Introduction: Water and the Anthropocene in Latin America from 1950 to the Present

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Since 1950, water availability and use have been critically affected by three major socio-economic processes: the production and export of raw materials, industrialization, and urbanization. While the specialization of the countries of Latin America and the Caribbean as suppliers of raw materials for the international market began during the colonial period and was later reinforced during the formation of national states in the nineteenth century, industrialization and urbanization (which are connected) are predominantly phenomena from the period post-1950 and a part of the Great Acceleration of the Anthropocene. The Great Acceleration refers to an exponential increase in economic activity and resource consumption that explains the great anthropogenic transformations alluded to in the Anthropocene concept (Waters et al. 2016). In Latin America, this acceleration is expressed in the growth of the population and its purchasing power and consumption levels, as well as in the exploitation of raw materials needed to feed a growing industrialization and/or increase in exports, and in so doing, strengthen the foreign exchange reserves of the states. Across the region, the Great Acceleration has meant an increase in water consumption and pollution, thus pressuring the physical limits of the quality and quantity of that resource (Castro 2016; Ruckert et al. 2021).

Although the region shows declining population growth rates (mainly due to declining fertility), the population of Latin America and the Caribbean increased three times (292 percent) between 1950 and 2022, from 168.3 million to 660.3 million inhabitants (Economic Commission for Latin America and the Caribbean [ECLAC] 2022). While the countries of the region already have high levels of poverty and inequality indices among the highest in the world, the anthropic pressures from this slower population growth will be compounded by the growth of the economy and the population's consumption power. According to World Bank data (n.d.), the region's GDP grew seven times (715 percent) between 1960 and 2023, from USD 732 billion to USD 5.97 trillion. GDP per capita during the same period increased by 169 percent, from USD 3,344.80 in 1960 to USD 8,992.30 in 2023.

As in previous periods, the production of raw materials has been oriented not only to domestic consumption but also to exports. While the demand for agricultural

products for domestic consumption has increased along with the population and its level of consumption, the region's international trade continues to be dominated by the export of raw materials and the import of manufactured goods, suffering the respective ecological consequences (Gudynas 2015; Torres et al. 2022). According to World Bank data (ibid.), agricultural production in the region as a whole increased from USD 78.82 billion in 1965 to USD 335.14 billion in 2023, representing a 325 percent growth. For its part, mineral extraction (metalliferous and non-metalliferous) increased five times (503 percent) between 1970 and 2017, from 659 to 3,972 million tons (Bárcena 2018), generating strong ecological pressures and social conflicts, with special emphasis on water availability.

In terms of economic activities, one of the main novelties of this period has been the development and growth of manufacturing production driven by the import substitution industrialization model that is mostly oriented to domestic consumption (Furtado 1993). With significant variations among countries, this model was in force between the 1940s and 1990s. Since the 1990s, both the economic policies that liberalized and deregulated the market and the neo-developmentalist policies that followed in some countries have not been favorable to industrial development. Despite this, according to 2022 data, the manufacturing industry's share in the region's GDP (13.9 percent) is higher than the share of the agricultural and mining sectors combined (6 percent and 5 percent, respectively) (ECLAC 2023). Over the entire period, the region's industrial production grew four times, from USD 207,320 in 1965 to USD 984,540 million in 2023 (World Bank n.d.).

If the growth of the urban population is one of the most distinctive features of the Great Acceleration at the global level, this is particularly noticeable in the case of Latin America and the Caribbean, where this population has increased extremely rapidly since 1950, reaching levels of urbanization only comparable, from an interregional point of view, with those of North America. Between 1950 and 2010, the region's urban population grew from 69 to 469 million people, and its share of the total population increased from 41 percent in 1950 to 80 percent in 2010 (ECLAC 2012). Along with urbanization, metropolitan areas grew. Between 1950 and 2010, the number of cities with 1 million inhabitants or more grew from eight to fifty-six. However, there is significant variation among countries in the region. While some of them had reached, at 2010 values, urbanization rates higher than 85 percent (Argentina, Chile, Uruguay, Brazil, and Venezuela), in other countries, the percentage of urban population remains below 60 percent (Costa Rica, Honduras, Nicaragua, Paraguay, Guatemala and Haiti).

According to ECLAC data (2012), urbanization levels are positively associated with those of economic and social development: the higher the level of urbanization, the higher the human development index (HDI) and gross domestic product (GDP) per capita. In ecological terms, this implies that despite the alarming levels of poverty and social inequality in Latin American and Caribbean cities, the urban

population demands and consumes more natural resources than the rural population.

In addition to the demands on water from industrial, agricultural, and mining activities (which have increased considerably during the post-1950 period), growing urbanization adds its own demands. In fact, some authors consider urbanization as an "accelerator" of the processes that characterize the Anthropocene (Elmqvist et al. 2021). This is due to several reasons (CEPAL 2012; Intergovernmental Panel on Climate Change [IPCC] 2022; United Nations Development Programme [UNDP] 2022). First, urbanization inherently entails a significant degree of artificialization of the environment, which creates greater ecological pressures on the territory where cities are established, depending on their density and dispersion. Second, the ecological effects of urbanization are not limited to the occupied territory or its surroundings but reach to more distant ecosystems from which most of the resources for urban life are obtained. Third, the lifestyles and higher incomes of the urban population are associated with patterns of production, consumption, and waste generation that are more burdensome to the environment. Finally, urbanization is a prominent cause of climate change, mainly due to increased greenhouse gas emissions associated with activities in and for cities.

In Latin America and the Caribbean, where planetary imbalances interact with social inequalities, rapid and unplanned urban development further increases pressure on natural systems. The most socially vulnerable populations tend to settle in environmentally fragile or high-risk areas, such as slopes and flood plains, affecting not only these environments but also human health, as these are areas without basic services such as drinking water, sanitation, or waste collection (Santos 1993; UNDP 2022). In addition, the most vulnerable urban populations are also more exposed to the effects of climate change. Nowhere is the interdependence between ecological vulnerability and social vulnerability more evident (IPCC 2022): manifestations of climate change, such as extreme heat waves, disproportionately affect human health, livelihoods, and health infrastructure (water, sanitation, energy, and transport systems) in informal urban settlements.

In addition to the above, urbanization is closely linked to natural disasters, which have increasingly dominated political, academic, and media agendas due to several factors, including the increasing frequency of such events, their possible connections with global environmental changes, and the significant role of human actions, both deliberate and unintentional, in exacerbating these disasters (ECLAC 2012). Besides, there has been growing frustration with the human inability to control these phenomena despite technological and scientific advances, which contributes to a sense of resignation, as reflected in the theories of the risk society (Beck 2002). The relationship between urbanization and disasters is complex. On the one hand, urbanization amplifies the weight of the "human factor" in disasters through the artificialization of the environment and unsustainable patterns of production

and consumption, which increases the likelihood that ecological imbalances, both global and local, will lead to disasters. In addition, urbanization intensifies the impact of such events by exposing larger populations and assets to their effects. On the other hand, urban areas facilitate more effective disaster mitigation with early warning systems and rapid response measures (ECLAC 2012).

In summary, as the chapters in this volume will show, the growth of urbanization, industrialization, and dependence on the extraction of raw materials has entailed – during this period in the context of climate change – the growing and excessive use of water, leading to what some refer to as a "water crisis," despite the fact that this is the region of the world with the highest per capita availability of freshwater (Fernández Colón 2009). This crisis is manifested in the reduction of river flows, the loss of lakes and wetlands, the decrease in groundwater levels, and the contamination of the resource in all its sources. Climate change has exacerbated this crisis, impacting human health, livelihoods, and essential infrastructure (IPCC 2022). As the chapters in this volume will further show, the excessive use and persistent contamination of water pose challenges to universalizing access to drinking water and basic sanitation. At the same time, the predominant water management models and practices in the region are inefficient or insufficient to achieve a sustainable use that, among other things, would guarantee universal access to water and sanitation services and allow better adaptation to recurrent droughts and floods and natural disasters (ECLAC 2012; Castro 2016,). Despite international and national declarations of the human right to water (Castro 2016), universal access to water, marked by deep social inequalities, remains an unresolved task throughout the region. This scenario may worsen if the major transformations in the biochemical processes and physical limits of the planet that are typical of the Great Acceleration become accentuated.

Translated by Eric Rummelhoff and revised by Luisa Raquel Ellermeier.

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