus Declaration
for committed and shared research in Amazonia

August 4, 2023

Spanning across nine South American countries, the Amazon is a unique area that is home to one of the world's most important forest ecosystems. Presently, this ecosystem is facing all kinds of global challenges: ecological, economic, geopolitical, health and socio-cultural. To help meet these challenges through science, IRD and its scientific partners, as well as local and regional research and civil society players from seven countries on the continent met in Manaus from 3 to 5 July 2023. They have united around the need to develop and support a range of major regional research initiatives.

All the participants at the Manaus scientific workshop agreed on the urgent need to focus efforts on respecting and preserving the Amazon in all its cultural and biological diversity. They acknowledge the critical importance of this set of socio-ecosystems, for its essential roles in global climate, in the biogeochemical balance of the Atlantic Ocean and the mangroves at the river's outlet, and as living territories, a source of biodiversity, food and well-being for the native peoples and diverse communities that inhabit it. Aware of the challenges and threats facing the Amazon, the participants from academic institutions, non-governmental organizations, regional organizations and representatives of native peoples call upon governments to urgently and responsibly review the subsequent research actions and to provide the necessary political and financial support.

For biodiversity and sustainable and equitable management of natural resources

1. Combat illegal deforestation, one of the main threats to the Amazon. It is crucial to enhance collaborative efforts to halt the loss of forests by promoting sustainable land-use practices, encouraging reforestation with local and well-adapted species, and implementing effective protection, monitoring and control measures.

2. Work to identify and promote the contributions of nature to communities, by giving importance to ecosystem and environmental services, particularly through agroecology, and traditional forms of biodiversity use and their role in conserving agrobiodiversity. The aim is to combine the conservation and sustainable use of biodiversity, and to encourage approaches that promote the rights of nature.

3. Strengthen decision-making autonomy for local actors concerning their biodiversity through legislative changes. The implementation of the Nagoya Protocol and community protocols on the terms of access to, and the fair and equitable sharing of genetic resources and associated knowledge, needs to be rethought. This means respecting the intellectual rights of local populations over their knowledge and practices as well as supporting the recognition of traditional territories.

4. Promote ecologically and socially responsible forest and non-forest products by structuring sustainable value chains that respect ecosystems. It is important to be vigilant not to replicate the unsustainable extractivist situations experienced in Amazonia, and to move beyond a solely productivist approach.

5. Strengthen the Amazon Regional Observatory (ORA) led by ACTO and redefine the notions of ecosystem services (resulting from natural processes) and environmental services (resulting from human intervention, such as agroecology, agroforestry systems and reforestation using local species) and work on the notion of equitable sharing of resources.

6. Evaluate, monitor and report on the evolution of biodiversity using molecular barcoding and environmental DNA techniques. This involves a sustained data collection and coordination effort to build up a collaborative «molecular reference bank» for the Amazon region, in partnership with expert naturalist data collection institutions. The biodiversity observatory (OBAP) that is currently being set up should be based on the 20 years of experience and data collection of the national observation service HYBAM (observatory of hydrology of the Amazon basin supported by a collaboration between several meteorological services of Amazonian countries, Latin American universities, the IRD and the CNRS): HYBAM stations can be used as initial collection sites, in a spirit of complementarity to acquire useful data.

7. Work in real partnership with all the local populations concerned to understand biodiversity on a landscape scale, in the spirit of Resolution 129 «Avoid the point of no return in the Amazon by protecting 80% by 2025» of the IUCN Congress in Marseille in 2021.

For georesources and better human health

8. Provide information through a Guide to Good Mining Practices, and provide training to oil and mining operators (artisanal and semi-industrial) on more sustainable methods and practices for the extraction of oil and minerals, particularly gold, as well as for rehabilitation and revegetation in the context of alluvial gold mining sites. The aim is twofold. Firstly, to reduce the emission of suspended particles and the contaminants they contain, and protect aquatic environments. Secondly, to develop and test mitigation solutions (re-sludging, re-vegetation, use of symbiotic micro-organisms, etc.) to restore the ecological functions of soils, and to promote the recovery of secondary forests and limit the dispersion of contaminants from these polluted sites.

9. Reduce deforestation as well as the use of mercury and cyanide in the informal and formal extraction of gold and other minerals, which are sources of very serious pollution throughout the Amazon basin. The aim is to support the signatory states of the Minamata Convention in complying with the ban on the use of mercury by collaborating in the implementation of sustainable alternatives and cleaner technologies that are already available. Efforts should also focus on legislation. Based on scientific diagnosis and data, legal action could be taken at the highest national and international levels to address environmental, health and human rights issues, particularly for indigenous peoples and local communities in territories affected by extractive activities.

10. Set up systems for monitoring human exposure to metal pollutants in impacted regions (disease registers, exposure levels) and increase knowledge of the circulation and chemical transformations of mercury (natural and industrial) in the various components of socio-ecosystems. These monitoring systems need to be standardized throughout the Amazon basin.

11. Strengthen initiatives such as ACTO's Mercury Panorama, which will make it possible to obtain scientific informations on the mercury contamination of sediments and fish and make a well-founded plea to the relevant authorities.

For sustainable cities and regional development

12. Protect and support indigenous peoples and local communities affected by the expansion of the urban frontier accompanied by deforestation and extractive processes. Throughout their history, local populations have ensured the conservation of ecosystems through the sustainable and rational use of forest resources. The aim is to respect and promote people's traditional knowledge as a citizen science. In this way, we can better respond to crisis situations and ensure the continuity in lifestyle choices in the territories. The active and meaningful participation of indigenous peoples is essential in decision-making processes linked to the development and conservation of ecosystems for the benefit of the greatest number of people.

13. Promote and improve mapping to monitor deforestation, forest degradation, carbon emissions and urbanization. This mapping must be based on new remote sensing and artificial intelligence technologies. Efforts to share technologies, images, software and technical capabilities should be stepped up, using free images and free tools wherever possible.

14. Promote the creation of trade networks supported by sustainable and fair markets (fair-trade), integrating Amazonian countries into a cooperative planning and marketing process, serving local, regional and international markets, adding value to the primary product, with incentives to participate in international fairs to disseminate Amazonian bioproducts. The aim is to co-construct new bioeconomy projects in order to generate a sustainable community economy that is not tied to fluctuations in international prices (as is the case for cocoa or coffee) or leading to environmental degradation.

15. Reposition the Amazon in the migratory, economic and political movements of Latin American countries. This implies examining the impact of large land and river infrastructures, non-harmonized conservation measures between the Amazon and other biomes (e.g. agribusiness developments in the Cerrado, caatingas), international markets and imported deforestation on amazonian socio-ecosystems.

16. Develop new strategies for monitoring the urbanisation phenomenon in Amazonia. With over 70% of the population living in urban centres, the urban Amazon and its processes need to be made visible and analysed using geospatial techniques. The aim is to advocate for the rational and controlled densification of cities in order to avoid uncontrolled expansion, facilitate circular economies and promote activities based on ecosystem ser-vices, where the urban metabolism tends to be coupled with the functioning of the Amazon ecosystem (e.g. water cycles), thereby minimizing

environmental pollution. Similarly, it is necessary to implement architectures that are in line with the climatic conditions of the region, avoiding excessive use of energy and taking advantage of the benefits of the forest, such as rainwater and sustainable building materials. This means taking into account local communities' knowledge and perception of these processes.

For sustainable Food Systems, and the Land-Soil link

17. Reconsider the links between food systems and production systems from the perspective of the circular economy and the 'One Health' approach. Urban expansion in Amazonia, where the rural population is now a minority in all the countries of the basin, is multiplying anthropogenic pressures and making it necessary to develop applied research projects combining several objectives, with sustainability as a central theme.

18. Develop research into value chains adapted to the local scale, in order to promote the diversity of food systems. Drawing on traditional knowledge and cultural systems, this research should address the following questions: how to produce better, how to integrate production systems better (e.g. agroforestry), how to process, where to sell?

19. Control the development of aquaculture to avoid ecological degradation throughout the Amazon basin. Research should particularly focus on the production of local species to the detriment of exotic, potentially invasive species. Understanding the life cycles of native species will help maximize ecological processes, and ultimately reduce the use of inputs (first among them fishmeal-based feeds), for more ecological and sustainable production.

20. Conduct innovative research into biological resources for the sustainable management of Amazonian soils. For example, fungi, of which there is a very high diversity in the Amazon, play an important role in soil conservation and the preservation of biodiversity. It is important to conduct research in the subsoil of the biome in order to understand biocomponents, interactive chemical processes and the exchange of information between roots, fungi and bacteria («biointernet» or «interactive biorede») between plants, their roots and other biological components, because knowledge of biodiversity goes beyond what is visible to the eye.

For climate, water and a land-sea gradient

21. Valorise existing data by mapping all the work done in the Amazon in these fields and improve the visibility of observatories and databases (HYBAM, ORA, mangrove observatories, SEARS stations, Hydroweb etc.), by advocating the need for long-term environmental and climate observations. The aim is to make these databases available to the scientific community and to decision-makers in order to improve knowledge of the current and future functioning of the hydroclimatic and oceanic system that is the Amazon, and to use the data and modelling derived from these data for better long-term management of the region.

22. Step up efforts to collect in situ and satellite data, set up databases (FAIR practices) and model water, climate, sediment dynamics and nutrient/contaminant transport. The aim is to reaffirm the importance of multidisciplinary work on feedbacks between deforestation, climate and socio-environmental dynamics, changes in flow rates and sediment transport, and the impact on the biogeochemistry of the Atlantic Ocean and primary production.

23. Use the data from the AMAZOMIX campaign (current, medium and long term), which in 2021 involved a multidisciplinary team of researchers to explore the mouth of the Ama-zon in order to study the impacts of currents, the Amazon plume and turbulent pro-cesses, and work on the themes of land-sea interfaces and create environmental indicators for resource conservation.

24. Work on the enhancement and the preservation of flood zones and mangroves, which play an important role in storing carbon, regulating flooding and preserving biotic and abiotic resources.

25. Promote the practical implementation of scientific, expertise and training projects of regional interest, linking technological innovation to water resource management, in order to better reconcile scientific research and the implementation of public policies.

CONCLUSION

We, the participants of the Manaus workshop, affirm that protecting the Amazon requires a systemic approach, from local to global, and a collective and inclusive commitment. We need to develop research that meets the needs of local populations in their territories. To achieve this, it is essential to identify and intensify the interfaces for dialogue with societies, so as to gain a better understanding of the issues and research aimed at sustainability. Many solutions already exist. We need political will as well as multi-institutional and inclusive collaboration to implement these solutions and to ensure that traditional communities co-create and appropriate scientific results. At the same time, we need to support new scientific fronts that will be useful for developing the 25 proposed actions. It is also necessary to develop new research on Amazonian socio-environments in a multi-stakeholder and interdisciplinary approach, and to strengthen interactions with ACTO in particular. Dialogue and advocacy with decision-makers is the responsibility of scientists and civil society players for a sustainable and inclusive Amazon, which is vital for the planet's equilibrium and the achievement of the SDGs in an agenda increasingly shaken by the climate emergency.

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