

Regional Public Goods, Aid, and Development

by

Todd Sandler*

School of Economic, Political, & Policy Sciences
University of Texas at Dallas, GR 31
800 W Campbell Road
Richardson, TX 75080-3021 USA
tsandler@utdallas.edu
Phone 1-972-883-6725
Fax 1-972-883-6486

October 2007

Abstract

This article examines the prognosis for the efficient supply of regional public goods (RPGs) in developing regions based on the three properties of publicness – nonrivalry of benefits, nonexcludability of benefit recipients, and the aggregation technology. The latter property has much to say not only about the form of policy intervention, but also about the most appropriate donor for RPG assistance, when needed. Regional development banks and regional trade pacts are essential in directing collective action to RPGs that bolster development. Other aid participants – networks, nongovernmental organizations, public-private partnerships, and charitable foundations – are essential supporters of RPGs in some sectors, especially in the absence of spillovers to donor countries. RPGs are shown to face more severe difficulties than national or global public goods. The usefulness of regional subsidiarity is also explored.

*Sandler is the Vibhooti Shukla Professor of Economics and Political Economy.

Regional Public Goods, Aid, and Development

1. Introduction

Globalization is associated with augmented cross-border flows that include goods, services, financial capital, labor, and benefit spillovers from public goods. In regards to spillovers, borders are porous to pollutants, viruses (real or virtual), bacteria, crime, terrorists, drugs, discoveries, best practices, revolutionary rhetoric, and financial crises. The new regionalism with its emphasis on local governance recognizes that public good spillovers may be at the regional level, thereby giving rise to regional public goods (RPGs) (Arce and Sandler, 2002; Estevadeordal, Frantz, and Nguyen, 2004; Hettne and Söderbaum, 2006; Stålgren, 2000). This interest in RPGs underscores the need for collective action at the regional level to ensure adequate supplies of these goods. To address this need, regional development banks and regional trade pacts are uniquely positioned and equipped to bolster efforts to finance RPGs, whose benefits affect a well-defined group of developing nations (Sandler, 2004, 2006). Other agents – e.g., public-private partnerships, nongovernmental organizations (NGOs), and charitable foundations – can further actions to fund RPGs for developing countries. Such efforts provide the *social overhead capital* (SOC) needed for sustained development. RPGs are not only complementary to national public goods (NPGs), but are also necessary for developing countries to achieve sufficient economies of scale in market size to compete internationally.

This paper has myriad purposes. First, the paper presents many RPG examples, based on the three characteristics of publicness – nonrivalry of benefits, nonexcludability of benefit recipients, and the aggregation technology. Second, the paper indicates how the prognoses for efficient supply of RPGs hinge on their mix of these characteristics. Some RPGs have good prognoses, while others do not (Sandler, 1997, 1998, 2002, 2003). Third, the paper examines

RPGs in six key areas – health, environment, knowledge, governance, peace and security, and infrastructure – in order to highlight essential concerns that are area specific. Fourth, the paper contrasts RPGs with NPGs, transregional public goods (TRPGs), and global public goods (GPGs). In so doing, we identify factors that either inhibit or promote the provision of these goods. Surprisingly, RPGs confront more severe impediments than NPGs and GPGs. Fifth, the paper presents some key roles that RPGs play in furthering development (Birdsall, 2006; Kanbur, Sandler, and Morrison, 1999; Westcott, 2004). Sixth, the paper takes stock of supporting and detracting influences on regional subsidiarity, whereby solely regional jurisdictions allocate resources to RPGs. Finally, the paper briefly investigates the varied participants and their diverse roles in supporting the provision of RPGs.

2. Preliminaries

In the standard literature, a pure public good possesses benefits that are nonrival and nonexcludable. Benefits are nonrival when a unit of the good can be consumed by one agent without detracting, in the least, from the consumption opportunities still available for others from the same unit of the good. Nonrivalry of benefits is alternatively defined in terms of zero marginal cost of extending the good's benefits to other consumers. This then means that exclusion is inefficient, since anyone who derives a positive marginal benefit should be given access to the good's benefits, which is costless to society. Cleansing a region-based ecosystem possesses nonrival benefits insofar the benefits of the reduced pollutants can be enjoyed by multiple recipients without limiting the benefits available for others within the benefit's spillover range. The cleansing benefits are also nonexcludable because, once provided, payers and nonpayers alike receive the benefits. Nonexcludability leads to free riding because there is an incentive not to pay for benefits that are received under any circumstances. By free riding, an

individual can then use his or her scarce resources to purchase those goods whose benefits are excludable and must be purchased. In general, public goods possess these two defining properties of pure publicness to varying extents.

The third property of publicness is the aggregation technology,¹ which indicates how individual countries' provision amounts determine the overall levels of the RPGs, available for consumption. Many alternative aggregators exist with diverse implications for supply adequacy and the possible need of aid for developing countries.

On the definition of RPGs

RPGs provide benefits to individuals in two or more nations in a well-defined region. The regional basis may be geological – e.g., nations along a river or on a plain or seacoast. In the latter instant, the cleanup of an oil spill in a gulf offers benefits to all potentially affected coastal nations as currents and random factors (e.g., wind or weather) influence which nations are ultimately impacted. The regional tie may be political (e.g., alliance members or commonwealth members) or geographical (e.g., nations on the same continent). In other instances, regional benefit spillovers may be culture based owing to a common language or heritage. The regional range of spillovers may also be meteorological; e.g., better crop-planting methods possess a benefit range defined by geoclimatic considerations.

The spillover range is behind the distinction between NPGs and RPGs, with the former generating a range confined to a nation-state. TRPGs have a benefit range that includes two or more regions. As nations begin to supply RPGs through regional institutions, a need will arise to network these institutions to supply TRPGs – e.g., transtropical public goods. Finally, GPGs display a benefit range that includes either a large swath of the planet or, in some cases (e.g., ameliorating global warming), the entire globe.

RPGs and development

RPGs in the form of infrastructure provide SOC, needed to sustain development. Some SOC are confined to the country, while other examples of SOC involve multiple countries. The Greater Mekong Subregional Program involves connecting six countries (Cambodia, the People's Republic of China, Laos, Myanmar, Thailand, and Vietnam) along the Mekong River in infrastructure networks for transport, energy, telecommunication, and trade (Rufin, 2004; Sakai and Nguyen, 2004; Westcott, 2004). Such infrastructure networks are RPGs that are complementary to private capital. These networks augment the size of markets and, thus, the profitability of private investment, which in turn supports growth and development.

RPGs also include regional security, required to encourage private capital inflows and aid. Donors are not going to send aid to conflict-torn nations or regions, where the aid may be used to fuel hostilities or else may have little or no impact. Murdoch and Sandler (2002, 2004) showed that conflicts in neighboring countries reduce growth within a 800 kilometer radius of their borders. Regionwide benefit spillovers from controlling conflicts may be quite significant. Moreover, RPGs in the health and environment sectors ensure the productivity and well-being of component nations' residents, while RPGs in the knowledge sector foster progress and technological advancement. The latter not only bolsters growth, but also improves a country's competitive edge. RPGs involving governance permit nations within and among regions to interact for mutual benefit (Nogueira, 2004; Rana, 2004). Sufficient governance standards reduce risks which help nations to attract private investment. Such standards also augment a nation's trading partners.

3. Taxonomy of RPGs and Their Prognoses for Supply

Pure public goods possess nonrival and nonexcludable benefits. For pure public RPGs, interventions by a multilateral institution, regional organization, or other collective is required for adequate provision because countries do not have the proper incentives to supply the goods on their own. User fees cannot be charged insofar as extending use is costless, owing to the absence of rivalry in the form of crowding. Society is, thus, better off when no country is excluded. Purely public regional goods include cleansing an ecosystem, curbing the dispersion of a pest, maintaining network integrity, controlling regional flooding, and developing best practices for treating a disease.

Impure publicness of RPGs can stem from partial rivalry or partial excludability or both. Partial rivalry is often in the form of crowding or congestion, which reduces the benefits to recipients as utilization increases. The treatment of diseased patients by a medical team displays partial rivalry in terms of crowding as more patients limit the time and attention afforded by the team to any patient. If the associated disease is infectious, then some of the benefits from the treatment – e.g., reduced contagion – is nonexcludable to others in the region. With incomplete exclusion, partially nonrival RPGs will be associated with some free riders, who use the good, crowd others, and escape payment. Thus, impure RPGs are often undersupplied and overutilized, which worsens as the extent of exclusion decreases. Other examples of impure RPGs include reducing acid rain, monitoring disease outbreaks, suppressing forest fires, and uncovering geoclimatic-specific research findings. Impure RPGs often require some assistance from multilateral institutions, regional organizations, and other donors.

Club RPGs are impure public goods, whose benefits are *fully* excludable and partially rival. Club RPGs include waterways, power grids, air traffic control networks, crisis-management teams, and satellite-launch facility (e.g., Alcântara in Brazil for Latin America). For any of these club goods, an extra user (e.g., more ships on the waterway or more commercial

flights in a regional airspace) curbs the available services for others through lengthier passage time or longer queues. Club users – known as members – can efficiently supply these club RPGs, financed through congestion-internalizing tolls that charge according to the additional costs imposed on the members. If exclusion is complete, there will be no free riders and only paying members utilize the club RPG. The toll charges each user the same fee, equal to the crowding costs associated with a standardized unit of use or visit. Preference differences among members can be easily captured: member countries with a stronger preference for the club RPG will use it more often and pay more in total tolls. Under most circumstances, this toll arrangement will finance an efficient provision level (Cornes and Sandler, 1996).

Regional clubs in Asia can seek loans from multilateral institutions or regional development banks to initially fund the club good. Proceeds from tolls can subsequently repay the loan and maintain the club RPG. Countries in a region that cannot afford the tolls can seek aid from myriad sources to underwrite their utilization of the club good (Kanbur, Sandler, and Morrison, 1999). Clubs represent a low transaction cost means of supplying a class of RPGs without the need of a large expensive bureaucracy.

Aggregation technologies

The aggregation technology of RPGs influences the incentives that potential contributors possess and, hence, affects the supply prognosis. Each subclass of public goods, introduced above, can be further subdivided by the aggregation technology to better fathom the prediction for efficient supply of RPGs (Sandler, 1998, 2004).

Until Hirshleifer's (1983) pathbreaking analysis, the sole aggregator technology was that of *summation* where the overall level of the public good equals the sum of the countries' provision. For cleansing an ecosystem, the amount of pollutants removed equals the summed

efforts of the providing countries. Treating diseased patients and the capacity of a regional waterway also depend on the summed provision levels. With a summation aggregator, every provider's efforts are perfectly substitutable for those of others; one nation's provided unit has the same marginal impact on total supply as that supplied by any other country. Thus, for purely public goods, summation is associated with strong free-rider proclivities and an undersupply prognosis. In a regional context, a country would not be willing to assume a loan to supply an RPG, since the country cannot pressure others to help pay back the loan, despite regionwide benefits. This then implies that grants are more appropriate for funding summation RPGs whose benefits are nonrival and nonexcludable.

A generalization of the summation technology is that of weighted sum, for which the weights are no longer one. Inasmuch as these weights indicate the marginal impact that a unit of provision by one country has on the total level of the RPG, different weights mean that providers' efforts are not perfectly interchangeable or substitutable. In actions to reduce sulfur deposits falling on a country, the influence of emission cutbacks abroad depends on wind patterns, the sites of emission sources, and the pollutant's airborne time (Murdoch, Sandler, and Sargent, 1997). Weighted sum also applies to curbing the spread of a pest, since the effectiveness of individual country's actions depends upon the concentration of the pest and natural barriers to inhibit its dispersion. The reliability of a power grid hinges on the characteristics of component sectors of the grid and their carrying capacity. With weighted sum, undersupply of RPGs may be attenuated because some nations receive greater payoffs from their efforts. For example, geographically larger countries experience a greater portion of the reduction in deposits that results from curtailing their sulfur emissions and so are more motivated to act.

Another important aggregation technology is that of weakest link, for which the smallest

contribution determines the quantity of the RPG for a region. Maintaining the integrity of a network adheres to a weakest-link technology since the country that keeps its part of the network in the most ill repair determines the network's reliability. Other RPGs abiding by this technology are monitoring disease outbreaks and air traffic control networks. In some cases, incentives promote the efficient provision of a weakest-link RPG. Matching behavior is likely, with providers giving only as much as the smallest provision level because greater provision exhausts resources without augmenting the RPG.

The best prognosis for weakest-link pure public goods is when countries have similar tastes and income. Difficulties arise when countries' preferences or incomes differ because a poor country may not be able to meet the provision standard desired by a rich country. In this case, the rich country may have to bolster the poorer country's provision efforts. Another provision concern arises for a weak-link club RPG, whose overall supply can be compromised by a member country that insufficiently maintains the good. In Europe, air traffic can be stopped by the temporary failure of some country's control center. To address this inefficiency, the club must use tolls to finance provision *and maintenance*, and not leave the latter to the discretion of individual members. In other words, all potential externalities must be internalized by the toll.

Another aggregator is threshold where the benefits of an RPG are only experienced once the cumulative quantity of the RPG surpasses a certain total. For example, a forest fire can only be put out if sufficient manpower, equipment, and fire retardants are applied to the conflagration. Fire-suppression efforts short of the requisite threshold may reduce the fire temporarily but will not extinguish it. Similarly, regional flood control and crisis management (e.g., curbing an insurgency) must surpass a threshold if actions are to be effective and lasting. When a threshold applies, there is a need to pool efforts. The threshold aggregator limits the incentive to free ride *until* the threshold is attained, so that threshold RPGs display more limited undersupply. A toll

scheme can efficiently supply a club RPG as the club provides the leadership necessary to pool resources and meet or exceed the threshold as dictated by taste.

A fifth aggregator is best shot where the largest provision by a country determines the overall level of the RPG – smaller provision efforts are redundant. Best-shot RPGs include developing a best practice for treating a region-specific disease, finding geoclimatic-specific research breakthroughs, and establishing a regional satellite-launch facility. Best-shot RPGs require coordination so that effort is not wasted through duplication. Coordination may be problematic in the presence of more than one best-shot candidate country. In many developing regions, no country has the capacity to provide the best-shot RPG so that efforts must be pooled, which poses a collective action concern, or help must come from donors or institutions. Japan, China and India are likely providers of best-shot RPGs in Asia. Also, the Asian Development Bank can assume a leadership role. Generally, best-shot RPGs have a better prognosis for supply than summation RPGs when countries are heterogeneous and at least one country in the region possesses sufficient capacity. Such a country knows that free riding is not a viable option for it.

Other aggregators exist and include weaker link and better shot, which are less extreme forms of weakest link and best shot, respectively (Cornes and Sandler, 1996; Sandler, 2006). Each aggregator technology has its own supply prognosis.

[Table 1 near here]

Table 1 displays an RPG taxonomy with 15 categories in which each of the three classes of RPGs – pure public, impure public, and club – are further subdivided by the five aggregators. For each category, the supply prognosis is given along with an appropriate example. A number of points are worth emphasizing. Even a pure public good may not be undersupplied for some aggregators so that the latter can offset the free-rider incentive generally associated with pure

publicness. Club RPGs are typically supplied efficiently except if the aggregator (e.g., weakest link) introduces an externality. A wide range of alternative prognoses exist. If institutional design can endogenously fix the aggregator, then efficient provision can be promoted by judicious institutional design. A weighted-sum technology may support RPG supply whenever there is sufficient weight on the country's own effort relative to other countries efforts. Moreover, weakest-link RPGs highlight the importance of capacity, while best-shot and threshold RPGs underscore the importance of coordination and/or pooling of efforts. For both of these aggregators, developing region may have to look beyond their territory to rich donors, new players (e.g., charitable foundations and partnerships), and multilateral institutions to bolster capacity. A primary concern arises when these weakest-link and best-shot RPGs hold little interest for rich countries in other regions. The regional development banks and regional trade pacts then have a crucial role in funding the necessary capacity.

4. RPGs by Sectors

We divide RPGs into six distinct sectors – health, environment, knowledge, governance, peace and security, and infrastructure. Typically, infrastructure is not classified as a separate sector,² but it is so distinguished here because infrastructure includes RPGs, such as waterways, energy grids, and communication networks, that do not fit into the standard five sectors. Moreover, infrastructure is absolutely essential at both the national and regional levels for sustained development. Commerce, sufficient scale economies, and inflow of private capital depend on infrastructure in the form of RPGs (Rufin, 2004).

Each of the six sectors possesses RPGs with diverse public good characteristics that affect their provision prognosis and, thus, the need and form of outside help (Sandler and Arce, 2007). In the health sector, there is a prevalence of weakest-link (e.g., monitoring outbreaks and

limiting contagious diseases) and best-shot (e.g., developing new vaccines) RPGs that raise capacity concerns. For weakest-link RPGs, some countries' actions must be shored up to achieve an acceptable provision standard. For best-shot RPGs, there may be no country with sufficient resources or expertise to discover the breakthrough in technique or cure. Public-private partnerships (e.g., the Global Fund and the Onchocerciasis Control Partnership), charitable foundations, and nation-based organizations (e.g., Centers for Disease Control and Pasteur Institute) have a real role to play, particularly for diseases that do not pose a threat to donor countries. Regional development banks and multilateral agencies can join these partnerships and augment their funding.

Environmental RPGs are more likely to be characterized by summation or weighted-sum aggregators. Because pollutants spread from multiple emission sources and can be influenced by manmade and natural factors, each country's provision thus affects the overall supply of pollutants differently. To consummate agreements, the dispersion patterns of regional pollutants must be known. Once sulfur and nitrogen oxides dispersion patterns were known in Europe, nations quickly formed effective treaties to control these emissions (Murdoch, Sandler, and Sargent, 1997; Sandler, 2004). If emissions are transported beyond the region of origin, then impacted rich countries have an incentive to assist in pollution control. Spillovers of sulfur and nitrogen oxides emissions from Asia are now documented on the west coast of the United States. In less-developed regions, foreign assistance is needed to control a host of environmental RPGs. From 1980 until the middle 1990s, the largest share of overseas development assistance went to the environmental sector (Mascarenhas and Sandler, 2005). Regional development banks and global institutions can fund these efforts. In some cases, networks can assist in financing, and are particularly useful for addressing similar environmental problems that plague more than one region. Thus, these networks have been set up by the global multilaterals owing to transregional

spillovers.

The knowledge sector concerns discovery and utilization of findings. Discovery is a best-shot RPG when the research (e.g., region-specific pest control, the discovery of new species, or the mapping of pollutant dispersion) benefits just that region. To adequately support such best-shot RPGs, a region must either pool its scientific resources or else seek assistance from donors or the global scientific community. The presence of a leader nation in the region can greatly facilitate the requisite coordination. Utilization of discoveries from within and beyond the region is highly dependent on adequate NPGs, such as education, that are complementary to RPGs (World Bank, 2001). Foreign aid must first supply these NPGs if knowledge RPGs are to follow.

Since the financial crises of east Asia, governance has grown in importance as an RPG. After the mid 1990s, the governance sector receives more assistance than the other four traditional sectors, thus surpassing the support given to the environmental sector (Mascarenhas and Sandler, 2005). This is due, in large part, to the perceived spillovers to rich countries that view financial crises as not only affecting their foreign direct investments but also as having contagious aspects that could spark a worldwide recession. Governance RPGs and GPGs adhere often to a weakest-link aggregator insofar as the least adequate practice can disproportionately influence the stability of the whole system. This is true of the adoption of sound financial practices, monitoring of these practices, harmonization of governance practices, and removal of trade barriers. Required standards of performance must be bolstered through regional and global institutions, rich donor nations, and rich (if any) countries within the region. The development of better governance practices is a best-shot RPG that can be easily borrowed from other regions.

The last of the traditional assistance sectors is peace and security, which involve actions to restore peace to conflict-ridden countries. Even internal conflict can have regionwide impacts

in terms of an exodus of refugees, the spread of diseases, the disruption of supply lines, and the loss of economic growth. Maintenance of regionwide peace is a weakest-link RPG that raises coordination and capacity concerns. To date, a very small share of overseas development assistance goes to peace and security (Mascarenhas and Sandler, 2005) with alliances (e.g., NATO), the United States, and the United Nations doing the most to quell conflicts that may spread within and beyond regions. Providing security and peace possesses nonrival and nonexcludable benefits, indicative of purely public goods.

Finally, infrastructure RPGs tend to abide by summation and weakest-link aggregators. The most important property of these RPGs is that many are club goods whose provision can be financed by tolls imposed on regional users. Thus, waterways and other forms of infrastructure can be supported through loans from regional development banks and multilateral institutions that are eventually paid back from user fees.

[Table 2 near here]

Table 2 summarizes some of the key properties of the RPGs, associated with each of the six sectors. The table also lists four illustrative RPG examples for each sector.

5. Geographical Range of Spillovers

Public goods can also differ by the range of benefit spillovers, with RPGs displaying an intermediate range between NPGs and GPGs. TRPGs display spillovers that impact two or more regions but do not extend globally. For example, eradicating tropical diseases, protecting migratory species, and installing a tsunami early-warning system generate benefits that impact more than one region. Table 3 presents ten examples of the four geographic categories of public goods, distinguished by their range of spillovers.

[Table 3 near here]

Perhaps surprising, RPGs pose many more inhibitors than NPGs and GPGs. For NPGs, nations have adequate incentives to provide such goods, since nations are able to capture all of the associated benefits. Thus, they are willing to finance NPGs through loans, a primary financial instrument used by regional development bank to fund NPGs and RPGs. Lenders are predisposed to loan the money in that the collateral can be secured and there is no doubt who is responsible for reimbursing the loan. In the case of GPGs, benefit spillovers can motivate donor nations to underwrite these goods. Global institutions have an interest, the funds, and a mandate to supply GPGs. RPGs, in contrast, offer no spillover benefits to donor nations outside of the region or to supporters of global organizations. Nations within a region have little incentive to assume debt for an RPG that benefits the entire region unless other nations are also carrying their appropriate debt burdens. In many cases, there may be no clear entity to obtain loans, provide collateral, or promote a regional agenda. This may be exacerbated by regional rivalries and conflicts. One must remember that most conflicts today are located in developing regions. Lack of capacity may also inhibit some regional development banks from supporting a sufficient array of RPGs. This capacity problem may be heightened by a culture for rich nations to support global rather than regional institutions. Donors of all varieties are comfortable with supporting global institutions that have a proclivity to fund NPGs and GPGs. Even the regional development banks – with the recent exception of the Asian Development Bank – have not really supported RPGs. When they have done so, they have primarily relied on loans rather than grants (Mascarenhas and Sandler, 2005; Sandler, 2006).

[Table 4 near here]

In Table 4, both promoting and inhibiting considerations are listed for the four geographic categories of public goods. TRPGs represent an interesting class of public goods that may fare better than RPGs. Two major inhibitors are the associated transaction costs in

establishing networks among impacted regions and the geographic dispersion of spillover recipients. Given this dispersion, a TRPG may change character between regions (e.g., prophylactic measures against malaria and river blindness differ among infected regions).

Networks, public-private partnerships, and charitable foundations have become essential funders of TRPGs.

6. On Regional Subsidiarity

Subsidiarity derives from the notion that the smallest appropriate jurisdiction should provide the public good. In its starkest form, subsidiarity mandates that the decision-making jurisdiction should match perfectly with a public range of spillovers. Subsidiarity is consistent with global institutions supplying GPGs, the appropriate transregional jurisdiction or network providing TRPGs, regional institutions underwriting RPGs, and nations supporting NPGs. Subsidiarity is associated with the notion of fiscal equivalence (Olson, 1969). The analogy is not perfect because, for developing regions, the financing of RPGs is often bolstered from outside of the decision-making district. Thus, a developing nation may be making the provision decision for its NPGs, but the funding source may be from a regional development bank and other donors.

Adherence to subsidiarity is intended to ensure that decision makers adjust expenditure decisions to reflect those who secure benefits. If the decision-making jurisdiction is smaller than the good's spillover range, then undersupply is anticipated as not all recipients' benefits are taken into account when provision is decided. If, in contrast, the decision-making jurisdiction is larger than the good's spillover range, then oversupply is predicted as tax spillovers to nonrecipients are not taken into account when provision is decided. By matching political and economic domains, subsidiarity is intended to achieve efficiency as an RPG's marginal benefit, summed over regional recipients, is equated to its marginal costs. Tailoring political

jurisdictions to the public good's spillover range limits transaction costs by reducing the number of participants to just those with a stake in the decision. Such tailoring also reduces transaction costs by increasing repeated interactions and curtailing asymmetric information. Regional subsidiarity supports the evolution of decision-making institutions from shared culture, common norms, similar concerns, shared experiences, propinquity, and similar values. By establishing different regions, subsidiarity can promote innovation as regions develop alternative practices and solutions, not unlike the way autonomous states within a nation can uncover better practices. Finally, delegation of RPG decisions to a regional jurisdiction avoids "mission creep" of global institutions that have subsumed ever greater responsibilities for public goods with diverse ranges of spillovers.

There are factors that also detract from a blind application of subsidiarity where the spillover range is the sole consideration of jurisdiction design. For example, economies of scale can justify having a RPG provided by an institution whose political domain exceeds that of the requisite region if the reduced unit costs offset any lost efficiency from departing from subsidiarity. Global institutions may achieve scale economies for those provision levels that permit fixed costs to be spread over serving the needs of multiple regions. For instance, the World Health Organization (WHO) can further health RPGs in a number of regions at a lower cost than having region-specific health organizations. Another offsetting influence to subsidiarity is the presence of economies of scope from reduced unit costs from supplying two or more RPGs by the same jurisdiction, even though spillover ranges are not identical. Once again, unit cost savings must be compared with any lost efficiency to judge whether scope economies should be exploited. As the number of jointly supplied RPGs increases, the anticipated violation of subsidiarity strengthens. Another obvious obstacle to subsidiarity is the absence of the requisite regional institution or jurisdiction. For river blindness, the disease affected three

different regions – Latin America, Africa, and the Arabian Peninsula – so that there is no jurisdiction that neatly fitted the spillover range for controlling the disease. In this case, a public-private partnership involving the WHO, Merck, host countries to the disease, the World Bank, and other donors effectively curbed the disease. For some best-shot, better-shot, and threshold RPGs, the requisite effort may necessitate pooling resources beyond the jurisdiction associated with subsidiarity. Additionally, temporal or dynamic considerations – e.g., addressing a problem immediately – may require significant nonmatching of economic and political jurisdictions initially as an available jurisdiction is utilized. With time, a greater coincidence of economic and political jurisdiction can be achieved.

[Table 5 near here]

Table 5 summarizes the supporting and inhibiting influences on the applicability of the subsidiarity principle for the supply of RPGs. The new regionalism should eventually give rise to more capable regional institutions, as it has in Europe. The regional development banks can play a crucial role in supporting RPGs and strengthening regional institutions. As these institutions mature, subsidiarity will have a greater role to play for RPGs despite the detracting factors for subsidiarity.

7. Participants in Support of RPGs

There is now a diverse set of participants that can assist developing regions supply their RPG needs. The key participant is the regional development bank, which can fund a wide range of RPGs. These banks can assist in efforts, along with the International Monetary Fund, for countries to achieve financial stability through sound practices. The regional development banks must determine the mix of grants and loans, which should be based on the composition of NPGs and RPGs funded. Loans to individual nations are appropriate for NPGs, while grants to nations

are more appropriate for RPGs. Regional trade pacts and custom unions can coordinate intraregional activities concerning RPG provision, and assist a regional collective to secure loans for RPGs that benefit the entire region. Loans for RPGs are fine, provided that they involve a collective.

Global multilateral institutions can pool funds for best-shot, threshold, and summation RPGs and bolster capacity for weakest-link RPGs. For the latter, these institutions can shore up countries that cannot afford an acceptable level of the RPG. Such shoring-up activities have a free-rider concern with respect to donor countries; global institutions can overcome this concern. Global multilaterals can also channel funds into the regional development banks, thereby augmenting their capacity to fund RPGs. Specialized agencies of these global institutions – e.g., United Nations Development Programme (UNDP) and WHO – can champion and support specific RPGs.

Networks are particularly useful for allocating resources to TRPGs. In addition, networks can help provide capacity for countries to supply weakest-link RPGs to acceptable standards. Networks are especially attuned to addressing RPGs that surface in multiple regions involving agriculture (i.e., Consultative Group for International Agricultural Research) or the environment (i.e., Global Environmental Facility). Some health RPGs (e.g., curbing malaria or eradicating polio) influence multiple regions and can be assisted by networks.

Public-private partnerships and charitable foundations are two relatively new aid participants that provide assistance for a variety of RPGs. Partnerships can draw on component members' comparative advantage. Thus, in the case of the Onchocerciasis Control Partnership, Merck supplied the necessary drugs, while the other participants dealt with the drug's distribution and the financing of the operation. Both partnerships and charitable foundations infuse funds that do not crowd out other sources of contributions. These participants often

support select sector such as health. Most important, partnerships and foundations often fund RPGs that provide no spillover for donor nations, thereby making up for bilateral donors' ennui.

Other institutions – NGOs and nation-based organizations – tend to focus on specific RPGs. NGOs display wide interests and champion many global and regional concerns including refugees that traditional donor countries do not support. For communicable diseases, nation-based organizations (e.g., the Centers for Disease Control, the National Institutes of Health, and Pasteur Institute) direct resources to best-shot RPGs (e.g., isolating new viruses) or provide capacity for weakest-link RPGs (e.g., monitoring outbreaks) that pose a threat at home.

Finally, bilateral donors support NPGs and RPGs that ameliorate poverty and are complementary for development. These donors also fund global and regional aid institutions, including the regional development banks.

Table 6 offers a ready summary of potential donors and their role in bolstering RPGs.

[Table 6 near here]

8. Concluding Remarks

This article has some basic messages with respect to RPGs. In conjunction, the three properties of publicness determine the prognosis of efficient RPG supply, which indicates the need, if any, for remedial action. Each of the six sectors – health, environment, knowledge, governance, peace and security, and infrastructure – confronts different RPG policy concerns because distinct sectors are associated with alternative publicness properties. Although ignored until the 1980s, the aggregation technology has much to do with not only the form of policy intervention, but also the most appropriate donor for RPG assistance. Among these facilitators, regional development banks and regional trade pacts play the pivotal role in coordinating donors and fostering the supply of RPGs, necessary for development. These regional institutions can

coalesce collective action within the region to finance RPGs through grants, when a single nation is insufficiently motivated to borrow for RPGs that generate regionwide benefits. New aid participants – networks, NGOs, partnerships, and charitable foundations – can play an especially important part in funding RPGs that provide no spillovers to country donors. This article also shows that blind adherence to subsidiarity is ill-advised as considerations can support jurisdictions that exceed or fall short of the RPG's spillover range. Finally, RPGs are shown to confront more difficult funding problems than NPGs and GPGs. This then underscores the need to support RPGs that, like social overhead capital, are crucial to growth and development.

Footnotes

1. The aggregation technology was first introduced by Hirshleifer (1983) and Cornes and Sandler (1984). Hirshleifer (1983) called it a social composition function.

2. See the Secretariat of the International Task Force on Global Public Goods (2006) on the five traditional sectors.

References

- Arce, Daniel G. and Todd Sandler (2002). *Regional Public Goods: Typologies, Provision, Financing, and Development Assistance*. Stockholm: Almqvist and Wiksell International for Expert Group on Development Issues, Swedish Ministry for Foreign Affairs.
- Birdsall, Nancy (2006). “Overcoming Coordination and Attribution Problems, Meeting the Challenge of Underfunded Regionalism,” in Inge Kaul and Pedro Conceição (eds.). *The New Public Finance: Responding to Global Challenges*. New York: Oxford University Press, pp. 529–548.
- Cornes, Richard and Todd Sandler (1984). “Easy Riders, Joint Production, and Public Goods.” *Economic Journal* 94(3): 580–598.
- Cornes, Richard and Todd Sandler (1996). *The Theory of Externalities, Public Goods, and Club Goods*, 2nd ed. Cambridge: Cambridge University Press.
- Estevadeordal, Antoni, Brian Frantz, and Tam Robert Nguyen (eds.) (2004). *Regional Public Goods: From Theory to Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank.
- Hettne, Björn and Fredrik Söderbaum (2006). “Regional Cooperation: A Tool for Addressing Regional and Global Challenges,” in Secretariat of the International Task Force on Global Public Goods (ed.). *Expert Paper Series Seven: Cross-Cutting Issues*. Stockholm: Secretariat of the International Task Force on Global Public Goods, pp. 179–244.
- Hirshleifer, Jack (1983). “From Weakest-Link to Best-Shot: The Voluntary Provision of Public Goods.” *Public Choice* 41(3): 371–386.
- Kanbur, Ravi, Todd Sandler, and Kevin Morrison (1999). *The Future of Development Assistance: Common Pools and International Public Goods*. Policy Essay Series.

Washington, DC: Overseas Development Council.

- Mascarenhas, Raechelle and Todd Sandler (2005). “Donors’ Mechanisms for Financing International and National Public Goods: Loans or Grants?” *World Economy* 28(8): 1095–1117.
- Murdoch, James C. and Todd Sandler (2002). “Economic Growth, Civil Wars, and Spatial Spillovers.” *Journal of Conflict Resolution* 46(1): 91–110.
- Murdoch, James C. and Todd Sandler (2004). “Civil Wars and Economic Growth: Spatial Dispersion.” *American Journal of Political Science* 48(1): 137–150.
- Murdoch, James C., Todd Sandler, and Keith Sargent (1997). “A Tale of Two Collectives: Sulphur versus Nitrogen Oxides Emission Reduction in Europe.” *Economica* 64(2): 281–301.
- Nogueira, Roberto Martinez (2004). “Regional Public Goods, Governance and Capacity Building,” in Antoni Esteveordal, Brian Frantz, and Tam Robert Nguyen (eds.). *Regional Public Goods: From Theory to Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank, pp. 275–292.
- Olson, Mancur (1969). “The Principle of ‘Fiscal Equivalence:’ The Division of Responsibilities among Different Levels of Government.” *American Economic Association Papers and Proceedings* 59(2): 479–487.
- Rana, P. B. (2004). “Monetary and Financial Cooperation in Asia,” in Antoni Esteveordal, Brian Frantz, and Tam Robert Nguyen (eds.). *Regional Public Goods: From Theory to Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank, pp. 295–300.
- Rufin, Carlos (2004). “Regional Public Goods and Infrastructure,” in Antoni Esteveordal, Brian Frantz, and Tam Robert Nguyen (eds.). *Regional Public Goods: From Theory to*

- Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank, pp. 181–202.
- Sakai, Kazu and Tam Robert Nguyen (2004). “Coordinating the Supply of Regional Public Goods: The Greater Mekong Subregional Program,” in Antoni Esteveordal, Brian Frantz, and Tam Robert Nguyen (eds.). *Regional Public Goods: From Theory to Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank, pp. 422–444.
- Sandler, Todd (1997). *Global Challenges*. Cambridge: Cambridge University Press.
- Sandler, Todd (1998). “Global and Regional Public Goods: A Prognosis for Collective Action.” *Fiscal Studies* 19(3): 221–247.
- Sandler, Todd (2002). “Financing International Public Goods,” in Marco Ferroni and Ashoka Mody (eds.). *International Public Goods: Incentives, Measurement, and Financing*. Boston: Kluwer Academic Publishers, pp. 81–117.
- Sandler, Todd (2003). “Assessing the Optimal Provision of Public Goods: In Search of the Holy Grail,” in Inge Kaul, Pedro Conceição, Katell Le Goulven, and Ronald U. Mendoza (eds.). *Providing Global Public Goods: Managing Globalization*. New York: Oxford University Press, pp. 131–151.
- Sandler, Todd (2004). *Global Collective Action*. Cambridge: Cambridge University Press.
- Sandler, Todd (2006). “Regional Public Goods and International Organizations.” *Review of International Organizations* 1(1): 5–25.
- Sandler, Todd and Daniel G. Arce (2007). “New Face of Development Assistance: Public Goods and Changing Ethics.” *Journal of International Development* 19(3): 527–544.
- Secretariat of the International Task Force on Global Public Goods (2006). *Meeting Global Challenges: International Cooperation in the National Interest*. Stockholm: Secretariat

of the International Task Force on Global Public Goods.

Stålgren, Patrick (2000). “Regional Public Goods and the Future of International Development Cooperation: A Review of the Literature.” Working Paper 2000:2. Stockholm: Expert Group on Development Issues, Swedish Ministry for Foreign Affairs.

Westcott, Clay C. (2004). “Promoting the Provision of Regional Public Goods in Asia,” in Antoni Estevadeordal, Brian Frantz, and Tam Robert Nguyen (eds.). *Regional Public Goods: From Theory to Practice*. Washington, DC: Inter-American Development Bank and Asian Development Bank, pp. 81–104.

World Bank (2001). *Global Development Finance: Building Coalitions for Effective Development Finance*. Washington, DC: World Bank.

Table 1. Taxonomy and supply prognosis of regional public goods

Aggregation technology	Pure public good (nonrival and nonexcludable benefits)	Impure public good (partially) rival and/or partially excludable benefits	Club goods (partially rival and excludable benefits)
Summation: Overall level of public good equals the sum of countries' or donors' contributions.	undersupplied <i>cleansing an ecosystem</i>	Partly undersupplied <i>treating diseased patients</i>	efficiently supplied <i>regional waterway</i>
Weighted sum: Overall level of public good equals a weighted sum of countries' provisions.	partly undersupplied <i>curbing spread of a pest</i>	partly undersupplied <i>reducing acid rain</i>	efficiently supplied <i>power network</i>
Weakest link: Smallest provision level determines the public good's aggregate level.	supply may be efficient <i>maintaining network integrity</i>	undersupplied <i>monitoring outbreak</i>	undersupplied <i>air traffic control network</i>
Threshold: Benefits from the public good only arise once the level of the good surpasses a threshold.	limited undersupply <i>regional flood control</i>	limited undersupply <i>forest fire suppression</i>	efficiently supplied <i>crisis-management teams</i>
Best shot: Largest provision determines the public good's aggregate level.	undersupplied or efficient <i>developing best practice for treating a disease</i>	undersupplied or efficient <i>geoclimatic-specific research findings</i>	efficiently supplied <i>satellite-launch facility</i>

Note: Italics indicate specific public good examples.

Table 2. Regional public goods by sectors

Health: prevalence of weakest-link and best-shot public goods (capacity concerns)

- vaccines for region-specific diseases
- monitoring disease outbreaks
- developing best practices for treating region-specific diseases
- maintaining sterilization in hospitals

Environment: prevalence of summation and weighted sum public goods (need for information)

- curbing acid rain
- reducing transboundary haze
- preserving rain forests
- preventing floods

Knowledge: prevalence of best-shot public goods (pooling efforts; leadership)

- agriculture extension services
- network of data and information exchange
- geoclimatic-specific research findings
- mapping spillovers of public goods

Governance: prevalence of weakest-link public goods (coordination needed)

- adopting sound financial practices
- monitoring financial practices (Regional Economic Monitoring Unit in Asia)
- harmonizing transport conventions
- eliminating trade barriers

Peace and security: prevalence of weakest-link public goods (coordination and capacity)

- eliminating insurgencies
- reducing terrorism
- combating organized crime
- uncovering intelligence

Infrastructure: summation and weakest-link public goods (coordination and capacity), club goods

- river development (Greater Mekong Subregion program)
 - interstate highways
 - energy grids
 - rail transport (harmonization of gauge and practices)
-

Table 3. Examples of public goods by geographical range of spillovers

<i>National</i>	<i>Regional</i>	<i>Transregional</i>	<i>Global</i>
• water treatment plant	• harmonizing transport conventions	• eradicating tropical diseases	• curbing global warming
• health-care infrastructure	• eradicating region-specific pests	• ameliorating sulfur emissions	• limited ozone-shield depletion
• governance capacity	• geoclimatic-specific agricultural advances	• reducing transnational terrorism	• mapping human genomes
• education	• regional river development	• protecting migratory species	• preserving biodiversity
• groundwater conservation	• intercountry highway network	• controlling drug trafficking	• mapping asteroids
• national defense	• energy grids	• tsunami early-warning systems	• curing cancers
• irrigation system	• forest fire suppression	• tracking hurricanes	• satellite communication networks
• intrastate highways	• eliminating insurgencies	• controlling malaria	• combating organized crime
• national parks	• bioprospecting	• air traffic control	• controlling antibiotic-resistant diseases
• police force	• gas pipelines	• sound financial practices	• isolating new diseases

Table 4. Factors promoting and inhibiting NPGs, RPGs, TRPGs, and GPGs

National public goods (NPGs)

- Incentives exist for nations to provide (promote)
- Loans will be taken out (promote)
- Aid agencies and donor countries are willing to provide (promote)
- NPGs are complementary to RPGs, TRPGs, and GPGs (promote)
- Nations may lack finances (inhibit)
- Nations may lack expertise (inhibit)

Regional public goods (RPGs)

- New regionalism and trading blocs can facilitate provision (promote)
- Favorable characteristics of publicness (e.g., joint products, weighted-sum aggregator, and excludable benefits) (promote)
- Cultural and spatial propinquity among spillover recipients (promote)
- Fewer nations involved than for TRPGs and GPGs (promote)
- Past and ongoing interactions among regional countries (promote)
- Absence of donor spillovers owing to regional specificity of benefits (inhibit)
- No clear entity to obtain loans, provide collateral, or promote a regional agenda (inhibit)
- Absence, at times, of a leader nation within the region (inhibit)
- Insufficient capacity of some regional development banks (inhibit)
- Regional rivalry, fueled by past and current conflicts (inhibit)
- Absence of a culture to support regional development banks (inhibit)

Transregional public goods (TRPGs)

- Donor spillover may arise (promote)
- Multilateral aid agencies have an interest (promote)
- May be some dominant region-specific characteristics (influence uncertain)
- Transaction costs associated with establishing transregional network (inhibit)
- Large number of involved nations (inhibit)
- Geographic dispersion of spillover recipients (inhibit)
- Absence of a jurisdiction-specific institution (inhibit)

Global public goods (GPGs)

- Donor spillovers exist (promote)
 - Multilateral institutions have an interest (promote)
 - Rich nations may be helped or harmed (influence uncertain)
 - Large number of nations involved (inhibit)
 - May possess unfavorable publicness properties (inhibit)
-

Table 5. Supporting and detracting influences on regional subsidiarity

Supporting factors for regional subsidiarity

- Fosters efficiency by equating RPG's marginal benefits (summed over regional recipients) to its marginal costs.
- Foster efficiency by limiting tax spillovers to nonbeneficiaries.
- Limits transaction costs by reducing the number of participants, augmenting repeated interactions, and curtailing asymmetric information.
- Supports the evolution of institutions from shared culture, norms, concerns, experiences, propinquity, and values.
- Bolsters interregional evolutions.
- Avoids "mission creep" of global institutions.

Detracting factors for regional subsidiarity

- Economies of scale from reduced unit costs favor allocation by a larger jurisdiction than the spillover range of the public good.
 - Economies of scope from reduced unit costs encourage providing two or more RPGs in the same jurisdiction even when spillover ranges do not match.
 - The requisite regional institution does not exist nor possess sufficient capacity.
 - Some aggregation technologies (e.g., best shot) favor jurisdictions beyond those identified by regional subsidiarity.
 - Temporal or dynamic consideration may require significant nonmatching of economic and political jurisdictions initially. Over time a greater coincidence is achieved.
-

Table 6. Participants in support of RPGs

Donors	Contributions
<i>Regional Development Banks</i>	Provide funding for RPGs. Determines the mix of grants/loans based on mix of nation-specific and regionwide spillovers. Coordinate action to promote regionwide financial stability.
<i>Regional Trade Pacts</i>	Coordinate intraregional activities. Provide collateral for RPG loans. Promote intraregional trade.
<i>Global Multilaterals:</i> World Bank UNDP, WHO, WTO	Pool funds for best-shot, threshold, and summation RPGs and bolster capacity for weakest-link RPGs. Specialized agencies can promote specific public goods. Can channel funds into regional institutions.
<i>Networks:</i> Global Environmental Facility (GEF), Consultative Group for International Agricultural Research (CGIAR)	Can coordinate efforts for TRPGs. Shore up weakest-link countries to meet acceptable standards of RPG provision. GEF addresses regional and global commons problems, while CGIAR focuses on knowledge.
<i>Partnerships:</i> Global Fund, Onchocerciasis Control Partnership	Draw on members' comparative advantage. Supply new sources of funding. Champion certain sectors and specific RPGs.
<i>Charitable Foundations:</i> Wellcome Trust, Gates Foundation	Provide new inflows of funds. Bolster countries' capacity in the case of weakest-link RPGs and pool resources for best-shot, threshold, or summation RPGs. Fosters efforts where there may be limited donor spillovers – e.g., region-specific diseases.
<i>Nongovernmental Organizations:</i> Red Cross, Medecins Sans Frontieres, Greenpeace	Address specific RPGs – disaster relief, preservation of ocean ecosystems, immunization, and refugee relief. Champion specific RPGs.
<i>Bilateral Donors</i>	Support complementary NPGs and RPGs. Also support multilateral agencies, regional development banks, and networks.
<i>Nation-Based Organizations:</i> Centers for Disease Control (CDC), National Institutes of Health (NIH), Pasteur Institute	Support various health-related RPGs – outbreak surveillance, data collection, disease isolation, and vaccine development. Interest in infectious diseases with donor country spillovers.