

## The multiple viewpoints for the Amazon: geographic limits and meanings

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**Introduction** The geographic term “Amazon” describes several distinct but overlapping hydrological, geological, biological, and geopolitical entities located in northern South America (Albert et al. 2018) (**Figure 1**). It is therefore useful to distinguish the Amazon as a drainage basin, a sedimentary basin, a biodiversity province, and a geopolitical unit.

**The Amazon drainage basin** is the largest watershed (i.e., catchment) on Earth, extending over c. 40% of the South American continent. The hydrological area of the Amazon basin covers about **7.3 million km<sup>2</sup>**, including about 6.3 million km<sup>2</sup> in the Amazon *sensu stricto* and about 990,000 km<sup>2</sup> in the Tocantins-Araguaia drainage and estuarine coastal areas. It should be noted that the modern transcontinental Amazon River, connecting the Andes with the Atlantic, formed in the Late Miocene epoch ca. 10 million years ago (Figueiredo et al. 2009). Before that time Amazonia was hydrologically connected to the Magdalena and Orinoco drainage basins in what is now Colombia and Venezuela, constituting a region denominated **Pan-Amazonia** (Hoorn et al. 2010).

**The Amazon sedimentary basin** is a geological depression of about 500,000 km<sup>2</sup> that lies between the Brazilian and Guiana Shields to the south and north respectively, and between the Purús and Gurupá structural arches to the west and east respectively.

**The Amazon biogeographic province** is a vast and ecologically heterogeneous region that extends over about 5,800,000 km<sup>2</sup>, with margins that roughly coincide with the Amazon Rainforest, the largest contiguous region of moist, tropical forests on Earth. Thus, unlike the Amazon drainage basin, the Amazon biogeographic province encompasses extensive areas of forest in the Guiana Shield - including much of Amapá, French Guiana, Guyana, and Suriname that drains directly into the Atlantic, and much of forested southern Venezuela and eastern Colombia that drains into the Orinoco River. The Amazon biogeographic province also includes the forested eastern flanks of the northern and central Andes from Colombia to Bolivia, seasonally-inundated floodplains and wetlands, and seasonally-burned savannahs of the Guiana and Brazilian uplands.

In Brazilian literature, the term ‘**Amazon biome**’ (Bioma Amazonia) is used as a synonym of the Amazon biogeographic province. However, in international scientific literature the term ‘biome’ is used more broadly to indicate climatic zones with similar vegetation formations in different parts of the world (e.g., Olson et al. 2001), such that Amazonia is only one regional expression of the global concept of the “tropical rainforest biome”.

When considering most biogeochemical cycles of the Amazon region as a whole, for example the forest carbon cycle, studies tend to focus on the entire lowland rainforest, i.e., an area equivalent to the Amazon biogeographical province, not the Amazon drainage basin, thus excluding non-lowland forest biomes such as the Planalto and the Andean montane regions. In contrast, hydrological studies tend to focus on the entire watershed. Following Eva et al (2005) the five **Ecological regions** of Amazonia *sensu latissimo* (i.e., the whole Amazon-Tocantins watershed plus adjoining lowland forest regions) are Amazon basin lowland forests (5,569,170 km<sup>2</sup>), Guyana lowland forests (970,160 km<sup>2</sup>), Gurupi lowland forests (161,460 km<sup>2</sup>), non-forest

Amazon watershed in the Planalto (864,950 km<sup>2</sup>), and montane Andes in the Amazon watershed (555,560 km<sup>2</sup>). The narrowest definition (lowland forest within the Amazon basin) is also referred to as Amazonia *sensu stricto*, while ter Steege et al. (2015, 2020) used the term Amazonia for all Amazon Lowland Forest (< 500 m), which also includes the forests of the Guianas, and amounts to roughly 5,790,000 km<sup>2</sup>.

Regarding the administrative and political boundaries, the **Pan-Amazonia** covers eight countries, including Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela, and the overseas department of French Guiana where the Amazon forest occupies their territories.

Amazonia, however, goes far beyond the natural areas described above, as a place packed with **historical and cultural meanings** that transcend physical boundaries. Amazonia has multiple perceptions in different communities that transcend any one region; its national borders are artifacts of colonial histories, geopolitical scrambles, and hegemonic land grabs. Its ethnicities and linguistic groups do not adhere to one set of ecological formations or any single way of understanding the world.

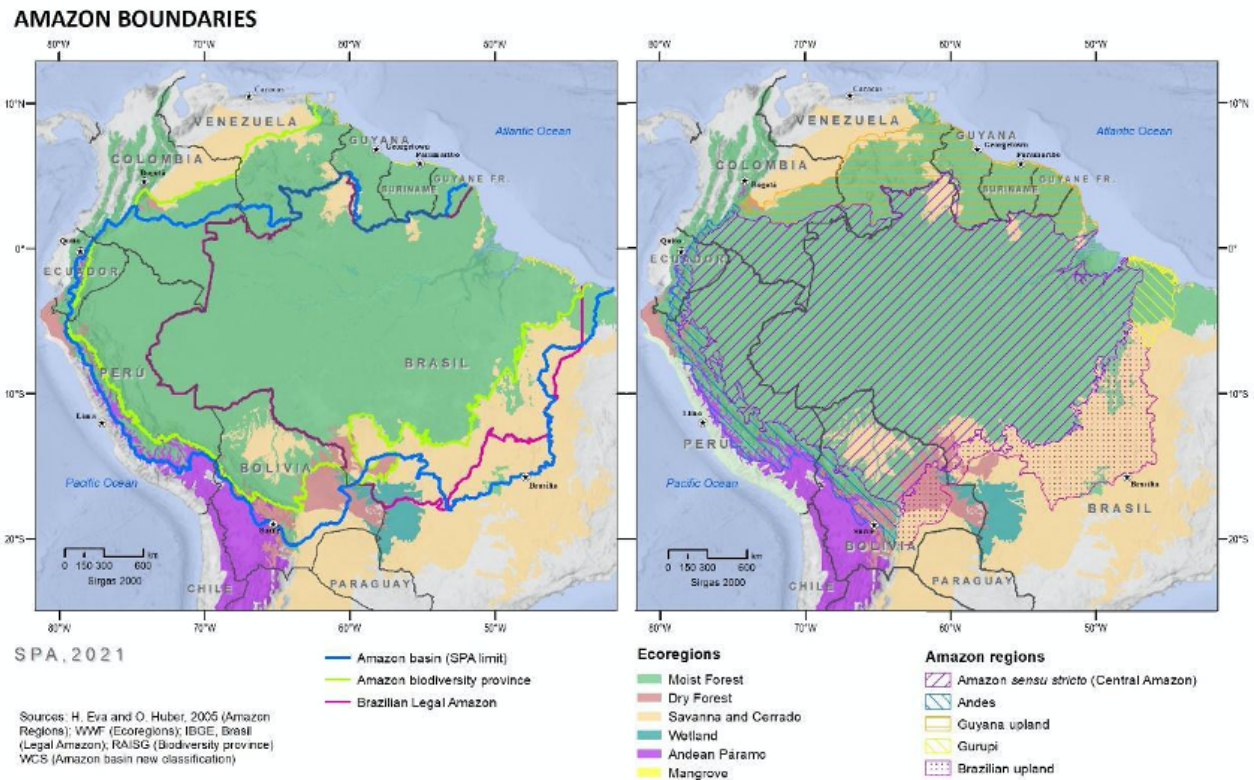
The Chapters of this Report walk through these different geographic boundaries and meanings for the Amazon (**Table 1**) according to the availability of information, the temporal and spatial scale of the studies, and the nature of the questions being asked from different disciplines. For example, while the analysis of ecological or hydrological connectivity is better approached from a regional, transboundary point of view, the analysis of the political and economic drivers of land-use change cannot be completed without considering the influence of local, regional, and national dynamics imposed by geopolitical limits, as well territorial dynamics of Amazonian traditional peoples. Similarly, the scope of solutions and alternatives to the multiple threats that the Amazon is experiencing, will necessarily encompass *in-situ* approaches that can effectively support or improve the living conditions of local families, carefully supported by coherent regional and national policies. Within this heterogeneity of scales and points of view, the Science Panel for the Amazon adopts as a general scope of the study the boundary of Amazon drainage basins, which includes Tocantins-Araguaia and the Western Northeast Atlantic basins. Despite covering different ecosystems characteristic of the ecotones in the Amazon and Cerrado transition, this boundary includes the most part of Legal Brazilian classification, which has particular legislation and rules for land-use change in both public and private lands. This is also important for the socio-economic and political analysis carried out under the Panel.

**Table 1.** Limits and definitions used to delimit the Amazon. The second definition is used in this report.

<b>Region</b>	<b>Definition</b>
The Amazon drainage basin ( <i>sensu stricto</i> )	The largest watershed (i.e., catchment) on Earth, extending over c. 40% of the South American continent.
Amazon Basin River drainage <i>sensu lato</i> (SPA)	Same as above, plus the Tocantins-Araguaia drainage basin, which enters the Atlantic Ocean while only partially joining the Amazon River and estuarine coastal areas.
Amazon sedimentary basin	Geological depression of about 500,000 km <sup>2</sup> that lies between the Brazilian and Guiana Shields, and between the Purús and Gurupá structural arches.
Amazon biogeographic province	Margins roughly coinciding with the Amazon Rainforest ecoregion, the largest contiguous region of moist, tropical forests on Earth. Unlike the Amazon drainage basin, the Amazon biogeographic province encompasses forested areas of the Guiana Shield (Amapá, French Guiana, Guyana, Suriname, southern Venezuela, eastern Colombia), and excludes the seasonally-dry forests of the Cerrado.
Amazon lowland forests	Amazon in the narrowest definition, the lowland forest within the Amazon basin.
Amazonia <i>sensu stricto</i>	
Amazon ‘biome’ (Bioma Amazonica)	Synonym of the Amazon biogeographic province. In international scientific literature, the term ‘biome’ is used more broadly to apply to all examples of similar vegetation formations in different parts of the world (e.g., Olson et al. 2001) so that Amazonia is only one regional expression of the global concept of the “tropical rainforest biome”.
Amazon forests: Amazonia <i>sensu latissimo</i>	Amazon in a general sense, including lowland forests (5,569,170 km <sup>2</sup> ), Guyana lowland forests (970,160 km <sup>2</sup> ), Gurupi lowland forests (161,460 km <sup>2</sup> ), dry-forest Amazon watershed in the Planalto (864,950 km <sup>2</sup> ), and montane cloud forest Andes within the Amazon watershed (555,560 km <sup>2</sup> ).
Amazonian administrative and political boundaries	Amazon covers eight countries, including Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela, and the overseas department of French Guiana where the Amazon forest occupies their territories.
Pan-Amazonia: landscape evolution unit	Paleogeographic landscape of the Early and Middle Miocene Epoch (c. 22 - 10 Ma) that was a main arena of Amazonian evolution. Includes areas of the modern Amazon, Essequibo, Magdalena and Orinoco drainage basins.
Pan-Amazon: political-administrative units	Countries with Amazon forest within their national territory: Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela.
Brazilian Legal Amazon	Largest socio-geographic division in Brazil, containing all nine states in the Amazon basin: Acre, Amazonas, Amapá, Maranhão (just west of the 44° Meridian), Mato Grosso, Pará,

	Rondônia, Roraima, Tocantins), with a human population around 29 million people including more than 300,000 indigenous people belonging to more than 170 ethnicities.
Amazon: Historical and cultural meanings	Multiple psychological and cultural concepts that often transcend geographic boundaries, generally perceiving national borders as artifacts of colonial histories and hegemonic land grabs.

**Figure 1.** The geographic term “Amazon” describes several distinct but overlapping hydrological, geological, biological, and political entities located in northern South America (Albert et al. 2018). **A.** The Amazon may be viewed as a drainage basin (area with a blue margin), a sedimentary basin (not delineated here), a biogeographical province (green area), and a geopolitical boundary (pink margin). **B.** The five ecological regions of Amazonia *sensu latissimo* accordingly to Eva et al. (2005).



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