

Environmental Sustainability and Poverty Eradication in Developing Countries

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DEVELOPMENT IN CRISIS: CHANGING THE RULES IN A GLOBAL WORLD

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Abstract

One of the challenges for the 21st century is overcoming widespread poverty in low and middle income economies without jeopardizing the environment. There are three key features of present-day economic development: Most developing economies, and certainly the majority of the populations living within them, depend directly on natural resources; natural resource use and degradation are increasing in much of the developing world; and, much of the rural poor – who are growing in number – are concentrated in ecologically fragile and remote areas. This suggests that natural resource management is not peripheral to economic development but should be the focus of sustainable development policies. For example, targeting the main primary production activities of an economy to improve their competitiveness, attain their export potential, limit resource overexploitation and waste, and generate increase returns and revenues is necessary but not sufficient. The financial returns and funds generated from primary production activities must be reinvested in the industrial activities, infrastructure, health services, education and skills necessary for long-term economic development. In addition, specific policies need to be targeted at the poor where they live, especially the rural poor clustered in fragile environments and remote areas. This will require involving the poor in these areas in payment for ecosystem services, targeting investments directly to the rural poor, reducing their dependence on exploiting environmental resources, and tackling their lack of access to affordable credit, insurance, land, and transport. Finally, the international community must implement new financial mechanisms for channeling assistance to the developing world, such as financial transactions taxes and other innovative instruments.

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Introduction

Land use change in developing countries is critically bound up with their pattern of economic development. Most of these economies, and certainly the majority of the populations living within them, depend directly on natural resources. Primary product exports account for the vast majority of the export earnings of many developing economies, and one or two primary commodities make up the bulk of exports (Barbier 2005, ch. 1). Agricultural value added accounts for an average of 40% of GDP, and nearly 80% of the labor force is engaged in agricultural or resource-based activities (World Bank 2008a). Further adding to these disparities, by 2025, the rural population of the developing world will have increased to almost 3.2 billion, placing increasing pressure on a declining resource base (Population Division of the United Nations 2008).

In developing economies, cropland area has continued to expand at the expense of forest and woodland (Barbier 2011; FAO 2006; Fischer and Heilig 1997; Ramankutty and Foley 1999). In the developing regions of Africa, Asia and Latin America, tropical forests were the primary sources of new agricultural land in the 1980s and 1990s (Gibbs et al. 2010). Almost one-fifth of new crop production in developing countries from 1990 to 2050 is expected to rely on expanding cultivated area, and two-thirds of this new land will come from conversion of forests and wetlands (Fischer and Heilig 1997). In some regions, such as tropical Latin America, livestock grazing is also projected to cause extensive deforestation in the near future (Wassenaar et al. 2007). Although historically such land use changes may have been associated with successful resource-based development, this is less likely for most developing countries today (Barbier

2011). The main reason is that the current process of land use and expansion has two unique structural features.

First, considerable land expansion in ecologically fragile areas is serving mainly as an outlet for the subsistence and near-subsistence needs of the rural poor (Barbier 2005 and 2010). A substantial proportion of the population in low and middle-income countries is concentrated in marginal areas and on ecologically fragile land, such as converted forest frontier areas, poor quality uplands, converted wetlands, and so forth (Comprehensive Assessment of Water Management in Agriculture 2007; World Bank 2003). Households on these lands not only face problems of land degradation and low productivity but also tend to be some of the poorest in the world. Yet, population increases and other economic pressures are driving many of the rural poor to bring yet more marginal land into production (Chen and Ravillion 2007; Population Division of the United Nations 2008). The result is that such marginal land expansion continues to be the main basis for absorbing the growing number of the rural poor in developing economies (Barbier 2011; Carr 2009; Coxhead et al. 2002; Pichón 1997).

Second, marginal land expansion may be an important outlet for the rural poor, but it may not be the main cause of overall land use change in developing countries. Recent evidence suggests that the main agents of tropical deforestation globally are commercially oriented economic activities, such as plantation owners, large-scale farmers, ranchers, timber concerns, and mining operations, assisted by government policies (Boucher et al. 2011; Chomitz et al 2007; DeFries et al. 2010; FAO 2001, 2003 and 2006; Rudel 2007). These activities rely on large-scale capital investments that often result in export-oriented extractive enclaves with little or no forward and backward linkages to the rest of the economy (Barbier 2005 and 2011; Bridge 2008; van der Ploeg 2011). Such development promotes substantial resource conversion,

especially the expansion of the agricultural land base through the conversion of forests, wetlands and other natural habitat, while simultaneously ensuring that developing economies remain highly dependent on the exploitation of natural resources and are unable to diversify.

The purpose of this paper is, first, to explain the economic and poverty implications of these two structural features of resource-based development in low and middle income economies, and second, to suggest policies to change this inimical pattern of development. The interconnection between natural resources and economic development provides an opportunity to design better development policies for poverty eradication. Overcoming the linkages between resource-based development and poverty in poor economies will also require new mechanisms of funding the necessary financial and technical support to help instigate such change.

Resource-based development and poverty in poor economies

Since 1950, the estimated population in developing economies on “fragile lands” has doubled (World Bank 2003). These fragile environments are prone to land degradation, and consist of upland areas, forest systems and drylands that suffer from low agricultural productivity, and areas that present significant constraints for intensive agriculture. Today, nearly 1.3 billion people – almost a fifth of the world’s population – live in such areas in developing regions (Barbier 2011, Table 9.10). Almost half of the people in these fragile environments (631 million) consist of the rural poor, who throughout the developing world outnumber the poor living on favored lands by 2 to 1 (Comprehensive Assessment of Water Management in Agriculture 2007, Table 15.1).

Figure 1 further illustrates that rural poverty is correlated with the fraction of the population in developing countries found on fragile lands. As the figure indicates, for a sample

of 76 developing economies from Africa, Asia and Latin America, the incidence of rural poverty rises with the share of the total population concentrated on fragile lands. Although the average poverty rate across all economies is 45.8%, the rate falls to 36.8% for those countries with less than 20% of their population in fragile environments. For those with more than 50% of their populations in marginal areas, however, the incidence of rural poverty rise to 53% or more.

The tendency for the rural poor to be clustered in the most marginal environments is also supported by studies at the regional and country level, although important differences exist within and between countries. For example, researchers from the World Bank have examined the “poverty-environment nexus” in three of the poorest countries in Southeast Asia – Cambodia, Laos and Vietnam (Dasgupta et al. 2005; Minot and Baulch 2002). In Cambodia, the core poor in rural areas appear to be located in areas that are already heavily deforested; on the other hand, poor populations tend to be more concentrated in the lowlands rather than steeply sloped lands. In Laos, the poorest provinces in the north and northeast also have the highest incidence of poor rural populations. These individuals are located mainly in forested areas and the highlands. In Vietnam, large poor populations confined to steep slopes exist in the provinces comprising the Northern and Central Highlands, but extensive rural poverty is also found along the North Central Coast and the Red River Delta.

The rural poor of developing economies also tend to be located in remote areas, locations with poor market access, requiring five or more hours to reach a market town of 5,000 or more (see Figure 2). Nearly half (49%) of these locations consist of less favored areas, semi and semi-arid regions characterized by frequent moisture stress that limits agricultural production (World Bank 2008b). Across 105 developing countries, the average (median) share of rural population

in remote areas is 31.2% (23.2%), whereas the average (median) share of rural population in poverty is 46.6% (45.0%).

Developing economies with high concentrations of their populations on fragile lands and in remote areas not only display high rates of rural poverty but also are some of the poorest countries in the world today. As indicated in Figure 2, for a sample of 90 low and middle income economies from Africa, Asia and Latin America, real GDP per capita declines sharply with the share of the population in fragile environments. For all economies, the average GDP per capita is \$1,566, but for those economies with less than 20% of their populations on fragile lands, real GDP per capita more than doubles to \$3,326. In contrast, for those economies with 50% or more of the population in fragile lands, GDP per capita is only \$822 and for those economies with 70% or more of the population in marginal rural environments, real GDP per capita is \$671. According to the World Bank (2008a), the low-income, or poorest, economies of the world are those in which 2006 Gross National Income per capita was \$905 or less. Similarly, as Figure 4 indicates, developing economies with a large share of their populations located in remote rural areas tend to be relatively poor. Across 102 countries, the average (median) share of rural population in remote areas is 31.8% (24.5%), and the average (median) share of real GDP per capita is \$1,923 (\$1,011).

The rural poor will continue to be clustered on marginal lands, fragile environments and remote areas, given current global rural population and poverty trends. First, despite rapid global urbanization, the rural population of developing regions continues to grow, albeit at a slower rate in recent years. From 1950 to 1975, annual rural population growth in these regions was 1.8%, and from 1975 to 2007 it was just over 1.0% (Population Division of the United Nations 2008). Second, around three-quarters of the developing world's poor still live in rural areas, even

allowing for the higher cost of living facing the poor in urban areas. In general, about twice as many poor people live in rural than in urban areas in the developing world (Chen and Ravallion 2007).¹

Developing economies that are extremely resource dependent, i.e. with a large share of primary exports to total merchandise exports, also have a higher degree of rural poverty and more of their population living in “fragile” environments. Table 1 confirms this pattern of resource use for 81 developing economies that have at least 20% of their total populations living on fragile lands and grouping them by the degree of resource dependency of the economy, as measured by the share of primary commodities in total merchandise exports. The figure in parentheses by each country also indicates the share of the rural population living below the national rural poverty line.

The pattern across countries is striking. 62 of the 81 developing economies have a primary product export share of 50% or more, and could therefore be considered highly resource dependent. All of these economies also show high incidence of rural poverty; on average, they have a rural poverty rate of 53.4%, and in almost all economies 20% or more of their rural population is poor. Of the remaining 19 countries that have at least 20% of their populations on marginal lands but are less resource dependent (primary product export share \leq 50%), most still have a high incidence of rural poverty. Only five countries, China, Malaysia, Jordan, Sri Lanka and Tunisia, have rural poverty rates less than 20%.

Table 1 also confirms the correlation between the concentration of populations in fragile environments and resource dependency. Over 70% of the 62 highly resource dependent

¹For example, Chen and Ravallion (2007) note that \$1-a-day rural poverty rate of 30% in 2002 is more than double the urban rate, and although 70% of the rural population lives on less than US\$2 a day, the proportion in urban areas is less than half that figure.

economies has at least 30% of their populations located in marginal rural areas. 15 of these economies have at least 50% of their populations concentrated in fragile environments. In contrast, more than half of the 19 less resource dependent economies have 20-30% of their populations living on fragile lands, and only one economy (Swaziland) has 50% or more of its population located in marginal areas.

Resource-dependent developing economies also have a higher share of their rural populations living in remote areas (See Figure 5). This trend is especially notable for economies once primary products' share of total exports exceeds 60% or more. At over 65% of primary product share, developing countries have 15 to 40% of their populations located five or more hours from a market town of 5,000 or more. Economies with over 70% of primary product share have 40 to 70% of the rural population in remote areas, and countries with over 80% of resource-dependent exports have more than 70% of their rural population living in regions with poor market access.

Towards a new resource-based development and poverty eradication strategy

To summarize, a distinct pattern of natural resource use and rural poverty has emerged in developing economies since 1950. Many low and middle-income economies display both a high degree of resource dependency that coincides with the concentration of large segment of the population in fragile environments and in remote areas with poor market access, and rural poverty. Moreover, there appears to be a correlation of this pattern of resource use with poor economic performance: those developing countries that are highly resource dependent and whose populations are concentrated in fragile environments and remote areas tend not only to have high incidence of rural poverty but also are some of the poorest economies in the world.

To eradicate such persistent problems of rural poverty in developing economies will require a structural transformation of resource-based development in many low and middle-income countries. Such a change in development strategy will require two key policy elements.

First, natural resource management must become the central focus of sustainable economic development. New policies must be developed to target the main primary production activities of an economy to improve their competitiveness, attain their export potential, limit resource overexploitation and waste, and generate increase returns and revenues. The financial returns and funds generated from primary production activities must in turn be reinvested in the industrial activities, infrastructure, health services, education and skills necessary for long-term economic development.

However, designing and implementing policies for more efficient and sustainable resource-based development is necessary but not sufficient. In addition, specific policies need to be targeted at the poor where they live, especially the rural poor clustered in fragile and remote areas. This will require direct financing, such as through involving the poor in payment for ecosystem services schemes and other measures that enhance the environments on which the poor depend, targeting investments directly to improving the livelihoods of the rural poor, thus reducing their dependence on exploiting environmental resources, and tackling the lack of access of the rural poor in less favored areas to well-functioning and affordable markets for credit, insurance and land, and the high transportation and transaction costs that prohibit the poorest households in remote areas to engage in off-farm employment.

Policies for more efficient and sustainable resource-based development

Since 1950, few low and middle income economies with abundant endowments of land, mineral and fossil fuel resources have achieved successful resource-based development (Barbier 2005 and 2011; van der Ploeg 2011). For example, Gylfason (2001) has examined the long-run growth performance of 85 resource-rich developing economies since 1965. Only Botswana, Malaysia and Thailand managed to achieve a long-term investment rate exceeding 25% of GDP and long-run average annual growth rates exceeding 4%, which is a performance comparable to that of high income economies. Malaysia and Thailand have also managed successfully to diversify their economies through re-investing the financial gains from primary production for export. Botswana has yet to diversify its economy significantly but has developed favorable institutions and policies for managing its natural wealth and primary production for extensive economy-wide benefits.

In addition, there are signs that four large emerging market economies, Brazil, China, India and Russia – the "BRIC" economies - are beginning to reap economy-wide benefits from exploiting their vast sources of land and natural resources, as well as through instigating economic reforms and growth-promoting policies. But these economies are unusual compared to most developing countries because of the sheer scale of their populations, economies and resource endowments. Although the economic growth performance of the BRIC countries over the past two decades have been impressive, it is unclear how much of this recent economic development is the result of successful and sustainable management of their large natural resource endowments, or simply due to the having such large endowments to command for economic development (Barbier 2011). All four countries have expanded the production and consumption of their strategically important mineral endowments as their economies have

grown. Russia and China have also made extensive use of their domestic fossil fuel resources, too, to promote energy-intensive industrialization. Brazil has engaged in extensive frontier agricultural land expansion, and along with China and India, has harnessed its freshwater resources for agricultural, industrial and hydroelectric uses. Overall, it appears that the successful resource-based development of the BRIC economies has more in common with the type of development pursued by the resource abundant and populous United States during its long phase of economic boom from the late 19th century onwards than with the typically smaller resource-rich developing economies (Barbier 2011).

In sum, although there have been few examples of a successful resource-based development strategy for many developing economies perhaps as a guide to such a strategy, policymakers should look to the three successful, resource-rich small open economies identified by Gylfason (2001) – Botswana, Malaysia and Thailand. Although these countries still face problems in managing their natural resources and overcoming dualism and poverty, several lessons for improving the sustainability of other small resource-dependent developing economies can still be learned from these three country examples.²

First, the type of natural resource endowment and primary production activities is not necessarily an obstacle to implementing a successful strategy. Botswana's economy is largely dependent on minerals, Thailand started out as almost exclusively an agricultural-based food exporter and Malaysia built its success first on mineral and timber reserves, then plantation tree crops, and finally, by developing a highly diversified economy. All three countries are testament to the fact that neither the abundance of natural resources nor the type of resources exploited for

² For further discussion of the long-run natural resource management and development strategies of Botswana, Malaysia and Thailand, see in particular Barbier (2005 and 2011), Coxhead and Jayasuriya (2003), Iimi (2007), Lange and Wright (2004), Sarraf and Jiwaji (2001) and Vincent et al (1997).

primary production are inherently a “curse” or a “blessing” on economic development (Barbier 2005 and 2011; Gylfason 2001; Sarraf and Jiwanji 2001; van der Ploeg 2011). It is the institutions and policies of an economy that determines whether or not resource-based development will be successful in the long run. Or, as Sarraf and Jiwanji (2001, p.3) have argued, "the natural resource curse is not necessarily the fate of resource abundant countries... sound economic policies and good management of windfall gains can lead to sustained economic growth."

Second, because resource endowments, primary production activities and the historical, cultural, economic and geographical circumstances of each country are different, the type of successful development strategy adopted will also vary for different economies. For example, Thailand and Malaysia initially embarked on similar strategies to encourage sustainable primary production and resource use, but the primacy of agriculture in Thailand plus differing economic and social conditions meant that its diversification strategy eventually diverged from that of Malaysia.

Third, the development strategy has to be comprehensive. The success of Malaysia and Thailand in diversifying their economy, and Botswana in sustaining growth, suggests that reliance on primary product exports is not necessarily an obstacle to development. But it must be accompanied by specific policies to improve the competitiveness and export potential of the main primary production activities of the economy, while limiting resource over-exploitation and waste. In addition, the resulting increased returns and revenues generated from primary production activities must be re-invested in the industrial activities, infrastructure, health services, and the education and skills necessary for long-term economic development.

Finally, no strategy is perfect. In all three economies, important sectors and populations have yet to gain significantly from improving the sustainability of the main primary producing sectors. In Malaysia, there is concern about the continuing destruction of forests, especially in the more remote Sabah and Sarawak Provinces, and the expansion of oil palm plantations. In Thailand, the loss of mangroves, growing pollution problems and the failure to instigate development in upland regions are major issues. Botswana has still to grapple with a stagnant agricultural sector, large numbers of people living in fragile environments and widespread rural poverty. Finding ways to broaden the economy-wide benefits and improve the sustainability of resource-dependent economies is an ongoing challenge for such small open economies.

Policies for targeting poverty alleviation in less favored and remote areas

However, encouraging more efficient and sustainable resource-based development in developing economies may not on its own eliminate the persistent problem of widespread rural poverty. Specific policies need to be targeted at the poor where they live, especially the rural poor clustered in fragile environments and remote areas. Even developing economies that have pursued successful resource-based development, such as Botswana, Malaysia and Thailand, are still grappling with these structural poverty problems. For example, as indicated in Table 1, Botswana has 30 to 50% of its population located on fragile land and nearly 60% of its rural population living in poverty. Malaysia has 20 to 30% of its population in less favored areas and rural poverty rate of around 16%. Around 18% of Thailand's rural population is located in remote areas, and 14% of the rural population lives in poverty (World Bank 2008b and 2010).

A targeted strategy for the rural poor in remote and less favored areas will require the following components:

- Provide financing directly, through involving the poor in payment for ecosystem services schemes and other measures that enhance the environments on which the poor depend.
- Target investments directly to improving the livelihoods of the rural poor, thus reducing their dependence on exploiting environmental resources.
- Improve access of the rural poor in less favored and remote areas to well-functioning and affordable markets for credit, insurance and land .
- Reduce the high transportation and transaction costs that prohibit the poorest households in remote areas to engage in off-farm employment.
- Provide effective institutions and governance in support of poor communities use of common pool resources.

If policies are to be targeted to improve both rural livelihoods and protect the fragile environments on which many poor people depend, such a strategy must take into many important factors influencing households' behavior, including lack of income opportunities or access to key markets for land, labor and credit, and the availability and quality of natural resources, including land, to exploit (Barbier 2010). Nevertheless, there are several ways in which a strategy could be developed to target improving the livelihoods of the poor.

The first is to provide financing directly, through involving the poor in payment for ecosystem services schemes and other measures that enhance the environments on which the poor depend.³ Payments for the conservation of standing forests or wildlife habitat are the most frequent type of compensation programs used currently in developing countries, and they have been mainly aimed at paying landowners for the opportunity costs of preserving natural

³ See, for example, Alix-Garcia et al. (2008); Barbier (2010); Bulte et al. (2008); Grieg-Gran et al. (2005); Pagiola et al. (2005); Wunder (2008); and Zilberman et al. (2008).

landscapes that provide one or more diverse services: carbon sequestration, watershed protection, biodiversity benefits, wildlife protection and landscape beauty (Grieg-Gran et al. 2005; Pagiola et al. 2005; Wunder 2008). Wherever possible, the payment schemes should be designed to increase the participation of the poor, to reduce any negative impacts on nonparticipants while creating additional job opportunities for rural workers, and to provide technical assistance, access to inputs, credit and other support to encourage poor smallholders to adopt the desired land use practices. More effort must be devoted to designing projects and programs that include the direct participation of the landless and near landless.

Even in a poor African economy, such as Tanzania, a correctly designed payment for ecosystem services (PES) program can provide an important source of funding for sustainable land use practices in agriculture while leading to greater watershed protection (Branca et al. 2011). In the upstream catchment area of the Ruvu River, poor farmers face financial and technical obstacles to adopting sustainable land management that reduce soil erosion and enhance downstream water quality. By providing institutional, technical and financial support to farmers, a PES scheme for watershed protection delivers on these environmental goals while at the same time boosting crop productivity from improved soil conservation and fertility and thus raising farm incomes. The PES scheme is now trying to enhance sustainability by investing in an appropriate legal and institutional framework for long-term financing and expansion of sustainable land management among farmers to improve watershed management.

A second objective is to target investments directly to improving the livelihoods of the rural poor, thus reducing their dependence on exploiting environmental resources. For example, in Ecuador, Madagascar and Cambodia poverty maps have been developed to target public investments to geographically defined sub-groups of the population according to their relative

poverty status, which could substantially improve the performance of the programs in term of poverty alleviation (Elbers et al. 2007). A World Bank study that examined 122 targeted programs in 48 developing countries confirms their effectiveness in reducing poverty, if they are designed properly (Coady et al. 2004).

Targeting the poor is even more urgent during major economic crises, which occur frequently in developing economies (Ravallion 2008). Under-investment in human capital and lack of access to financial credit are persistent problems for the extreme poor, especially in fragile environments. Low income households generate insufficient savings, suffer chronic indebtedness and rely on informal credit markets with high short-term interest rates. Two types of policies and investment programs targeted to the poor are essential in these circumstances. The first is a comprehensive and targeted safety net that adequately insures the poor in time of crisis. The second is the maintenance, and if possible expansion, of long-term educational and health services targeted at the poor. Unfortunately, during financial and economic crises, publicly funded health and education services are often the first expenditures reduced by developing country governments.

Ultimately, however, it is the lack of access of the rural poor in less favored areas to well-functioning and affordable markets for credit, insurance and land, and the high transportation and transaction costs that prohibit the poorest households in remote areas to engage in off-farm employment, which are the major long-run obstacles that need to be addressed. Such problems lie at the heart of the poverty-environment trap faced by many poor people in remote and less favored areas (Barbier 2010). For example, Carter and Barrett (2006, p.195) note that the existence of a poverty trap threshold "depends on the degree to which the household is excluded from intertemporal exchange through credit, insurance or savings,

whether formally or through social networks. A household with perfect access to capital over time and across states of nature would not face a critical threshold." Similarly, Shively and Fisher (2004, p. 1366) maintain that "policies to reduce deforestation should focus on increasing returns to off-farm employment, strengthening rural credit markets, and ensuring farmers have secure tenure over existing agricultural land."

Finally, in many developing countries, the current legal framework and formal institutional structures for resource management do not allow local communities any legal rights to establish and enforce control over the ecosystem goods and services on which the livelihoods of these communities depend.⁴ Establishing an improved institutional framework does not necessarily require transferring full ownership of natural resources to local communities, but could involve co-management by governments and local communities that would allow, for example, the participation of the communities in decisions concerning the long-term management, development and utilization of these resources. Without such institutional involvement of local communities, multiple problems can arise from competing interests amongst stakeholders, undeveloped or inappropriate governance structures, poor science, or lack of political will, which can ultimately undermine well-intentioned efforts to improve poor people's livelihoods (Aswani et al. 2012; Chharte and Agrawal 2008).

New financing of environment and development assistance

To provide the necessary financial and technical support for more sustainable resource-based development and eradicating rural poverty, low and middle income economies will need

⁴ See, for example, Aswani et al. (2012); Barbier and Sathirathai (2004); Chharte and Agrawal (2008); Ferraro and Kiss (2006); and Jindal et al. (2008).

new sources of assistance to. Existing sources of aid are simply inadequate for the task. For example, the cost of funding the UN Millennium Development Goals of reducing global poverty requires additional development assistance of \$83 billion annually by 2010, whereas from 2001 to 2008 developing countries had received only \$37 billion in extra aid for this purpose (Atkinson 2006; UNCTAD 2010).

Table 1 outlines actual and potential funding mechanisms for environment and development assistance. Three alternatives have been widely proposed to conventional sources of assistance: environment and development funds; creating global markets for carbon and environmental payments; and revenues from global trade and financial transactions.

Existing environment and development funds have met with limited success. One established fund, the Global Environmental Facility, started in 1991, has elicited \$10 billion from direct donor contributions, supplemented by more than \$47 billion in co-financing from additional supplementary aid from governments, for over 2,900 projects in 165 developing economies.⁵ That seems a lot, yet the facility is clearly underfunded: since 1994 its total budget allocation has declined in real terms by 10%, while its range of environment and climate projects continues to expand (Clemençon 2006). A newer initiative, the Adaptation Fund, finances adaptation investments in developing countries that are Parties to the Kyoto Protocol on climate change. This Fund is financed with 2% of the Certified Emission Reduction credits issued for projects of the Clean Development Mechanism and from other sources. Currently, the Adaptation Fund has raised only \$12.6 million; to adapt to climate change, developing countries will need \$70 to 100 billion a year in additional assistance from 2010 to 2050.⁶

⁵ From www.theGeF.org, 18 January 2012.

⁶ From <http://www.climatefundsupdate.org/>, 18 January 2012.

International payment for ecosystem services has emerged as a possible new source of financing environment and development schemes. The only operating such scheme is the nascent mechanism to reduce emissions from deforestation and forest degradation (REDD+). This initiative has the capacity to make a huge difference, although it is costly. A 50% decline in global deforestation through REDD+ would reduce global greenhouse gas emissions by 1.5 to 2.7 Gt (3 to 6% of total annual emissions), but cost \$17.2 to \$28 billion per year (Kindermann et al. 2008). Financing REDD+ through carbon markets could earn developing countries US\$2.2-13.5 billion annually – not nearly enough to match the costs (Ebeling and Yasué. 2008). A pilot initiative established by several UN agencies in 2008, UN-REDD, has \$118 million in funds – not nearly enough to make up the shortfall.⁷ The sums can't be made to add up, even including bilateral initiatives such as the Amazon Fund (\$32.7 million), the Congo Basin Forest Fund (\$13.9 million), and Norway's International Climate and Forest Initiative (\$70.1 million).⁸ Negotiations to expand global funding of REDD+ have stalled over concerns with verifying deforestation rates and carbon emissions, losses in timber and agricultural revenues, and corruption, fraud and governance.

Either a global cap and auction system for greenhouse (GHG) emissions or a global carbon tax could in theory raise substantial funds. Harmonized carbon taxes, which are more efficient and easier to administer globally, could raise \$318 to \$980 billion annually by 2015 (in 2005 prices) and \$527 to \$1,763 billion by 2030 (Hyder 2008). But political considerations, especially in the United States, seem to have ruled the option out. The alternative -- raising revenues from global trade and financial transactions – is more appealing.

⁷ From <http://www.climatefundsupdate.org/>, 18 January 2012.

⁸ From <http://www.climatefundsupdate.org/>, 18 January 2012.

An International Finance Facility (IFF) mobilizes resources from international capital markets by issuing long-term bonds that are repaid by donor countries over 20 to 30 years. By selling the bonds in capital markets, these long-term government pledges are converted into funds for immediate investment. An IFF for Immunization (IFFIm), launched in 2006, has so far raised \$3.6 billion through bonds, which it is using for immunization programs and vaccine purchases in 70 developing countries.⁹ Unlike other global financing mechanisms, an IFF can be started by a handful of donor countries without the need of an international agreement involving many countries, and can be implemented through existing aid institutions, such as the World Bank. However, the amounts raised through bonds are mostly likely to be in the tens, rather than hundreds, of billions of dollars. This suggests that an IFF is best suited for a specific health or infrastructure investments, such as immunization, clean energy or improved sanitization.

Alternatively, the United Nations Conference on Trade and Development (UNCTAD 2011) has proposed that developing economies invest 1% of their sovereign wealth funds in regional development banks, which could in turn facilitate a wide range of sustainable development initiatives. Such funds are routinely created by countries, when they set aside for investment purposes a proportion of their foreign exchange reserves accumulated from buying and selling goods and services in world markets. About \$4.3 trillion in global foreign exchange reserves, including \$3.5 trillion in developing countries, are held in such funds. Allocating just 1% from G20 countries would raise at least \$40 billion annually for global environment and development investments (Gates Foundation 2011).

A financial transaction tax (FTT) is another possible long-term funding source for major sustainability initiatives. A FTT is a tax collected on the sale of specific financial assets, such as

⁹ Information on the IFFIm can be obtained from its website www.iff-immunisation.org.

stock, bonds or futures. A very small FTT collected on the sale of financial assets, such as stock, bonds or futures, would have a negligible impact on liquidity or overall financial transactions, but could raise substantial funds globally. For example, a small tax of 0.10% on equities and 0.02% on bonds could bring in about \$48 billion from G20 member states (Gates Foundation 2011). The European Union proposed a FTT at the G20 summit in Cannes, France in November 2011. Although favorably received by many G20 countries, the proposal failed to receive full G20 back due to opposition from the United States, the United Kingdom and Canada worried about its added burden to their banks.

A variant on the FTT is a currency transaction tax, or Tobin tax, named after the economist James Tobin who first proposed it in the 1970s. This is a tax applied to any foreign currency exchange transaction. Foreign exchange transactions total around US\$ 800 trillion annually, which means that a Tobin tax of only 0.05% could raise \$400 billion in revenues for aid to poor economies, climate change mitigation and ecosystem conservation (Spahn 2010). Such small tax rates would not deter financial speculation, but they could raise substantial revenues for global initiatives.

Alternatively, taxes could be imposed on anything from the arms trade to airline travel. A 10% tax on global arms exports, for example, has been estimated to raise up to \$5 billion annually (Brzoska 2004). Additional tobacco sales taxes in G20 and other European Union countries could generate \$10.8 billion, global aviation fuel taxes an extra \$27 billion, and shipping fuel taxes \$37 billion (Gates Foundation 2011).³

The problem with any of these taxes is that they would require a negotiated international agreement involving many countries. Revenues should probably flow directly to a global fund, to prevent nations from collecting and siphoning the funds into their own national expenditures. But

negotiating and establishing such a mechanism would be difficult. Perhaps more problematically, taxing tobacco and arms could just lead to more black market activity, driving trade for light weapons underground. Yet despite these obstacles, a report by Gates Foundation (2011) to the G20, argued that along with a FTT, extra duties on these traded "bads" will be the most effective and equitable way of raising funds for global development efforts. This powerful message – the need to think creatively about financing sustainable development – is likely to remain on the agenda of the international community for some time.

Conclusion

Overcoming the problem of widespread poverty in low developing economies without jeopardizing the environment will require new strategies for resource-based development and poverty eradication. Policies to make resource-based development more efficient and sustainable should target the main primary production activities of developing economies to improve their competitiveness, attain their export potential, limit resource overexploitation and waste, and generate increase returns and revenues. The increased financial returns and funds generated from primary production activities must be reinvested in the industrial activities, infrastructure, health services, education and skills necessary for long-term economic development. Policies to eradicate poverty need to be targeted at the poor where they live, especially the rural poor clustered in fragile environments and remote areas. The specific elements of such a strategy include involving the poor in payment for ecosystem services schemes and other measures that enhance the environments on which the poor depend, targeting investments directly to improving the livelihoods of the rural poor, thus reducing their dependence on exploiting environmental resources, and tackling the lack of access of the rural poor in less favored areas to well-

functioning and affordable markets for credit, insurance and land, and the high transportation and transaction costs that prohibit the poorest households in remote areas to engage in off-farm employment.

Such strategies for sustainable resource-based management and poverty eradication will require additional financial and technical support from the world community. Unfortunately, conventional sources of development assistance are insufficient for this task. The international community must become serious about designing new financial mechanisms for channeling assistance to the developing world, such as financial transactions taxes and other innovative instruments, if these new strategies for sustainable development are to succeed.

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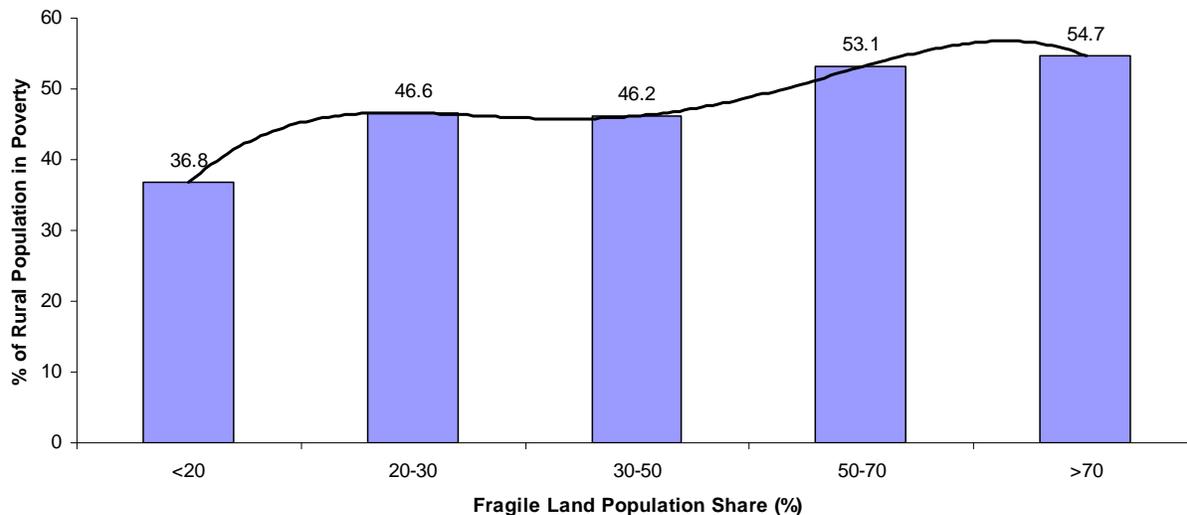
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Figure 1 The rural poor and population on fragile lands in developing economies



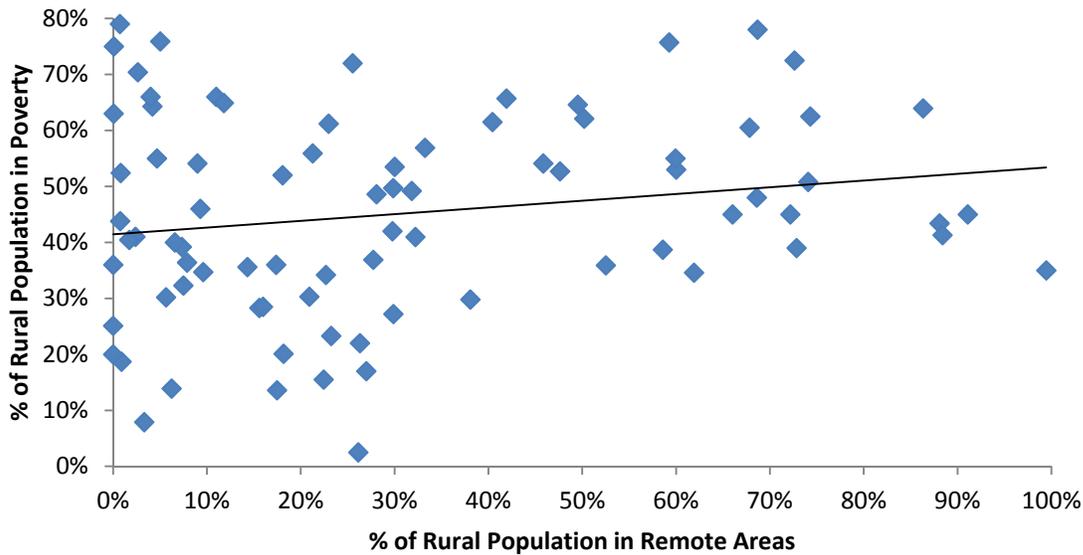
Notes: Developing economies are all economies from East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa with 2006 per capita income of \$11,115 or less, following World Bank (2008a).

Percentage of rural population in poverty is from World Bank (2008a).

Percentage of population on fragile land is from World Bank (2003).

Number of observations = 76 countries, of which 12 (<20% of population on fragile land), 26 (20-30%), 28 (30-50%), 7 (50-70%) and 3 (> 70%). The average rural poverty rate across all countries is 45.8%, and the median is 42.6%.

Figure 2 The rural poor and population in remote areas of developing economies



Notes: Developing economies are all economies from East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa with 2006 per capita income of \$11,115 or less, following World Bank (2008a).

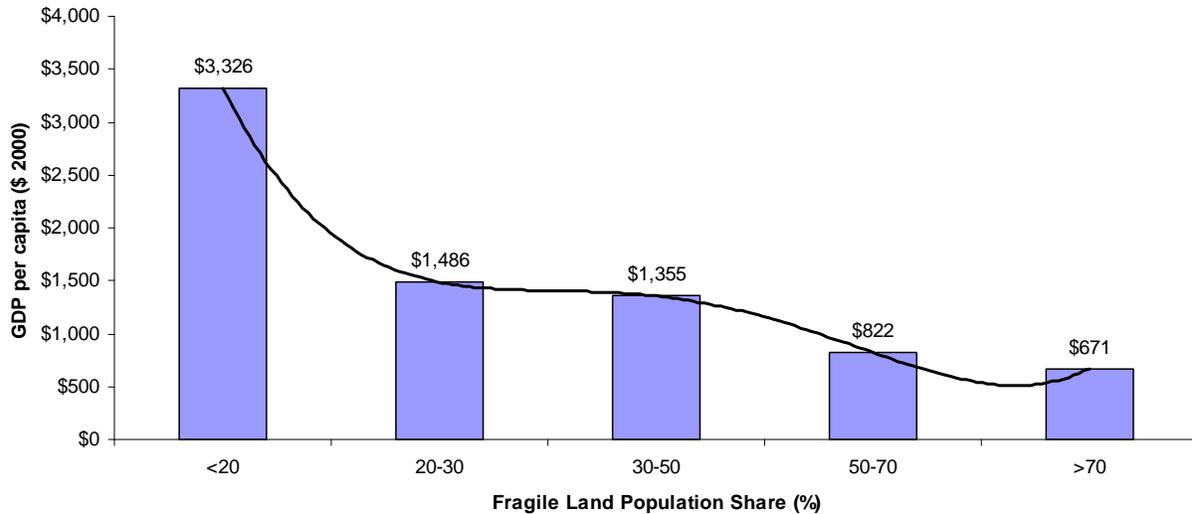
Remote areas are locations with poor market access, requiring five or more hours to reach a market town of 5,000 or more.

Percentage of rural population in poverty is from World Bank (2010).

Percentage of rural population in remote areas is from World Bank (2008b).

Number of observations = 105 countries. Average (median) share of rural population in remote areas is 31.2% (23.2%). Average (median) share of rural population in poverty is 46.6% (45.0%). Correlation coefficient $r = 0.18$.

Figure 3 Fragile land population and GDP per capita in developing economies



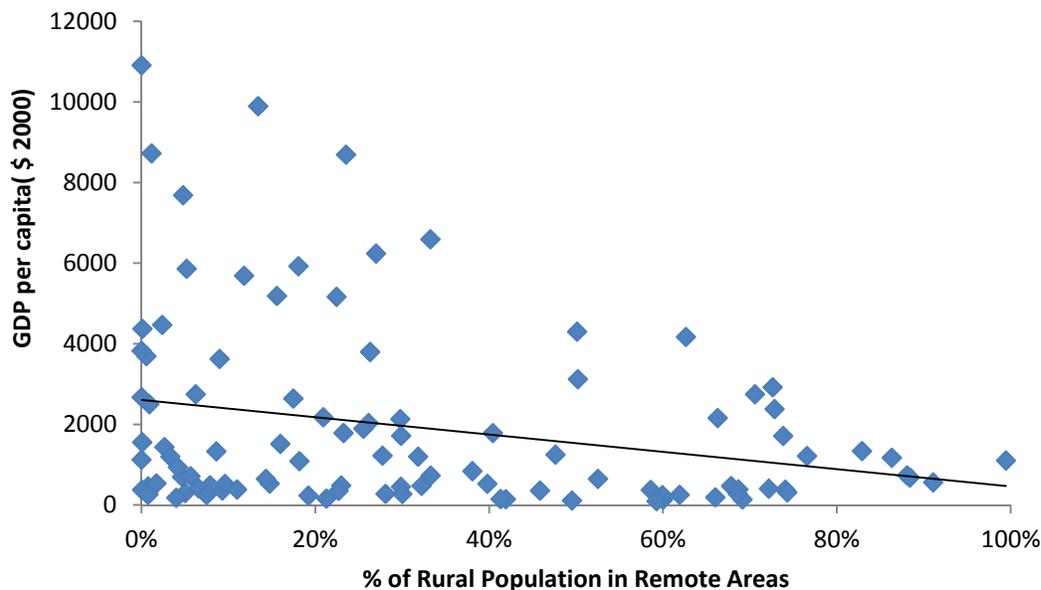
Notes: Developing economies are all economies from East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa with 2006 per capita income of \$11,115 or less, following World Bank (2008a).

GDP per capita (\$ 2000), latest year, is from World Bank (2008a).

Percentage of population on fragile land is from World Bank (2003).

Number of observations = 90 countries, of which 12 (<20% of population on fragile land), 27 (20-30%), 37 (30-50%), 9 (50-70%) and 5 (> 70%). The average GDP per capita (\$ 2000) across all countries is \$1,566 and the median is \$661.

Figure 4 Remote rural population and GDP per capita in developing economies



Notes: Developing economies are all economies from East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa with 2006 per capita income of \$11,115 or less, following World Bank (2008a).

Remote areas are locations with poor market access, requiring five or more hours to reach a market town of 5,000 or more.

GDP per capita (constant 2000 US\$) is from World Bank (2010).

Percentage of rural population in remote areas is from World Bank (2008b).

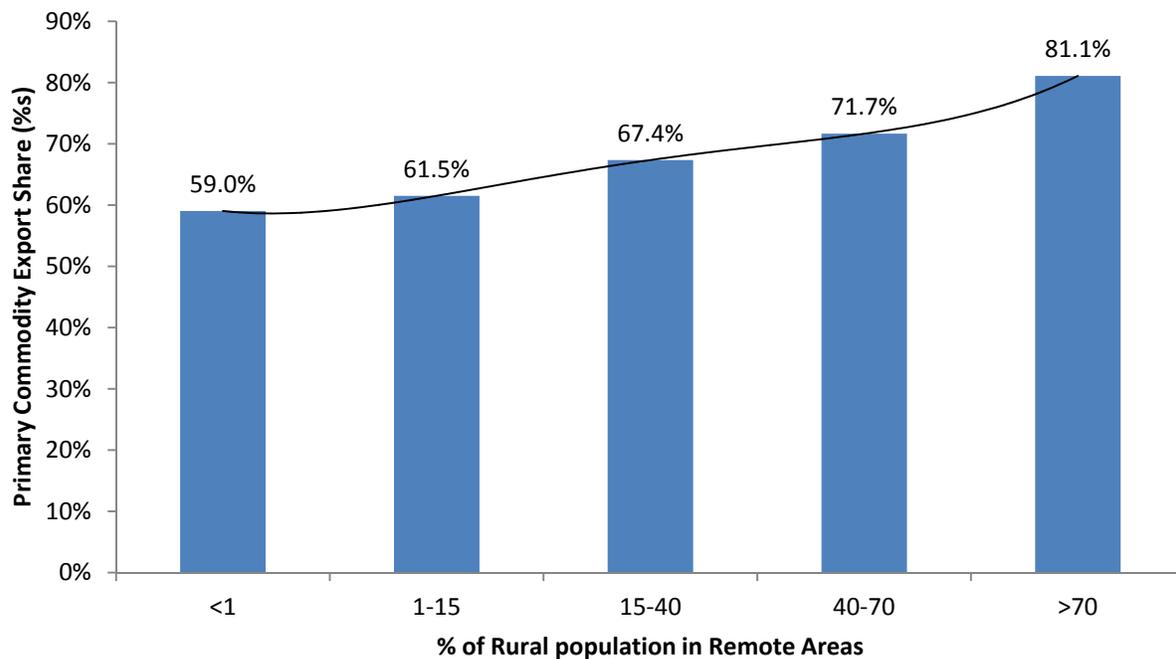
Number of observations = 102 countries. Average (median) share of rural population in remote areas is 31.8% (24.5%). Average (median) share of real GDP per capita is \$1,923 (\$1,011). Correlation coefficient $r = -0.26$.

Table 1. Low and Middle Income Economies and Patterns of Resource Use

	Share of Population on Fragile Land \geq 50%	Share of Population on Fragile Land 30-50%	Share of Population on Fragile Land 20-30%
Primary Product Export Share \geq 90%	Burkina Faso (52.4) Congo Dem. Rep. (NA) Mali (75.9) Papua New Guinea (41.3) Somalia (NA) Sudan (NA) Yemen Rep. (45.0)	Algeria (16.6) Angola (NA) Belize (NA) Benin (33.0) Cameroon (49.9) Chad (67.0) Equatorial Guinea (NA) Lao PDR (41.0) Mauritania (61.2) Nigeria (36.4) Sierra Leone (79.0) Solomon Islands (NA) Vanuatu (NA)	Bolivia (83.5) Burundi (64.6) Ecuador (69.0) Guinea-Bissau (65.7) Liberia (NA) Mozambique (55.3) Myanmar (NA) Zambia (78.0)
Primary Product Export Share 50-90%	Afghanistan (NA) Bhutan (NA) Cape Verde (NA) Egypt (23.3) Eritrea (53.0) Namibia (55.8) Niger (66.0) Zimbabwe (48.0)	Central Af. Rep. (84.0) Comoros (NA) Ethiopia (45.0) Gambia (63.0) Grenada (NA) Guatemala (74.5) Guinea (40.0) Guyana (39.2) Iran (7.2) Kenya (53.0) Rwanda (65.7) St Vincent & Gren. (NA) Senegal (40.4) Syria (NA) Tanzania (38.7) Uganda (41.7)	Côte d'Ivoire (38.4) Dominican Rep. (55.7) Ghana (39.2) Honduras (70.4) Indonesia (34.4) Madagascar (76.7) Mongolia (43.4) Panama (64.9) Peru (72.1) Togo (32.3)
Primary Product Export Share $<$ 50%	Swaziland (75.0)	Botswana (55.7) Haiti (66.0) Morocco (27.2) Nepal (34.6) Pakistan (35.9) South Africa (34.1) Tunisia (13.9)	Cambodia (38.0) China (4.6) El Salvador (64.8) India (30.2) Jamaica (25.1) Jordan (18.7) Malaysia (15.5) Mexico (27.9) Sri Lanka (7.9) Vietnam (35.6)

Notes: Primary product export share is the percentage of agricultural raw material, food, fuel, ore and metal commodities to total merchandise exports, latest year, from World Bank (2008a). Share of population on fragile land is from World Bank (2003, Table 4.3). Figure in parenthesis is the percentage of the rural population in poverty, from World Bank (2008a). Total countries = 81, of which 62 with 50% or more primary product export share (average rural poverty rate = 53.4%), and 19 with less than 50% primary product export share (average rural poverty rate = 35%).

Figure 5. Remote rural population and resource dependency in developing economies



Notes: Primary product export share is the percentage of agricultural raw material, food, fuel, ore and metal commodities to total merchandise exports, latest year (average = 67.4%, median = 75.6%), from World Bank (2010).

Remote areas are locations with poor market access, requiring five or more hours to reach a market town of 5,000 or more, from World Bank (2008b).

Number of observations = 103, of which 12 (> 70%), 25 (70-40%), 29 (40-15%), 21 (1-15%) and 14 (< 1%).

Table 2. Financing mechanisms for environment and development assistance

Mechanism	Description
Global Environmental Facility (GEF)	A multi-donor global mechanism to meet the additional costs of developing countries in achieving global environmental benefits from biological diversity, climate change, international waters, ozone layer depletion, reduced land degradation and abatement of persistent organic pollution.
Adaptation Fund	A fund financing adaptation projects and programs in developing countries; funded with 2% of the Certified Emission Reduction credits issued for projects of the Clean Development Mechanism and from other sources.
International payment for ecosystem services (IPES)	A global mechanism for raising and distributing funds from beneficiaries of ecosystem services to those who conserve them.
Reduced emissions from deforestation and forest degradation (REDD+) scheme	A specific IPES aimed at reducing greenhouse gas (GHG) emissions from deforestation and forest degradation in developing countries.
Global carbon cap and auction system	A cap and auction scheme for GHG emissions; funds are raised by auctioning the initial emission permits.
Global carbon tax	Taxes applied to carbon-equivalent GHG emissions.
International Finance Facility (IFF)	Mobilize financing from international capital markets by issuing long-term bonds repaid by donor countries.
Sovereign wealth fund (SWF)	A proportion of a country's foreign exchange reserves set aside for investment purposes.
Financial transaction tax (FTT)	Tax applied to the sale of specific financial assets, such as stock, bonds or futures.
Currency transaction tax (CTT or Tobin tax)	Tax applied to currency exchange transactions.
Airline travel tax	Tax applied to international airline ticket sales.
Aviation or shipping fuel tax	Tax applied to international aviation and shipping fuel use.
Arms trade tax	Tax applied to international exports of armaments.
Tobacco excise tax	Tax applied to sales of tobacco products, a proportion of which is allocated to global funds.