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Abstract

The expansion of modern societies disrupted the structure and function of most ecosystems. This trend is alarming because the persistence of human activities (e.g., economy) depends on biodiversity and ecosystem services. A central question is whether modern nations will respond appropriately to protect, restore, and maintain ecosystems. In particular, it is uncertain if underdeveloped and developing (UD-D) countries have sufficient political direction to make good decisions, since they are weak or consolidating democracies, where bad political behavior is common. These countries face persistent socioeconomic problems (e.g., poverty, opportunity, basic services), and environmental issues have no priority. However, many of these nations are located in tropical latitudes, so they are hyperdiverse and provide ecosystem services with global relevance. In this opinion article, I present a brief analysis of the context (political, social, and environmental) shared by UD-D countries, to investigate how these nations have responded to the need of socioeconomic development and the ongoing loss of natural capital. I put some emphasis on my country, Brazil, to exemplify a context dominated by weak governance, socioeconomic problems, high biodiversity, and the loss of ecosystems. I argue that authorities and political systems in UD-D nations are vulnerable to weak governance and wrong decisions; bad political behavior leads to failed policies, and the persistence of social problems leads to the destruction of ecosystems. Social progress and sustainability will require political commitment, financial resources, long-term planning, and correct policies—something that UD-D countries may not achieve on their own.

Keywords

biodiversity, economy, ecosystem services, governance, sustainability

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Introduction

We are facing the first global environmental crisis since the emergence of Western civilization. The rise and expansion of modern agroindustrial societies modified the functioning of every ecosystem on the planet. Human activities caused extensive changes to vegetation cover, hydrological regimes, biogeochemical cycles and atmosphere composition, enhancing contamination, overexploitation, species invasions and many other disturbances (Chapin et al., 2000; Vitousek, Mooney, Lubchenco, & Melillo, 1997). Parallel, we witnessed the progressive erosion of biodiversity, a process that elicited a period of mass extinction (Ceballos et al., 2015)—the first caused by one species. Many cataclysms have convulsed the planet in the past, but humans have caused colossal changes on a scale of centuries or

decades, leading many ecosystems to degradation or total collapse. It has modified the provision of essential and irreplaceable ecosystem services (e.g., water and soil production, climate regulation), jeopardizing the persistence of human activities (Mooney, 2010). The great challenge of present times is to find a balance between human needs and environmental limits, since the current

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environmental crisis is related to the production of wealth and resources for human societies (Burger et al., 2013; Ehrenfeld, 2005).

A central question is whether modern nations will respond appropriately to protect, restore, and maintain ecosystems and their services. This response may demand changes in societal values and behavior (bottom-up control), or the establishment of adequate policies (top-down control). Changing values is the most effective way to implement new behavioral standards and to achieve a more balanced relationship between human development and environmental limits (Fischer et al., 2012). However, to produce effects, it will require time (human generations) and correct educational effort (Pyke, 2017), conflicting with the pressing need for immediate action. The establishment of adequate policies, on the other hand, may have immediate effects, reducing risks and increasing socioeconomic sustainability. It is uncertain, however, if nations have or will have sufficient political direction to make good decisions, mainly because biodiversity losses (e.g., Butchart et al., 2010) suggest that authorities pay little or no attention to the problem. In fact, modern nations have historically set policies that boost production, income, and consumption, with little concern about long-term sustainability. A key point is the behavior of underdeveloped and developing countries (UD-D hereafter), since they are weak or consolidating democracies, where socioeconomic problems are ubiquitous (e.g., poverty, opportunity, income, education, health, security), and environmental issues have no priority. However, many of these nations are located in tropical latitudes, so they are hyperdiverse (Barlow et al., 2018; Brooks et al., 2006), home to the largest remnants of tropical forests (e.g., Amazon, Tropical Africa, Southeast Asia) and freshwater resources (e.g., Amazon, Nile, Congo, Indo and Mekong rivers). They provide essential ecosystem services with global relevance (Costanza et al., 2017; Larsen, Turner, & Brooks, 2012), indicating that inadequate policies will have far-reaching implications. In this sense, the behavior of UD-D countries will affect more and more the persistence of human activities on a global scale (Wallington & Cai, 2017).

In this opinion article, I present a brief analysis of the context (political, social, and environmental) shared by UD-D countries, to explain that policymakers, authorities, and political systems are not prepared to respond adequately to the ongoing environmental crisis. These countries are vulnerable to weak governance and bad decisions, where poverty, inequality, and economic instability are severe and unsolved. Bad political behavior leads to failed policies, and the persistence of social problems leads to the destruction of ecosystems (Figure 1). I put some emphasis on my country, Brazil, to exemplify a context dominated by weak governance,

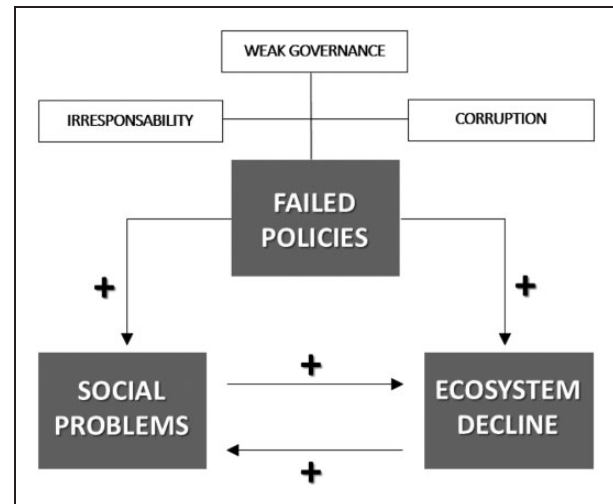


Figure 1. Conceptual model illustrating the interaction between policies, social problems, and the decline of ecosystems. Bad political behavior (weak governance, irresponsibility and corruption) is a regular component of the political system and a major cause behind failed policies. The symbol “+” indicates positive effects.

socioeconomic problems, high biodiversity, and the loss of natural capital. My intent is to reveal what to expect from these hyperdiverse countries in a moment of increasing environmental constraints.

Bad Political Behavior

Although democratic values are not spontaneous and universal, scientific evidence indicates that longer democratic experience increase people’s support to this regime (Fuchs-Schündeln & Schündeln, 2015). In addition, democracy is the model in which political power is shared among people, increasing responsibility over public decisions and the use of financial and natural resources. In modern society, however, democracy is heterogeneous. UD-D nations range between full democracies and authoritarian regimes but most are labeled as flawed democracies, authoritarian, or hybrids (The Economist Intelligence Unit, 2018). Democratic regimes in most UD-D nations are relatively recent (19th and 20th centuries); these countries share history of colonialism, independence, and democratization, with eventual intromission of dictatorships, revolutions, and undemocratic fashions. One important aspect is that many of these nations have low standards of governance. UD-D countries have material, educational, structural, and organizational deficiencies (e.g., economic resources, weak institutions, heavy bureaucracy) that negatively affect development and governance, impeding the maturation of democracies. Bad political behavior is widespread among political authorities and associated

staff, leading to weak policies that provide little social benefits (e.g., Azam & Emirullah, 2014; Balán, 2014; Flyvbjerg, 2009; Ribeiro, Alves, Martins, & Lenzi, 2018; Figure 1). Inequality in the distribution of wealth, power, and opportunities is a common feature (e.g., Altimir, 2001; Baliscan, Edillon, & Piza, 2005; Beegle, Christiaensen, Dabalen, & Gaddis, 2016; Vakis, Rigolini, & Lucchetti, 2015), leading to chronic problems of infrastructure, income, security, health, transportation, and education—to name a few.

Bad political behavior involves a diversity of conducts based on (i) weak governance, (ii) irresponsibility, and (iii) corruption (Table 1). The loss of financial resources and investments is routine, in the form of inadequate planning, irrelevant and unfinished projects, costs overrun, overprices, and actions that generate little social benefit (e.g., Flyvbjerg, 2009). Accountability is limited, and administrative mechanisms have difficulty to make authorities responsible for bad actions (Aranha, 2017). Surveillance is also weak, and politicians remain distant from public perusal (e.g., Wilson, 2000); they may do little or nothing during a whole mandate. Moreover, it is very common, if not the rule, that political effort is directed toward private interests, groups (e.g., political parties), or sectors (e.g., corporations). One important aspect is that authorities have control over the public budget. Access to financial resources and limited accountability has led to corruption, entrenched as the *modus operandi* of governance, institutionalized in different forms (e.g., da Silva, 1999; Ribeiro et al., 2018).

Table 1. Main Attributes Behind the Bad Political Behavior in Underdeveloped and Developing Nations.

Attribute	Description
Weak governance	Actions with low relevance for social development or with negative impact on the sustainability of economy and ecosystems. They appear in the form of development projects, investments, and legislation. It commonly involves incompetence and political influence on technical issues, implying the loss of financial resources and natural capital.
Irresponsibility	Negligent administration supported by limited accountability. The politician rarely responds (administratively or judicially) for negative consequences that arise from weak governance and corruption; losses are imputed to society. It allows the perpetuation of bad practices.
Corruption	Illegal appropriation of public resources or misuse of political power to gain advantages. It is common practice during mandates, but it also appears as a strategy to finance electoral campaigns.

Another important aspect is that political offices per se are very attractive, since they grant high salaries, economic supplements, special services, and privileges. Consequently, the struggle for power is strong, involving heavy investments on marketing (millions of dollars), including bribes and coercion. This strategy has been successful, since populations from UD-D countries are poorly educated, usually unable to evaluate proposals or misconducts. Bad political behavior is a serious hindrance to the development of these democracies, allowing political groups to perpetuate in power, keeping people away from decisions and governance. As a result, bad practices prevail, while relevant social problems remain unsolved (Figure 1).

Even in UD-D nations with full or flawed democracy, political power is widely misused. For example, Brazilian democracy is more mature if compared with many countries from Central America, Africa, and Southeast Asia (The Economist Intelligence Unit, 2018), but its political system is founded in weak standards of governance, irresponsibility, and corruption (e.g., Balán, 2014; da Silva, 1999; Ribeiro et al., 2018). As a result, the provision of public services is precarious or absent (Figure 2), even in the presence of a huge workforce (population 2017: 208 million), a strong economy (GDP 2017: US\$2 trillion) and high tax collection (federal taxes 2017: ca. US\$300 billion). In 2018, Brazil ranked 79th in the Human Development Index of the United Nations (out of 189 countries), while the state of Rio de Janeiro, the second main GDP, suffered a collapse in its health and security systems. Perhaps the best symptom is the demise of public education, considering that only 4% of students completing high school have sufficient skills in reading and mathematics (see portal.inep.gov.br). Therefore,

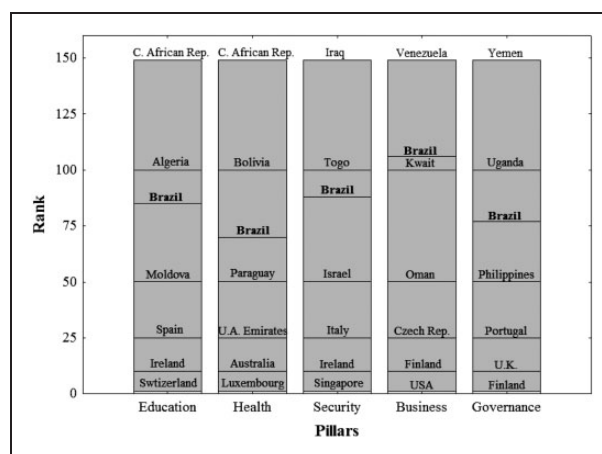


Figure 2. Position of Brazil and other countries in the ranking of the Legatum Prosperity Index, which evaluated pillars of socioeconomic development of 149 countries (Legatum Institute, 2018). The figure also shows the position of the 1st, 10th, 25th, 50th, 100th, and 149th country.

even in the presence of good indicators of democracy (e.g., solid institutions, equality before justice, right to vote, regular elections), a long history of bad political behavior has hindered progress in health, education, security, and infrastructure (Figure 2). The situation is far worse in countries with lower GDP or unstable regimes (e.g., Angola, Ruanda, Somalia, Democratic Republic of Congo, Haiti, Nicaragua, Venezuela, Cambodia, Laos), because resources and opportunities are limited, and democratic controls are weak or absent. Political instability and violent disputes cause social disruptions and aggravate the inequality in the distribution of wealth and power, leading to chronic problems in security, health, education, and income, as commonly observed in many countries from Africa, Middle East, and Asia. It is worth noting these countries rank low on democracy index lists (e.g., The Economist Intelligence Unit, 2018), where bad political behavior is institutionalized.

Failed Policies, Development, and Sustainability

Social problems remain largely unsolved in UD-D nations, especially because investments are limited, plans are inadequate, and political interests prevail. Consequently, social development is meager and nations perform poorly on a range of social pillars (e.g., Legatum Institute, 2018). As essential services remain poor, policies focus on economic development—in the belief that economy alone will solve the rest. The legislative and executive spheres prioritize specific legislation and financial investment to promote short-term economic growth, with the purpose of maintaining production, income, and consumption. Economy is indeed a foundation of social welfare in modern societies, with power to promote development in other sectors (Friedman, 2006). In UD-D countries, economic development can alleviate poverty, improving human well-being in the short term. However, authorities, based on bad political behavior, tend to support questionable actions, which benefit some specific sectors, provide limited social development, or have low sustainability (Figure 1). A central problem is that overemphasis on economy draws attention from issues (e.g., education, health) that demand correct attention, specific actions, and heavy investments. Consequently, policies fail in promoting adequate social development.

As social problems persist and development is tenacious, policies in UD-D countries neglect issues related to the environment, biodiversity, and sustainability. The persistence of serious economic and social problems opens space for policies that foster development at any cost, showing no concern about socioeconomic

sustainability in the long term. Consequences of economic development remain poorly evaluated, underestimated, or even ignored (e.g., Ferreira et al., 2014; Laurance, 2018). Politicians and authorities (society as well) show profound ignorance about the dependence of economic activities on natural ecosystems and biodiversity; little or nothing is known about ecosystem services, their different functions (i.e., support, provision, regulation, and cultural), and their direct connection with biodiversity (e.g., Cardinale et al., 2012; Costanza et al., 2017). Natural ecosystems are viewed as unproductive, especially when they do not generate capital, and the environment commonly appears as a barrier to economic development. The disassociation among environmental, social, and economic dimensions is, in fact, a common misunderstanding among nations of the world. In UD-D nations, poor political behavior plays a central role, because incompetence and negligence lead to harmful policies. Irresponsible behavior and poor accountability cause the loss of financial resources in projects that are poorly designed, irrelevant, or unsustainable. Corruption, in particular, is commonly associated with mega-projects that cause large-scale disturbances. In many countries, policies have continuously encouraged the expansion of agribusiness, energy production, mining, and infrastructure as a strategy to increase GDPs in the short term. It resulted in a tsunami of hydroelectric dams, water diversion, mining leases, roads, monocultures, aquaculture stations, and urbanization (e.g., Barlow et al., 2018; Castello & Macedo, 2015; Laurance, 2018; Laurance & Arrea, 2017; Pelicice et al., 2017; Stone, 2016; Winemiller et al., 2016), which together have disrupted the functioning of terrestrial, freshwater, and marine ecosystems. Consequently, tropical ecosystems and biodiversity consistently declined over the last decades (e.g., Butchart et al., 2010).

Brazil is a good example. Although the country is characterized by extraordinary biodiversity (Lewinsohn & Prado, 2005), it is grounded in strong socioeconomic deficits and weak standards of governance (e.g., Balán, 2014), providing poor social conditions for the population (Figure 2). In the last decades, the need for social development elicited a series of unsustainable actions with the promise of economic prosperity and social welfare (e.g., Bradshaw, Giam, & Sodhi, 2010; Ferreira et al., 2014; Loyola, 2014; Winemiller et al., 2016). Among controversial policies, I mention the production of commodities and protein (agribusiness), cheap energy (hydroelectricity, oil leases), and raw products (mining) (Table 2)—many of which directed to exportation. All these activities expanded consistently across the country (Agostinho, Gomes, Santos, Ortega, & Pelicice, 2016; Ferreira et al., 2014; Lapola et al., 2014; Lima, Oliveira, Giacomini, & Lima Junior, 2016; Martinelli,

Table 2. Indicators of Economic Development in Brazil Over the Last 50 Years.

Sector	Indicator	References
(1) Hydroelectric		
Number of large dams (2007)	>700	Agostinho et al. (2007)
Dams in the Amazon (operating or approved)	416	Winemiller et al. (2016)
Dams in the Amazon (planned)	334	Winemiller et al. (2016)
(2) Agriculture		
Total area (2016)	50,423,830 ha	www.fao.org/faostat
Increase in production (1961–2016)		www.fao.org/faostat
Soybean	35,370%	
Maize	610%	
Sugarcane	1,195%	
Wheat	1,154%	
Increase in inputs		www.fao.org/faostat
Nitrogen (2002–2016)	138%	
Phosphorus (2002–2016)	89%	
Pesticides (1990–2016)	659%	
(3) Inland aquaculture		
Total production (2016)	507,100 tons	FAO (2018)
Increase in production (2004–2014)	9.8% year	Kubitza (2015)
Production of tilapia (2014)	260,000 tons	Kubitza (2015)
(4) Mining		
Number of mines (2013)	8,400	Instituto Brasileiro de Mineração (2015)
Mining companies (2013)	8,870	Instituto Brasileiro de Mineração (2015)
Increase in value (US\$) of production (2000–2013)	487%	Instituto Brasileiro de Mineração (2015)

Naylor, Vitousek, & Moutinho, 2010). Parallel, urban areas have expanded with little planning, where populations are growing together with the demand for resources, production of wastes, deforestation, and loss of freshwater resources (Young, 2013). This storm of development policies brought financial returns for specific sectors (e.g., agribusiness, investors, banks) but caused extensive modifications to landscape structure, vegetation cover, and aquatic ecosystems (e.g., Agostinho et al., 2016; Brawn, 2017; Lapola et al., 2014; Martinelli et al., 2010). They reduced vegetation formations and biomes (e.g., Atlantic rainforests, savannas, grasslands, dry forests) to a set of small fragments (Cabral & Brito, 2013). Major rivers are now cascades of dams (e.g., Paraná and São Francisco), where natural flow regimes are deeply changed, and the hydropower potential is close to saturation (Agostinho et al., 2016). The Amazon is a notable exception, but agribusiness, hydropower, and mining activities are expanding fast in the region. Although these activities have precipitate the loss of essential ecosystem services (e.g., biodiversity, water production or purification, nutrient cycling, disease control, climate regulation), they provided negligible social development, considering that Brazil remains ranked low in several social pillars (e.g., Legatum Institute, 2018). Moreover, the loss of ecosystems and biodiversity has progressively impacted economic activities and well-being. They arise from poor sanitation conditions; the spread of diseases and pests; noxious

invasive species; pollution; accumulation of wastes and contaminants; or the loss of extractive and touristic resources, freshwater, and arable land (e.g., Agostinho, Thomaz, & Gomes, 2005; Lima Junior, Magalhães, & Vitule, 2015; Martinelli et al., 2010; Santos, Pinto-Coelho, Fonseca, Simões, & Zanchi, 2018). In addition, the persistence of bad political behavior led the country to the deepest administrative crisis since 1989 (redemocratization), which included the impeachment of the president in 2016, escalating sociopolitical conflicts, and authorities sentenced to prison. It caused significant economic losses (i.e., negative growth in GDP), social disturbances (i.e., unemployment, bankruptcy, inflation, and violence), and policy setbacks (Dobrovolski et al., 2018).

In contrast, authorities commonly disregard appropriate socioenvironmental measures (e.g., ecological restoration, protected areas, long-term planning, legislation, education), indicating that society will bear increasing environmental costs. In fact, Brazil was the worst ranked nation in a global assessment of environmental impacts (Bradshaw et al., 2010). This condition contrasts with the fact that Brazil has the largest system of protected areas in the world (Rylands & Brandon, 2005); however, protected areas are limited (few, small and fragmented; Cabral & Brito, 2013) in almost all regions of the country (see maps in Oliveira et al., 2017), leaving terrestrial and aquatic ecosystems vulnerable to large-scale degradation. Moreover, enforcement

of environmental laws is difficult, and the licensing system is based on poor scientific standards (e.g., environmental impact assessments, EIAs). Environmental agencies suffer from strong political influence and poor administration, creating opportunities for incompetence, poor administration, and corruption. Moreover, pressure from some sectors induced revisions in conservation policies and environmental legislation, for example, Forest Code (Nazareno et al., 2011), downsizing of protected areas (Bernard, Penna, & Araujo, 2014), simplification of the licensing process (Fearnside, 2016), and naturalization of nonnative species (Brito et al., 2018; Pelicice, Vitule, Lima Junior, Orsi, & Agostinho, 2014). There are many other initiatives to revise legislation in favor of unsustainable development (e.g., Di Dario et al., 2015; Ferreira et al., 2014; Loyola, 2014; Meira et al., 2016; Pelicice et al., 2017), indicating significant setbacks in conservation policies. This attitude goes against the Convention on Biological Diversity and the Aichi Biodiversity Targets (e.g., Lima Junior et al., 2018).

Obviously, Brazil is not the worst-case scenario. The situation is far more complicated in weak democracies, authoritarian regimes, or nations at war, where poverty and inequality are severe, development is a pressing need, and authorities are based on low democratic standards. In many poor nations from Africa, Middle East, and Southeast Asia, there is no consideration about the maintenance of ecosystems and sustainability. Because bad political behavior is the norm, and socioeconomic problems are routine, we must expect little initiative toward development policies that follow sustainability principles, or the implementation of effective conservation policies that preserve remnant biodiversity and ecosystems.

A Complex Future

UD-D countries are overpopulated and cope with poverty, inequality, and poor social conditions, problems that affect the well-being of people on a daily basis. Bad political behavior is a relevant force behind this situation, because it proposes policies with little potential to bring societal changes but with disastrous effects on the environment. As long as this condition prevails, social development will not succeed and ecosystems will fall—a vicious circle (Figure 1). Social progress will require political commitment, financial resources, long-term planning, and correct policies—something that UD-D countries may not achieve on their own. Brazil, for example, elected a new president, governors, senators, and deputies in 2018, the first election after the political turmoil initiated in 2016. However, candidates and parties maintain the same old discourse, attitude, ideas, and poor behavior. The new president, for

instance, has consistently claimed that, to launch economy, sustainability and biodiversity conservation will be minor concerns during his mandate. The fact is that UD-D countries, many of which hold extraordinary biodiversity, have limited engagement toward the preservation of ecosystems.

The risk of escalating international conflicts is very high, especially because the maintenance of wealth in rich countries will depend on the fate of poor nations. The need for development and the growing desire for consumption is mounting among UD-D countries. The current flow of migrants (refugees) in different parts of the world is a clear sign that the social collapse of poor nations will affect the well-being of developed nations. The globalization of economy is one important point, especially because some of the world's largest economies, including producers of commodities, are developing countries (e.g., Brazil, China, India). In addition, wealthy nations are main consumers of materials produced in UD-D countries, so they have responsibility over weak policies, that is, encouraging activities that erode biodiversity (Weinzettel, Vačkář, & Medková, 2018). Moreover, the loss of ecosystem services in tropical countries must affect more and more the economy elsewhere. Tropical forests, for example, affect climate dynamics at regional and global scales (Coe et al., 2017); the continued deforestation in South America, Africa, and Southeast Asia, along with the regulation of large rivers, must accelerate climate changes. Climate change, in turn, will affect the geography of economy (Tamirisa, 2008), especially for countries that rely on agribusiness (Cline, 2008). In this manner, the pervasive consequences of bad political behavior in UD-D nations are no longer a domestic problem. Developed countries, for their own sake, should increase their collaboration and responsibility over UD-D countries—something divergent from current policies that defend isolation, closing of borders and nationalism (e.g., Brexit, Trump policies).

Many ancient civilizations were unable to cope with socioeconomic and environmental problems and collapsed (Diamond, 2005). We are now revisiting this complex scenario but on a global scale. The progressive loss of essential ecosystem services (e.g., climate, soil, water, food) has negatively affected social dimensions, with risk of creating unsolvable problems in the near future. Behavioral changes could lead humanity to a better future, but these are difficult to implement. This obstacle increases the responsibility of authorities and policies to make the best choices now, because economic development, a pillar of modern society, may experience significant changes in the next years, and some important sectors may not persist in the long term (e.g., hydropower, agribusiness). UD-D nations will face special difficulties, since these countries demand economic

development, people are poorly educated, resources are limited, and populations are growing—and authorities have traditionally followed weak standards of governance. The prospect is not good, but, if there is something to do, we must look for better policies that combine social, economic, and environmental dimensions.

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