

Influencing Infrastructure Performance through Cross-Border Networks of Regulatory Agencies

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Abstract

Increasingly, networks of sectoral regulatory agencies in telecommunications, energy, transportation, and water have been providing regional public goods (RPGs). Developing countries especially stand to benefit from shared resources permitted by the provision of RPGs. RPGs are typically facilitated by regional networks and include data sharing for benchmarking, best practice techniques, capacity building and training, development studies, and the facilitation of events and meetings. The development of transnational networks and the RPGs they provide appears to be a strong answer that would encourage regional infrastructure development. The effects would be most noticeable in developing countries that face capacity, resource and financial and other constraints to national infrastructure development. The success of cross-border provision of public goods, however, may prove to be challenging, because of issues that arise with the provision of public goods. These problems include adverse selection, moral hazard, the prisoners' dilemma, and free-rider problems. Generally, any kind of problems having to do with collective action agreement, such as agreements on data collection standards, cross-country conflict of regulatory policies and legislation form noticeable obstacles to successfully providing cross-border public goods. Improving the provision of cross-border public goods may only be achieved by tackling provision problems that are not only financially related, but from the production end as well.

Keywords: Regional public goods, regulatory networks, collective action, provision problems.

1. Introduction

Infrastructure development in the form of telecommunications, energy and water are essential to encourage and maintain economic development. Over the last decade and extending into the current one, developing countries have focused increasing attention and resources on improving and reforming these sectors as a means of developing sustainable growth within each nation. Much emphasis has been placed on improving the physical aspect of networks, but as much effort has also been placed on providing autonomous, transparent, and effective regulation of these traditionally public utilities

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once they were privatized. According to Brown, Stern, Tenenbaum and Gencer (2006, p. xi), between 1990 and 2006, more than 200 regulatory commissions were created worldwide. Traditionally, these utility regulators were national regulators whose jurisdiction did not extend beyond the nation's geographical limits. In addition advances in sectoral utility provision make it possible to develop effective and strong network infrastructure in developing countries. For instance, advances in technology have created the opportunity for developing nations to create effective information infrastructure, and advances in wireless telecommunications technologies are offering opportunities to build interconnections with parts of the world that could not formerly afford to develop or build access to basic telecommunications. The creation of an effective cross-boarder infrastructure, however, requires the resolution of certain, cultural, political, sociological and economic matters. (Riggs, 1996) Included among these is the cross-border regulation of RPGs. Developing countries especially stand to benefit from shared resources permitted by the provision of RPGs. Regional institutions are perceived to be better able to overcome capacity problems, informational and financial shortcomings by pooling and sharing resources. Even in the absence of significant resource limitations, countries could benefit from regional cooperation, because globalization has resulted in greater interdependence among people across borders. (Kaul, Conçeeicao, Le Goulden, and Mendoza, 2003) For instance cellular phones could not be used internationally without the harmonization of standards and digital formats that permit network compatibility. In 1994 the Southern Africa Transport and Communications – Technical Unit (SATCC-TU) in recognition of the importance of enhanced regional cooperation began an initiative to encourage greater harmonization among member countries, with a view to developing common standards, developing and maintaining common facilities, sharing expertise, and generally moving towards an environment that would enable regional integration of markets to progress. (Goulden and Msimang 2005). RPGs are typically facilitated by regional networks and include data sharing for benchmarking, best practice techniques, capacity building and training, development studies, and the facilitation of events and meetings. The development of transnational regulatory networks and the RPGs they provide appears to be a strong answer that would encourage regional infrastructure development. Sandler (2006) provides a detailed description of the supply of transnational and regional public goods, but the role of regional regulatory networks and the goods they provide are not as well documented.² The effects would be most noticeable in developing countries that face capacity, resource and financial and other constraints to national infrastructure development. The success of cross-border provision

² According to Berg and Horrall (2007), since 1990 17 associations that provide RPGs have been formed including SATRC (South Asian Telecommunications Regulators' Council), IRG (Independent Regulators Group), ARIAE (Asociación Iberoamericana de Entidades Reguladoras de la Energía, Latin-American Association of Regulatory Agencies for Energy), TRASA (Telecommunications Regulators Association of Southern Africa), Regulatel (Foro Latinoamericano de Entes Reguladores de Telecomunicaciones) SAFIR (South Asia Forum for Infrastructure Regulation), AFUR (African Forum for Utility Regulators) CEER (Council of European Energy Regulators), ERRRA (Energy Regulators Regional Association), ADERASA (Association of Water and Sanitation Regulatory Entities of the Americas), OOCUR (Organisation of Caribbean Utility Regulators), ERG (European Regulators Group for Electronic Communications Networks and Services), ARICEA (Association of Regulators for Information and Communication Services of Eastern and Southern Africa) with COMESA, EAPIRF (East Asia and Pacific Infrastructure Regulatory Forum), and RERA (Regional Electricity Regulators Association), Southern Africa.

of public goods, however, may prove to be challenging, because of issues that arise with the provision of public goods. These problems include adverse selection, moral hazard, the prisoners' dilemma, and free-rider problems. Generally, any kind of problem having to do with collective action agreement, such as agreements on data collection standards, cross-country conflict of regulatory policies and legislation form noticeable obstacles to successfully providing cross-border public goods. Improving the provision of cross-border public goods may only be achieved by tackling provision problems are not only financially related, but technical (production related) in nature as well.

While there is a lot of research on the issues associated with cross-border public goods, more focus has been given to global public goods, and where RPGs are discussed, they are not usually in relation to infrastructure related products. The use of collective action in the provision services, and in the use of resources are becoming very attractive particularly to developing countries with less than ideal telecommunications, water, transportation and energy sectors. As a case in point, in 2005 a workshop called Knowledge Sharing for Development: Africa Regional Program was held in Cairo, Egypt. The purpose of the workshop was to explore tools for research communication and knowledge sharing challenges, and to build relationships among professionals with similar interests in research communication and knowledge sharing. Included in the workshop, was a session on how regional and international networks function. (Global Development Network, 2005). Improving our knowledge of RPGs and the challenges they face is essential to improve production and supply within regions that could benefit most from cross-border collaboration of this nature.³ A discussion of these infrastructure related RPGs is necessary to broaden the awareness of some of the issues that are specific to these types of goods and to encourage further attention and discussion.

The rest of the paper is as follows: Section 2 discusses the need for regional regulatory networks and Section 3 clarifies the definition of RPGs. Section 4 and 5 discuss the financial and technical problems associated with the provision of infrastructure related RPGs and presents the conclusion.

2. The Need for Regional Regulatory Networks (RRNs)

The need for regional cooperation and collaboration among neighboring countries is based on the belief that the right combination of country-based cross-boarder measures can lead to outcomes that are superior to those that could be achieved on the basis of national measures alone. (Ferroni, 2002). The collective provision of a good with the intention that the benefits will be shared among participants put the good in the public domain, and thus explanations for the existence of cross-national regulatory networks are embedded explanations for why public goods exist. Primary among explanations for the existence of RRNs is the failure of national markets to provide the good in question effectively. From a regional standpoint this also explains the need for cross-border regulatory networks in situations where there is a multinational market failure. With increased globalization, boundaries of markets are becoming increasingly blurry and

³As Goulden and Msimang (2005) explain, the ability of regulatory agencies to effectively regulate newly liberalized (telecom) markets depends on the capacity of each country. Given the newness of regulation in many Southern Africa Development Community (SADC) countries, the challenge of developing the human resource capacity to effectively regulate the is acute, making the adoption of a regional approach to dealing with the problem essential.

there are recognizable benefits that can be accrued from cross border interactions and cooperation that could not be autonomously obtained. (Inter-American Development Bank, 2005). For example The South American Regional Infrastructure Plan addresses transportation, telecommunications and energy needs along corridors that would link the continent's countries. There is a strong economic and financial case for the coordination of transport infrastructure among neighboring countries so that remote regions and landlocked countries can have access to urban centers. (Ferroni, 2002). Countries could benefit from significant cost savings and increased reliability if power grids could be integrated so that electricity could be jointly produced and distributed across borders. The international cooperation in the provision of goods is however generally problematic, because countries preferences for cooperation and RPGs may be heterogeneous and thus differing incentives may influence varying levels of participation that has inefficient outcomes. Producing a good that requires collective action also introduces incentives issues such as free-riding. When there are market failures such as this, another source of provision is necessary. Traditionally, the other source of production is believed to be the government. In the case of cross-border production however, governments may not be the obvious solution. A formal facility (RRNs) that can develop and enforce regional policies and actions to ensure adequate input into the provision of cross-border goods becomes essential. RRN are suited for this role, because they are structured to monitor compliance with normatively and coercively sanctioned expectations.

Even in cases where infrastructure related goods are not shared physically by countries, regional regulatory networks are important to facilitate the sharing of knowledge, information and experience as a means of improving national infrastructure. In other words, cross-border regulatory networks could be viewed as a regional public good itself, in the sense that it provides services across borders that are at least partially non-rival or only partially exclusionary. For instance, the Asian Regional Consultation on Work of the International Task Force on Global Public Goods met at the Asian Development Bank (ADB) headquarters in 2005.

As a result of this meeting, members of the task force had the opportunity to gain a new understanding and new perspectives on the challenges and opportunities of providing RPGs. (van der Linden, 2005) The public good provided by RRNs crosses national boundaries, but their benefits may be national in the form of the modernization of a country's infrastructure (including energy, water, and telecommunications) that is necessary for sustainable economic development. Networks of regional regulators are therefore important for complementing or encouraging physical network development, by facilitating the sharing of knowledge and experience among regions that share similar experiences and challenges. RRNs can influence decision making in infrastructures within regions and create opportunities for countries to explore common issues more effectively. (Berg and Horrall, 2007).

RRNs are essential for standardizing policy within regions that share network (such as an information highway, pipelines used for transportation of oil), or that are joined economically. For instance, the emergence of the European Union (EU) necessitated the creation of formal agencies with the power to develop appropriate rules that would encourage compliance within member states. RRNs, in this case were essential to coordinate the regulatory activities of EU member nations, thereby facilitating uniform and standard agreements on broad policies.

3. Understanding Regional Public Goods (RPGs)

The definition of a regional public good can be derived from the standard textbook definition of a public good. A good is considered to be public if it is non-rival in its consumption and non-exclusionary in its benefits. (Kaul et al, 1999). As an extension, a regional public good is a service or resource that is consumed across national borders and whose benefits are therefore shared by neighboring countries and are non-rival in consumption and non-exclusionary in benefits. Regional public goods fall between national or local public goods and global public goods. The non-rival property implies that the consumption of the good by individuals within a single nation does not lower or mitigates the consumption of the same good by other individuals within a different country, because one country's consumption does not lower the supply of the good. The non-exclusionary property suggests that it is difficult or impossible to prevent any country within the region from enjoying the benefits of the good. Usually non-exclusion of benefits means that an effective price cannot be charged for the use of the good. Goods that satisfy both properties are called pure RPGs and include services such as public pronouncements and best practice laws and procedures that are not provided by state governments, but by RRNs.⁴

If the good is either partially non-rival or partially non-exclusionary, or lacks any one of the two properties, then the good is considered to be an impure RPG. Congestion effects might be important where scale economies are involved in the production of the RPG. For instance the use of satellite in telecoms in communicating across border will be subject to interference and static if there is congestion, and the good is no longer available to everyone. Satellite communication, however are exclusive since users pay a charge per unit for its use. Regulatory networks RPGs that are excludable include benchmarking data. Capacity building is an example of an impure RPG with some rivalry of benefits.

Many infrastructure related RPGs are not completely non-rival or non-exclusionary, but the publicness of goods tends to be dynamic, so that a regional good with public properties could emerge as a private good in the future. Likewise a regional good that was once considered to be private may emerge as a RPG probably by design or due to the fact that technologies change overtime, and influences how the good is produced. (See Kaul, 2003). The dynamic nature of public goods forces us to contemplate the definition of RPGs not based only on consumption properties (non-rival and non-exclusionary benefits), but based on production technology as well. Regional public goods may be considered to be public goods because their production requires collective action, and are thus dependent on regional cooperative efforts.⁵ The role of RRNs becomes very important when this view of RPGs is considered. As Kaul (2004) suggested, in cases like this the role of national governments may be only to provide incentives and support to individual nations in aligning their private interests with the regions overall policy goals and objectives. Based on this view, regional public goods

⁴ See Berg and Horrall, 2007 for definitions of various infrastructure related RPGs.

⁵ The Inter-American Development Bank (2005) defines a RPG as any good, commodity, service, systems of rules or policy that is public in nature and that generates shared benefits for the participating countries and whose production is a result of collective action by the participating countries. The regional dimension of the definition is important, because if countries do not cooperate to produce the good, then it is not an RPG even if the benefits of the goods are shared once it is produced.

may be considered as regional collective action goods that are put in place by state or non-state actors (in the form of regulatory networks) to encourage certain behavior by countries.

In summary, public goods are RPGs if their benefits or costs extend beyond the borders of countries within certain geographical locations

4. Facilitating infrastructure through Regional Regulatory Networks

Encouraging infrastructure development through the use of RRNs can be viewed as synonymous with facilitating regional collective action, since RRNs usually take the form of groups consisting of representative member nations that must come to agreements on issues including the nature of the provision of infrastructure, information sharing, capacity building, and the development of broad policy objectives. Because the provision of the RPG is dependent on cross-country cooperation, collective actions will create challenges in the provision of the good that are not limited to a single country or group as with private goods. Challenges associated with the provision of RPGs emerge on both on the production as well as the resource ends, primarily because the provision of a good that has cross-border benefits (and costs) – whether among states or private actors – usually involve actors with national self interests instead of regional goals and objectives. Countries with greater influence will promote policies that benefit their country the most. Likewise collective action production processes encourage free-rider problems. The production of the RPG may therefore be undersupplied as some countries that consume the non-exclusive good will chose not to contribute to its production in the hope that other countries will. RRNs could respond to the free-rider challenge by instituting mandatory participation in cases where the free-rider can be distinguished from situations where contributions are low or non-existent because recipients (countries) place very little value on the good that is being produced. Differential preferences across countries could make this distinction unclear. At the knowledge sharing workshop in Cairo in 2005, participants identified some inhibitors to the proper functioning of regional networks. Among the challenges identified were conflict of interest among network members, unequal power relations, lack of commitment, unequal representation, hidden agenda, high membership fees, language barriers, the inability of networks to adjust to the changing environments, the lack of encouragement from local institutions to form new or to support existing networks, inadequate resources and lack of know-how and strategies to approach potential networks or partners. (Global Development Network, 2005). This section is devoted to analyzing the resource concerns (financial and technical) that are represented on this list of inhibitors, but many of the other challenges mentioned will also be discussed since the source of the problem may lie with the inadequate supply of resources.

Production (Technical) Challenges

As indicated before, RPGs are public in part because they have to be produced through regional collaborations or cooperations. RPGs are collectively produced because they cannot be (or are not) adequately produced through domestic policy alone. Individual country network participants recognize the need for international level cooperation even though such cooperation can give rise to productive incentive problems. The production methods or technologies that are involved in the creation of infrastructure

related RPGs can be described primarily by the weaker link, summation, weighted sum, threshold, and better shot, aggregation technologies. (Berg and Horrall, 2007). Each of these production processes possess advantages, but there are also challenges for the adequate production of infrastructure related RPGs. Table 1 outlines the characteristics and production related problems of infrastructure related RPGs.

With the *weaker link* technology, all participating countries contribute to the production of the RPG, but the quantity and quality of the public good depends mostly on the smallest level of country contribution, with contributions that exceed the minimum level adding to the impact of the RPG at a diminishing rate.⁶ Individual country contribution is therefore likely to vary within a region as some countries may have different willingness or ability to contribute (financially or otherwise). In other words, there might be a weak link that does not pull its weight. Heterogeneous contribution levels result because the benefits of a RPG will vary across countries, depending on country specific situations. For instance, as Berg and Horrall, 2007 pointed out, unanimous public pronouncements will depend heavily on the views of countries with the least interest in the topic. This kind of adverse selection results in the quality of the good being biased towards the country with the least interest, unless a way is found to cushion this bias. The most eager contributors to the RPG are not the countries with the strongest infrastructure or the ones with the most resources, but rather countries that are most wanting in the knowledge, the regimes, the standards and the rules that are required to challenge common or cross-border issues in infrastructure. It is possible for shortcomings in the participation of one country to be cushioned by the contribution of others when the weaker link technology is relevant, but usually only in part, because increasing amounts of contributions have successively smaller and smaller impacts on the production of the RPG. The low quality contributors crowds out high quality contributions, because there is a high cost associated effort. Countries that invest heavily into contributions are not likely to see the returns on their investments, because the quality and quantity of the good that is produced jointly is to a large extent only as good as the weakest link. That is, countries with the least to contribute will have the most influence in determining the output. In cases where adverse selection is particularly serious, regional regulatory intermediaries can be beneficial and are needed to create guidelines and provide appropriate incentives for stronger participants to assist weaker links. The use of an independent intermediary (RRN) may reduce the influence of self-seeking behaviors of politicians as well as non-state actors interventions, especially when the provision of the RPG involves intergovernmental participation.

Each country or participant is required to contribute to the production of the RPG with the *summation* technology. The total amount of the RPG produced using this process therefore equals the sum of the contributors from all the participating countries. (Sandler, 2003). The strength of the summation technology depends completely on cooperation to increase the benefits of the solution to a problem or opportunity, so that the collaborative efforts will yield greater benefits to every country. (IDB, 2005). As an example, recent national network news can be disseminated across countries that would augment the experience of regulators in other countries to understand the implications of new rulings (Berg and Horrall, 2007). In the case of communications, the quality of a regional informational infrastructure will depend on the quality and quantity of basic networks in

⁶ The definitions of aggregation technologies used are based on Sandler, 2006.

participating countries. Many developing countries, however, lack the some of the basic components that are essential for the working of such an infrastructure, and so the working of the regional infrastructure is inhibited. In cases like this, it might be necessary for regional intermediaries to intervene and provide support to countries in which the infrastructure or resources that are needed to provide the RPG. It could be beneficial to all countries if the technically stronger countries assist the weaker countries as a means of improving the overall quality of the regional good. (Kaul, 2004) The right incentives have to be in place for the stronger providers to assist the weak links in the production process. The quality of the RPG might be lower than the average expectation if the countries self-selected (adverse selection), so that only countries with the most need for the RPG participates in its production, because their perceived benefits from collaboration are large relative to those perceived by countries with greater technical (and financial) resources. The latter group may choose not to participate in the production of the RPG, causing its quality to be lower than if the group of participating countries included the stronger players as well as the weaker links.

The *weighted sum* process of producing RPGs occurs where the total amount of the RPG produced is the weighted sum of each country's contribution to the good. All countries have to make a contribution financially or in the form of specific behavior in order for the good to be produced. For instance, regulations or laws, that allows the collection of quality data from one country which would serve as a model for other nations, thereby giving data from that country greater weight than data for other countries. For instance, in southern Africa models of telecommunication production policies are usually adapted from South Africa thereby giving processes utilized by that country more weight. This happens mainly because South Africa in the past decade tend to be ahead of many of the other nations in Sub-Saharan Africa in terms of telecommunications infrastructure development, but as a result South Africa gets to have

Table 1. Characteristics and Production Related Problems of Regulatory Network Regional Public Goods

Pure RPG	Impure RPG (excludability)	Club Good (impure with some rivalry of benefits)	Aggregation Technology	Production Problem
		Events and Meetings	<i>Weighted-Sum</i>	<i>Moral hazard</i>
	Benchmarking Data		<i>Threshold</i>	<i>Free-Rider</i>
Public Pronouncements			<i>Weaker Link</i>	<i>Adverse Selection</i>
	Stakeholder Material	Capacity-Building/ Training	<i>Better-Shot</i>	<i>Prisoners' Dilemma</i>
Best Practice Laws, Procedures & Rules			<i>Better-Shot</i>	<i>Prisoners' Dilemma</i>
Network News			<i>Summation</i>	<i>Adverse Selection</i>
Studies			<i>Weighted-Sum</i>	<i>Moral Hazard</i>

a stronger voice that countries that are struggling more with infrastructure development issues.

Because of the difference in contributions across nations that occur when the weighted sum production process is utilized, differential impacts of country contributions results, which could negatively impact incentives to contribute or participate. Incentive problems can be perceived in situations where data rich countries may have little interest in participating because incremental benefits from obtaining data from other countries may be minimal.⁷ Countries that are unlikely to derive enough benefit from the RPG are less likely to contribute to its provision. Issues of moral hazard may emerge for RPGs that utilize the weighted sum production process. Countries with the most resources or are not as susceptible may not be interested in participating because they have less need for the RPG. Other countries may not take the appropriate amount of action because they know that if their contribution is small or suboptimal, it will carry very little weight. States may be less careful in terms of capacity development, or data gathering for instance, which results in a lower likelihood that the product will be produced in adequate amounts or quality, since the offending states realize that they will be protected by superior contributions which carry more weight, and which in the case of some RPGs such as rules and regulations, may be adopted. That is, if practices developed by individual nations are not appropriate or adequate, the country can simply adopt best practice models developed by a dominant country. This option may reduce the incentive for countries to pull their weight. Even the dominant nation may have a low incentive to “take care”, because the benefit from such care is shared, while the incremental cost is borne largely by country alone, when its contribution to the RPG is weighted more heavily than the contributions of others. In addition the problem of moral hazard may be compounded in the absence of significant heterogeneity of contributions. If country contributions are similar, there may be no dominant contribution and the RPG produced may be inferior. There is therefore a tradeoff because the existence of a dominant player can change the incentives of other nations to contribute, while the absence of a primary contributor may result in lower public standards.

In some instances, the total supply of the infrastructure related RPG relies mostly on the strongest (largest) contribution, with the importance of each remaining contribution diminishing with its size. This process of RPG production is known as the *better shot* production technology. As long as one country provides best practice examples, others could benefit by adding incrementally and thereby benefit from information sharing. The best practice may be in the form of general network policies or approach that works well. Problems arise with this production process, because the uniqueness of countries even within particular regions could reduce the usefulness of best practice methods and some countries may not benefit from adopting generic approaches. The fear that the one policy fits all approach may not work in individual countries could discourage countries from departing from the current norm. Countries may be unwilling to invest in improvements that could generate payoffs that are too small. Where incentives are sufficiently strong, RRNs could facilitate opportunities for countries to pool resources regionally, while

⁷ Positive incentives to contribute are also possible. In the case of data sharing, the dominant country could enjoy substantial benefits since standards used by the data-rich country tend to be the model that is adopted. The dominant country, therefore incurs no additional costs in order to modify its old model or to adopt an entirely new template.

encouraging the strongest participant to provide the good. The structure of the better shot aggregation technology encourages smaller contributions from nations with less resources, or know-how, which especially from a resource standpoint improves the opportunity for a country with limited contribution to gain as much benefit from the RPG as another country with significant contribution gains. The problem, however, is that the diminishing importance of smaller nations contributions can result in their voices not being heard. As Kaul et al, (2003) puts it, the decision making process of some (globally inclusive) public goods exclude some of the people that are affected by a good's spillovers, or where they are included, their full participation is not ensured in the decision making process. If there is insufficient representation from these "weaker" nations, they may be ignored and insufficient attention will be given to issues that are relevant to them, hence reducing the effectiveness of the RPG, and at the same time create a lack of incentive for cooperation from the underrepresented nations. In other words, the better shot aggregator may result in a variation of the prisoners' dilemma, in that the outcome from regional collaboration may not be Pareto efficient. A Pareto improvement to the outcome using this technology is possible, since smaller contributors could benefit more from the RPG if their voices could be heard, without diminishing the benefit of the RPG to the region.

The other primary production technology for infrastructure related RPGs is the *threshold aggregation* method. Where this method of production is utilized, the benefits of the RPG can only be achieved after a certain level of RPG supply is achieved. For instance, if cost data that is used for cost-based tariff setting for telephone and internet service is not of a certain quality (for example, if it is not disaggregated enough), then the data is relatively useless. The information must achieve a certain standing for it to be useful. The challenge with this production technique as it relates to data collection has to do with the difficulty in making data collection standards, such as common definitions, auditing procedures and validity checks. The interdependence that is inherent in the threshold technology is particularly susceptible to free-rider problem: One country might decide that the amount contributed by other countries is sufficient and that it would therefore be unnecessary for that country to contribute anything at all towards the RPG. The most desirable outcome (threshold) is unstable, because each country has an incentive to cheat. A small contributor may have the incentive not to put the effort into contributing what they may perceive as irrelevant to achieving the desired threshold, or unsubstantial relative to the contribution of others. Otherwise, some countries might have the incentive to lower individual contributions, as a means of lowering their costs, and maximizing their benefits when the desired level or quality of the RPG is achieved. If enough countries adopt this strategy, then the outcome is as in the prisoners' dilemma where the final achievement is smaller than what is desired or truly achievable.

Financial Challenges

Funding public goods that are shared by different countries is difficult because countries place different valuations on the benefits of cross-national cooperation. This makes the influence of Regional Development Banks (RDBs) and international organizations important catalysts of collective action (Ferroni, 2002). Empirically, seed money for the creation of infrastructure related organizations (particularly in developing regions) are generally funded through international and regional development assistance,

whose financing are usually voluntary.⁸ For instance South Asian Telecommunications Regulators' Council and Telecommunications Regulators Association of Southern Africa are just two infrastructure related organizations whose developments were encouraged by the ITU. The World Bank also provides financial assistance to numerous RRNs including the South Asia Forum for Infrastructure Regulation, the African Forum for Utility Regulators, and the Association of Water and Sanitation Regulatory Entities of the Americas. Regional funding agencies include the South African Development Community and the European Commission. There is also evidence of funding through public private partnerships, such as the Public Private Infrastructure Advisory Facility, usually in conjunction with the World Bank, national governments contributions and private sources. Regional funding agencies especially are uniquely positioned to provide funding for RPGs, because such agencies tend to have longstanding relationships with the countries. The regional development funding agencies specialize in fostering or supporting regional cooperation, and therefore have the experience that would help to generate and transfer adequate funding of RPGs production. (IDB, 2005). Financial problems associated with RPG production include the obvious lack of money to finance projects, but could also exist due to issues with the institutions that provide funding, the approach required for payment of benefits of the RPG and the divergence of means across countries.

Limited national financial resources: The stimulus for the development of regional regulatory networks that provide infrastructure related RPGs often come from outside agencies because one significant obstacle to facilitating cross-border cooperation is the lack of financial resources. Many developing countries do not have the where-with-all in terms of economic resources to acquire the systems that are needed to improve network infrastructure in their country. The success of collaborations is hindered by the inability to establish a funding source that will sustain network operations. In addition, while the benefits of sharing are obvious, many countries do not have the money to acquire the necessary inputs to take advantage of opportunities. As Riggs, 1996 argues, electronic networks are connecting on a daily basis with each other throughout the world, and with advancing technology it has become possible to create effective information infrastructures in developing countries to become part of a global information infrastructure. Such an information infrastructure, however, requires not just software and hardware, but physical, financial, and human resources as well data or knowledge. Some developing countries lack at least one of these components and could therefore benefit from sharing resources with countries that are close by. The lack of financial resources is evident in other national sectors as well and inhibits the benefits that can be gained from cross-border collaborations.

Funding institutions: Because funding for RPGs are primarily voluntary, uncertainties are created in the budgets of international organizations in the absence of cross-border financial intermediaries who could ensure financial commitment to contributions. The

⁸ Ferroni, 2002 argues that countries' recognition that national advantages could be maximized by using the right combination of national and regional policies is not sufficient to overcome the challenges of collective action. Regional development banks are therefore important organization that can act as catalysts of collective action that is needed in the production of RPGs.

conflict of interest that exists between the regionally desirable contribution to the RPG and the optimal commitment of individual countries circumvents the implementation of a Pareto optimal solution to the financing of RPGs. As a result there is a need for an independent institution that can enforce contributions and issue sanctions to violators. The use of institutions with authority to enforce payments is fairly straightforward in the case of national public goods, because government institutions are typically in place that has the authority (using the laws of the country) to back up enforcements. (Gerber, and Wichardt, 2007). With cross-border public goods, however enforcements are more complicated, because even where international intermediaries exist, there are often no common laws that exist to back up enforcements.

Individual regions are, however beginning to take the initiative to address financial concerns. In 2004 for example, the board of executive directors of the Inter-American Development Bank (IDB) approved the Initiative for the Promotion of Regional Public Goods. The bank made up to \$10 million dollars in resources to finance projects that support the development of RPGs in Latin America and the Caribbean. By taking this initiative the IDB is embracing the notion that rather than depending on international organizations, regional cooperation can be effectively address some of its problems. Many concerns and opportunities shared by countries within a region can addressed more effectively at the regional level, through cross-border cooperation in the production of public goods. RPGs are however sometimes under supplied because there is much difficulty in obtaining financial and institutional support for the regional effort. Countries are concerned about the possibility of subsidizing free-riders, since the RPG will benefit everyone regardless of their support. This requires the intervention of an appropriate regional organization to fund (and to encourage dialogue and action) at least at the early stages of a RPG production. (IDB, 2005).

Payment Approach: Financing of RPGs may be via loans or grant-based funding from regional and international agencies. Often countries are required to pay on the basis of their ability to do so, and in other circumstances RPGs may be financed from private contributions. Grant-based funding and loans are means through which the development banks can contribute to the provision of the RPG. Grants can be problematic when the RPG being produced generates free-riding. Non-paying parties cannot be excluded from the benefits of the public good so much care has to be taken with their allocation governance and management (Ferroni, 2002) to help mitigate moral hazard concerns. The problem with the use of loans by individual countries to finance RPGs is that the benefits from the investment that the loan financed are shared by all participating countries, while the borrowing country is responsible for the costs of the loan. The divergence between the beneficiary of the loan and who bears the burden of the loan can discourage countries from utilizing this method of financing.

Where contributions to the budget of cross border institutions are based on a country's ability to pay, counties with very limited financial resources may enjoy the benefits of the RPG for free. A more rigorous financial agreement that includes specific user fees, that essentially converts the RPG to a club status in some cases is essential to ensure financial stability in the provision of the public good. In recent years increased strain on water resources in Africa motivated actions that would protect and sustain the quality and quantity of water sources such as the river Nile. Approaches for water

protection involve services that are provided by regulatory networks with jurisdiction within countries along the Nile. Protecting the water source could generate public goods that are not whose benefits are unevenly spread across countries regionally. (Jäkerskog, A, J. Granit, A Risberg and W. Yu, 2007). For instance, policies that improve downstream irrigation potential or improve downstream drinking water obviously give greater benefits to downstream countries, compared to countries that are located further upstream the Nile. This raises the issue of whether the downstream countries should pay more or whether financial contributions should be based on ability to pay, since the primary beneficiaries of the RPG probably cannot afford to pay fully for the value of the benefits derived. That is, the economic status of the benefiting country could mitigate the financing approach that benefiting countries should be responsible for the bulk of the costs associated with the RPG's production. Gerber and Wichardt, 2007 proposes a two step process to address the financial challenge in public good provision so that even in cases where payments are based on the ability to pay, the incentive to free ride would be removed. In this model, beneficiaries must commit to the RPG by paying a deposit to a neutral institution prior to the country making its contribution for its share of the public good. As an incentive to contribute, participants would be refunded their deposits (minus minimal fees) once their financial contribution to the RPG has been made. Of course the deposits would have to be sufficiently large to ensure that the depositing country desire its return.

Funding from international and local investors is not uncommon in the production of RPGs. Often the private investor has some individual objectives that could be helped by ensuring a quality RPG. According to Kaul et al, 2002, responsibilities for providing and financing public goods in the areas of communication and transportation are often based on a mix of public and private financing. For instance, between 1998 and 2003, cellular service in the SADC grew from 2.9 million connections to 21.5 million connections. This significant growth in cellular service was funded by a consortium of domestic and foreign investors. At the same time, growth in communications services including the internet, data communications and the provision of customer premises equipment is largely a result of private financing. (Goulden and Msimang 1996)

Incomes: If income levels differ significantly across countries within regions, that at the same time have heterogeneous preferences, the RPG produced could be biased toward the preferences of countries with greater financial means. Richer countries are usually the ones that have the financial means to support their policy preferences for instance and to contribute financially towards policy reform in developing countries. The louder voice of a country due to its financial advantages can result in the adoption of policies that are not based on regional consensus.

5. Concluding Observations

The increased porousness of our borders and the challenges faced by many countries in the pursuit of infrastructure reform and development have fostered a new way of thinking that is regional, rather than completely domestic in nature. However, understanding RPGs and using them to the advantage of regions is very daunting, so problems associated with the production and delivery of infrastructure through the sharing of resources and regional collaborations is growing in importance across the world. The major

impediments associated with the direct provision and supply of RPGs is similar to the ones that result in the public provision of domestic or local public goods. These problems are incentive related and include adverse selection, moral hazard, free-rider issues and the prisoners' dilemma. Production challenges of this nature are complex as they involve both national and regional concerns. Another important obstacle to the provision of RPGs is the availability of financial support for the production of the RPG. Financial concerns have much to do with the inability of some countries to contribute to production. Funding sources exist from regional and international organizations, national governments as well as from the private sector, but adequate cross-border cooperation still remains a challenge that must be addressed.

The presence of an independent intermediary such a regional regulatory network is essential to facilitate the production and the financing of infrastructure related RPGs. RRNs in their role as facilitators is itself a public good and therefore RRNs may be viewed as RPGs as well. Capacity building remains an issue for newly formed networks with limited resources. The need for regional cooperation in the sharing of information, knowledge and experience is essential to develop the quality of RRNs and to improve the provision of the RPGs that they provide.

The technical and financial problems associated with infrastructure related RPGs, and the need for well trained and experienced RRNs are only a subset of the vast array of concerns that must be addressed. Chief among them is the fact that successful regional cooperation requires the development of a clear strategic plan-much like a white paper-that must be followed in setting the direction of regional policy. National incentives must be aligned with regional objectives in order to improve the success of RPGs provision. If countries believe that regional cooperation will generate benefits that could not be achieved autonomously by that country, then countries will the incentive to take advantage of regional initiatives that could increase benefits and reduce the costs of cross-border interactions. Understanding the nature of RPGs and the challenges that they create is a first step in developing solutions that would take full advantage of the use of regional cooperation to build capacity and to reform, modernize and further develop infrastructure within regions.

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