



Disaster Preparedness and Recovery: A Priority for Telecom Regulatory Agencies in Liberalized Environments

Dr Rohan Samarajiva, Professor

Delft University of Technology, Netherlands

LIRNE.NET, Economics of Infrastructures Section, Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, Netherlands.

Voice: +31 15 278 6427; Fax: +31 15 278 7925;

E-mail: samarajiva@lirne.net

Abstract

Telecommunications infrastructures are assigned a special position in policy partly because of their important roles in the everyday functioning of society. In addition to the direct effects of loss of service, failure of the telecom infrastructure cripples coordination capabilities, significantly hindering rescue and recovery operations. Effective disaster preparedness and recovery is a socio-political objective that any government must attend to, under whatever industrial structure. In the case of government- or private-monopoly provision, the government may issue general directives to the management, directly intervene in management functions under "emergency" conditions, and assume all or the bulk of disaster recovery costs. In the "new" order of private provision of telecom services, a different response is required.

Disaster preparedness and recovery by private operators cannot be ensured through licenses or concessions alone. The impossibility of making long-term concession agreements that address all possible contingencies applies with amplified force to disaster-related provisions. Therefore, independent regulatory agencies are a part of the solution. A regulatory agency's responsiveness can also yield much needed legitimacy. Disaster management is a regulatory activity that extends benefits beyond the relatively privileged minorities that have access to telecom networks in most developing countries.

This paper addresses the theory and practice of regulatory intervention in disaster preparedness and recovery drawing from the experience of a major pilot study conducted by the Telecom Regulatory Commission of Sri Lanka with the support of ICO Global Communications in 1998-99. The elements of effective design of appropriate legislative and license provisions are discussed in relation to weaknesses identified in provisions that are in place in Sri Lanka and elsewhere. Issues of cost containment of disaster preparedness and recovery measures and the allocation of responsibilities and risks are delineated. The benefits of competitive markets and new technologies such as GMPCS for effective use of telecommunications in disaster management are identified, as are the special problems.

Keywords: telecommunications, disasters, emergency, regulation

1 Introduction

Telecommunications infrastructures are assigned a special position in policy partly because of their important roles in the everyday functioning of society. The best way to appreciate that role is to experience or imagine the effects of a disaster that partially or completely affects the telecom infrastructure. In addition to the direct effects of loss of service, failure of the telecom infrastructure cripples coordination capabilities, significantly hindering rescue

and recovery operations. Repairs to other infrastructures, usually also affected by disasters, are difficult to conduct in the absence of a working telecom system.

Governments and international organizations have always assigned importance to infrastructure development. The failure, in most parts of the developing world, of efforts to build up universally available and reliable telecom infrastructures within a framework of government monopoly led to a focus on private participation in infrastructures in the last few decades. The present period is one in which a "paradigm shift" away from government-monopoly supply has been completed in telecom. For example, 98 countries privatized their government-owned telecom operators in the past decade (ITU, 2001). Institutional reforms usually include three components, implemented simultaneously or in staggered order: organizational reform of incumbent operator, including privatization; introduction of competition in the entirety, but more commonly parts, of the sector; and the creation of independent, or at least separate, sector-specific regulatory agencies to oversee the reformed sector. The primary purpose of these new agencies, especially in developing countries, is to provide stability and certainty to the new private investors against arbitrary takings by the government (Levy & Spiller, 1994). However, all regulatory agencies are assigned multiple functions that fall under the broad headings of regulation to create and maintain conditions for competition, regulation of oligopoly/monopoly and regulation to achieve social-political objectives (Prosser, 1997).

Disaster preparedness and recovery is an important socio-political objective, which has significant effect on the other regulatory functions. This paper examines the theory and practice of regulatory intervention in disaster preparedness and recovery. It seeks to identify the elements of effective regulatory responses to disaster preparedness and recovery by analysis of the findings of a pilot study on the use of telecommunications in disaster and emergency situations in Sri Lanka. The study was conducted in 1998-99 by the Telecom Regulatory Commission of Sri Lanka and was funded by ICO Global Communications, a satellite phone (GMPCS) operator based in the UK. The conclusions are directly applicable to developing countries with poor governance but may be of some value to development of effective

disaster management in infrastructure sectors in developed countries as well.

2 The rationale for disaster preparedness/recovery regulation

Effective disaster preparedness and recovery, especially of critical infrastructures such as telecom, is a socio-political objective that any government must attend to, under whatever industrial structure. In the case of government-monopoly supply, the government may issue general directives to the management, directly intervene in management functions under "emergency" conditions, and assume all or the bulk of disaster recovery costs. In ideal circumstances, there would be no need for additional oversight to ensure proper disaster preparedness or recovery behavior by management because they implement the will of the government. However, in reality and as postulated in public-policy theory, government, the "principal," has difficulty ensuring the implementation of its wishes by the management of the monopoly, the "agent." Monopoly managers are subject to multiple incentives and may neglect their disaster preparedness and recovery mandates, which, after all, are rarely noticed in normal times. Therefore, even in the countries still remaining under the "old" order, there may be need for "regulatory" oversight of infrastructure operators from special emergency managers or legislative committees, if not from formal regulatory agencies.

In the "new" order, no single operator has all encompassing power over a sector that can be expected to prepare for, and recover from, disasters. In addition, all operators, including the former monopolist, will now claim that they are driven by the "bottom line," and cannot expend resources on activities that do not contribute to profit. They will also resist presumed interference in management by government. It is possible to envisage market pressures yielding adequate disaster preparedness and recovery in competitive conditions (consumers with complete information and easy exit and entry). Because customers value reliable service, including adequate levels of disaster preparedness and recovery, they can be expected to factor this element into their service purchasing decisions. Given the assumptions, they will have enough information about these service qualities, will

be able to exit from under-performing suppliers at little or no cost, and will have alternative suppliers to turn to. However, these assumptions do not hold in infrastructure sectors. In addition, the significant negative externalities of infrastructure failure justify government action. Therefore, regulation of infrastructure providers in terms of disaster preparedness and recovery is justified even after liberalization.

3 Disaster preparedness/recovery regulation under liberalization

Explicit statement of expectations, non-discrimination and fair and consistent treatment are key elements a stable environment for private investment in infrastructure. If government informs all potential investors of its expectations including specified levels of disaster preparedness and recovery capabilities, prior to the investment being made, that can be incorporated into investment decisions. If all competitors are obligated to meet more or less similar standards, there can be no complaint, in that disaster-preparedness and recovery costs become part of the conditions of that market. If the problem can be solved with only these two actions, disaster preparedness and recovery by private operators can be ensured through licenses or concessions alone. However, the impossibility of making long-term concession agreements that address all possible contingencies applies with amplified force to disaster-related provisions. After all, a disaster is, in most cases, an unpredictable and indeterminate event.

Therefore, it is necessary to apply the solution of the independent regulatory agency to the problem of disaster preparedness and recovery. The concession, license, public law or regulation should contain general statements of government expectations regarding disaster preparedness and recovery by private operators. The regulatory agency should have the power to interpret and apply those general principles to specific circumstances. This power cannot be unconstrained because that would lay open investors to arbitrary takings. The power must be exercised in a fair and consistent manner, adhering as much as possible to regulatory best practice that includes reliance on expertise, transparency, the public interest and the communication

thereof (Samarajiva, 2000a). The qualification, "as much as possible," is merited because the exigencies of disasters may not allow for ideal forms of consultative decision making.

It has been observed that the responsiveness of government to disasters is an element in the general legitimacy of government. In the same way, a regulatory agency's responsiveness to a disaster can be critical in gaining much needed legitimacy. Disaster management is a regulatory activity that extends benefits beyond the relatively privileged minorities that have access to telecom networks in most developing countries, as pointed out by the Sri Lankan Minister of Telecom:

- The use of telecommunications in disaster management is an effective way of leveraging its potential beyond those who can directly afford it. A disaster team that is properly equipped can help not only the affluent person carrying a cell phone in his briefcase, but also the not so affluent person who does not have a phone in her home (Samaraweera, 1998).

In this context, it is surprising that disaster management does not appear as a regulatory priority in telecom as evidenced, for example, by its absence in the comprehensive list produced at the first ITU Development Symposium for Regulators (ITU, 2000)

4 Case of the Sri Lankan Telecom Sector

4.1 Pre-reform disaster management

The pre-reform period may be seen as made up of two parts. Prior to 1991 a government department supplied telecom services, under the Telecommunications Ordinance, the Administrative and Financial Regulations of the government applicable to all departments, and the directives of the Minister and the Cabinet. There was less than one telephone per hundred inhabitants; service quality was atrocious; and waiting time for new connections, for those unable to bypass the waiting list, exceeded 10 years. There were no specific mechanisms for disaster preparedness and recovery. Normal engineering calculations were used in dimensioning the system, which included

certain redundancy factors. In fact, given the Department's lethargy, around 35 per cent of exchange capacity was perennially unused. In the event of a disaster, the Department responded in normal government fashion: it purchased replacement equipment outside normal procurement rules; threw practically unlimited labor resources at the problem; and restored service as quickly as necessary. The intensity of the response was modulated by the degree of political concern. Not much attention was paid to costs, which were absorbed by the opaque government financial system.

The preliminary phase of sector reforms began in 1991 with a new Act. A regulatory authority, still a government department, was separated from the Department of Telecommunications, which was corporatized and renamed Sri Lanka Telecom (SLT). In its first year of existence, the badly under-resourced Authority issued three licenses, the second being to SLT. The licenses were extremely detailed, extending to 16 pages of single-spaced small-font print. There were 38 conditions that spelled out the obligations of the licensee with regard to matters such as anti-competitive practices, numbering plans, itemized billing and confidentiality of customer information. They were modified versions of the early licenses issued by OFTEL, the UK telecom regulator (Samarajiva, 1997). These three licenses (and most subsequent ones) included several conditions pertinent to disaster management including:

- A condition requiring the licensee to provide public emergency call services to emergency organizations;
- One mandating the provision of maritime and aeronautical emergency service for the safety of life;
- A requirement that the licensee make plans for rapid restoration of services during public emergencies, after necessary consultations with relevant agencies and implement them; and
- An obligation to provide priority fault repair service to emergency organizations.

The Authority did not enforce these conditions. The incumbent operator's compliance actually declined in this period as a result of the discontinuance of the short-number emergency dialing capability.

4.2 Post-reform disaster management

The Sri Lankan telecom sector entered a major phase of reform in 1996-97. In 1996, two fixed operators were licensed to compete with the incumbent in all markets except international. The incumbent was converted from a government corporation to a company named Sri Lanka Telecom Limited (SLTL). In the face of imminent competition, SLTL increased rollout significantly. At the same time, a previously licensed fourth mobile operator entered the market, igniting rapid growth in the mobile market. In 1997, 35 percent of SLTL was sold to NTT Corporation, which was also contracted to manage the company. An amendment to the law in 1996 (implemented in 1997) made the regulatory agency more independent and gave it adequate resources (Samarajiva, 2000b). A new Director General (the author of this paper) was appointed and the professional staff was doubled in 1998.

At this time the Commission sought to enforce license conditions, including those relevant to disaster management. It was found that all parties, including the regulatory agency, had ignored most of the license conditions since the issue of licenses. In the face of a massive enforcement problem, the Commission adopted a multi-prong approach that included tough enforcement of some license conditions (to the point of forcing the incumbent to compensate customers a total of around US\$ 1 million) and educational/persuasive efforts on others. Given the availability of external resources in the form of a grant of around US\$ 12,000 from ICO Global Communications and the need to prepare for Sri Lanka's accession to the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations (Tampere 1998), a pilot study (TRC, 1999a) was undertaken. The study included surveys of operators and emergency-related organizations, multiple meetings with operators including a national workshop and media activity. This initiative was loosely articulated with the ongoing preparations to meet the Y2K problem, which was described in Commission documents as a disaster of uncertain proportions but with a date certain.

The intense interactions with operators in the context of a broad program of disaster-awareness raising were quite educative. Much of the discussion referred to Sri

Lanka's endemic man-made disaster of terrorism, which included a series of deadly suicide bombing attacks on the capital city. The correlation between bomb attacks and telecom network failures was so strong that some inferred an attack had occurred whenever the network failed. Some even believed that the government shut down the telecom network to control news and rumors in the aftermath of an attack. Investigation showed that neither the government nor the security forces nor the incumbent operator were organized enough to shut down the network in such a manner. Operators coping with average annual growth rates of around 50 per cent (higher in some switching centers) were eating into the capacity margins normally set aside to handle sudden surges in use (TRC, 1999a, p. 32). As a result, when the natural surge in use caused by the first news of an attack began, the entire system would crash. There were no load-shedding mechanisms in place to prevent network failure. The other option of establishing a priority system, wherein the network would be shut down except for a subset of priority numbers belonging to disaster-response organizations, was also not implemented. The only thing that worked was crude redundancy. Organizations that subscribed to multiple telecom providers (Sri Lanka had three fixed-access and four mobile-access providers at this time) found that some networks functioned in post-attack situations. However, it was possible only to make intra-network calls at these times because of congestion and failure in other networks and at interconnection points. One remedy that was implemented as result of the study was the equipping of the ambulances of the major trauma hospital that treated bomb-attack victims with radio-communication capabilities, using a non-interconnected trunk-radio system (TRC, 1999b). Several critical government offices subscribed to multiple telecom providers, perhaps as a result of the dissemination of these findings.

The study process and the related activities that led to the installation of the trunk-radio communications in the ambulances also pointed to little-noticed vulnerability in mobile networks. Because the hospital's service area was well served by multiple mobile networks, the Commission staff on the emergency taskforce investigated the possibilities of providing fixed mobile phones to the ambulances. However, it was then

realized that mobile base stations can get overloaded very easily and that it was almost certain that bases stations close to disasters would be overloaded by increased calling attempts in the area, even if the overall network was unaffected by the disaster. In the absence of an effective priority system or a load-shedding mechanism, a mobile network would be quite ineffective in a disaster area (Anderson & Gow, 2001).

As could be expected in a liberalized environment, operators raised concerns about the costs of the various disaster-management actions proposed during the consultations. In the context of the need to upgrade emergency maritime services to maintain adherence to international treaty obligations, the incumbent also made extravagant claims for compensation by the government for functions clearly covered by the license. While pointing out the clear obligations specified in their licenses, the *Final Report* left open the possibilities of utilizing a portion of the license fees collected by the Commission for disaster-management purposes and of imposing a direct "emergency management levy" on all customer bills.

4.3 Problems Identified

Several regulatory problems may be identified from analysis of the pre-reform and post-reform disaster management in the Sri Lankan telecom sector. The first is the difficulty of implementing proper emergency management policies in a larger context of semi-functional regulation. It is not possible to assign blame for non-enforcement of disaster-related license conditions when practically all the license conditions were not being enforced.

On their face, the license conditions were highly detailed. But the detail masked weakness. The license conditions were rife with ambiguity. To actually enforce these license conditions on recalcitrant operators, it would first be necessary to go through some form of public proceeding to establish the precise nature of the obligations set out in the license conditions. It would also be necessary to ensure that the various actions required of government agencies, including the regulatory agency, were duly taken.

The problem may be illustrated by analysis of the license condition on special

arrangements for emergencies, which is core to disaster recovery:

- The Operator shall, after consultation with the authorities responsible for Emergency Organizations and such Government Departments as the Authority may from time to time determine and whose names are notified to the Operator by the Authority for the purpose, shall make plans and other arrangements for the provision or, as the case may be, the rapid restoration of such Telecommunication Services as are practicable and may reasonably be required in public emergencies.
- The Operator shall, on request by any such person as is designated for the purpose in the relevant plans and arrangements, implement those plans or arrangements in so far as it is reasonable and practicable to do so.
- Nothing in this Condition precludes the Operator from:
 - Recovering the costs which it incurs in making or implementing any such plans or arrangements from those, on behalf of or in consultation with whom the plans or arrangements are made; or
 - Making the implementation of any plan or arrangement conditional upon the person or persons for whom or on whose behalf that plan or arrangement is to be implemented indemnifying the Operator for all costs incurred as a consequence of the implementation.
- Nothing in this Condition shall restrain the person or persons referred to in paragraphs 8.3.1 or 8.3.2 from the right to obtain the services referred to in this Condition on a competitive basis conditional to compliance of the requirements stipulated by the Operator (TRC, 1997)

However detailed the language is, the obligations of the operator are not clear-cut. For example, if the Regulatory Agency does not notify the operator of the relevant emergency authorities and departments, the operator has an excuse for not consulting with them; in the absence of consultations for whatever reason, it has an excuse for not making plans and arrangements, and so on. The language does not allow the Regulatory Agency, which more than any other entity in

government has expertise in telecom, to be directly involved in disaster preparedness activities. There is far too much ambiguity in the phrases "as are practicable" and "may be reasonably required in public emergencies." Even the implementation of restoration plans is conditional on action by an entity other than the operator and leaves the operator leeway through the phrase "in so far as it is reasonable and practicable to do so."

The language in the license conditions will work in the context of an administrative relationship such as that between a government corporation and the Ministry that it reports to. In such a setting the senior civil servant in the Ministry can interpret the language and issue directives. The operator may grumble, but will obey. The problem is that the language is not specific enough to be effective in a liberalized environment where the relationship between the operator, now a private company, and the regulatory agency, no longer having general administrative authority over the operator, is somewhat adversarial.

The ambiguities in the mandatory language may be reduced by holding a public hearing to specify the obligations and by ensuring that the specified actions by entities other than the operator are taken at the appropriate times. However, the cost-recovery provisions in sub-condition 3 create the conditions for protracted disputes after implementation. Because the operator would have the best information on costs of implementation (as well as of alternative and less costly methods), it would be extremely difficult to prevent extortion of emergency organizations by an opportunistic operator. What was also discovered in the course of the pilot project was that the payments had to be made by emergency authorities, not the regulatory agency. At least in the Sri Lankan conditions of 1998-99, the emergency authorities (e.g., the Ministry of Social Services) were quite impoverished compared to the regulatory agency.

In sum, analysis of the emergency conditions in the Sri Lankan licenses shows that inadequate thought had been given to the practical problems of enforcement in a liberalized environment where operators are focused on their bottom-lines and in maximizing their power differentials in relation to the regulatory agency. Language such as that found in sub-condition 4 shows confusion on the part of the drafters: an

appreciation of the value of competition in preventing extortion by a monopolist combined with a lack of understanding of what it takes to restore a failed telecom network. It is likely that these problems exist in other countries as well.

The pilot study revealed several other regulatory problems as well. It is clear that for telecom networks of any kind to be usable in disaster situations, the problem of congestion and network failure due to the spike of use that usually accompanies the onset of a sudden disaster must be addressed. The crude solution is that of load shedding; irrespective of the nature of the calls, the network will automatically shed calls that are beyond its ability to handle. This solution does not necessarily require regulatory intervention, in that operators can simply implement it as part of network management. However, where operators do not implement load shedding but allow the network to crash, there may be cause for regulatory intervention.

Load shedding reduces the time that the network is effectively unusable. Without it, more time would be taken to restore the network to normal operation. However, load shedding does not assist disaster management in any way; it actually hinders disaster management. The instrument that will both prevent network overload and assist disaster management personnel is a priority call system. Here the network does not blindly shed any and all calls; it blocks calls that are not identified as priority calls in order to enable those with priority to use the network for disaster management purposes. The mechanical aspects of implementing a priority system on a fixed network are well known. The difficulty here is the regulatory task of creating and maintaining an accurate priority list and ensuring that the operators strictly abide by the stated rules. Given the desire to be able to communicate in a crisis situation, it is possible that persons unconnected to disaster management will get on the list, unless it is carefully managed. The Sri Lankan operators expressed concern that the existence of a priority system in one network and not in another could be used as a low-profile marketing tool against the former, because most consumers would not like the idea of being dropped from the network in a disaster situation.

It appears that not enough is known about the implementation of priority systems in mobile networks. Unlike in fixed networks where a particular number is permanently attached to a specific switch, the relationship between call originating instruments and the switches is much more fluid in mobile networks. According to Anderson and Gow's (2001) research in Canada, this poses serious difficulties for the effective implementation of priority systems.

The above problems associated with priority systems are difficult, but solutions can be found. Anderson and Gow (2001) point out a problem with priority systems lacks an identifiable solution. Priority systems assume that the disaster managers can be identified beforehand. But it is not possible to assume that those who require communication capabilities for disaster management are the political leadership, the police, fire fighters and such personnel; in many cases, ad hoc emergency managers emerge from the community and play the most critical roles.

5 Solutions

In one view, a disaster cannot be prepared for. It is a force majeure, an act outside human control. However, it is possible to mitigate the effects of disasters. For example, the accurate weather predictions and warnings that preceded India's Orissa super cyclone of 1999 enabled a major evacuation from the coastal areas and reduced what was still a massive death toll (Free Press Journal, 1999). It is possible to reduce the vulnerability of infrastructures to damage, to minimize the damage and to build in redundancy so that services can be restored quickly. In a liberalized environment it may be argued that these decisions are managerial, and generally outside the scope of regulatory intervention. However, the regulatory agency can provide incentives for actions that will achieve the desired socio-political objectives at reasonable cost, without infringing on managerial autonomy.

If for example, the de jure or de facto practice is for the government, international agencies or the consumers to bear the full costs of disaster recovery, there would be no incentive for a private or corporatized operator to design and operate an infrastructure in a way that would minimize damage from disaster. In the absence of penalties for system failure and slow

recovery caused by inadequate preparation for disaster, there are no incentives to design resilient systems and procedures for quick restoration of services. The Sri Lankan case shows the weakness of relying on license conditions and mandates alone, without effective incentives in the form of clear allocation of responsibilities for costs of disaster preparedness and recovery.

Insurance may be seen as a logical solution. Insurance is a good method of managing risk, but it is not a cure-all. If the insurance scheme is not properly designed, it can shift all the costs to consumers (many of whom may not even experience the disaster) without creating incentives for the company to set in place systems and procedures to minimize the vulnerability of the system to disaster. Regulators will have to closely supervise the arrangements that operators make with insurers, especially in cost-plus type environments.

The weakness of the Sri Lankan license conditions shows the value of creating general rules regarding disaster preparedness. General rules applicable to all operators are more appropriate for a competitive environment. Of course, proper disaster management and telecom expertise would have to be applied to the design of these rules. The regulatory agency and policy makers should, however, be aware of the danger of too many escape clauses being inserted into the rules by operator representatives, as can be seen from the Sri Lankan licenses.

Disaster recovery takes short-term and long-term forms. The short-term solutions lie in the making and implementation of effective contingency plans. The Sri Lankan study found that a declaration of a state of disaster (as is found in the United States) is a very useful mechanism for triggering exceptional responses on the part of the operator, the regulatory agency and other parties. A clearly demarcated "period of exception" would allow quick and flexible responses without having to abandon normal procedural safeguards across the board, thereby minimizing damage to the investment climate.

Sri Lanka's experience showed the value of redundancy, especially in underdeveloped countries: where one network failed, a competitive network survived. Regulatory agencies can study ways of incorporating this strength through the design of appropriate

interconnection and tariff policies that would encourage important social organizations to obtain infrastructure services from more than one supplier. With the increasing importance of wireless (both mobile and fixed) in the telecom sector, it may be necessary to develop procedures for reserve capacity and sharing procedures on antenna towers which are the most vulnerable elements of these networks.

The long-term solution to disaster recovery lies in the proper allocation of risk beforehand (preferably before new investors enter the market) so that the incentives are properly aligned. Obviously, the investor has to bear some part of the costs of recovery. Otherwise there would be no incentive to build and maintain robust systems. Because the investor in a regulated market does not have an easy option of exit, it is also reasonable for the consumers to bear part of the risk. Because government and the general population has an interest in prompt restoration of vital services it is also reasonable to allocate part of the risk to government. What is important is that these decisions must be taken before the disaster occurs and that they must be part of the knowledge base of the investor. Ad hoc solutions in the aftermath of a disaster are necessary in some cases, but detract from the creation of certainty necessary for investment.

In terms of optimizing the value of the network for disaster management, it is essential that regulatory agencies develop policies and procedures for the establishment and maintenance of priority systems. Given its sensitivity, it may be wise to develop only the broad policy framework through consultation, delegating the development of procedures and implementation to a small low-profile group. In the interim, steps should be taken to ensure that at least load shedding is in place. Of course, it is necessary to ensure that the regulatory agency has necessary powers either in the enabling legislation or in the licenses.

What the Sri Lankan pilot study does not directly highlight are the special advantages and challenges of truly disaster resistant infrastructure supply. For example, satellite-based telephone services or GMPCS (Global Mobile Personal Communication by Satellite) is the classic example of a disaster resistant (except for energy replenishment)

infrastructure. Except in the few countries that host the ground stations, the entire infrastructure sits high above the earth and is impervious to most forms of disasters. This service has lost much of its luster due to the bankruptcies of Iridium and ICO. However, it is still worthwhile for regulatory and disaster management agencies to explore the possibilities of incorporating this technology in their disaster management plans especially in light of the emergence of more tightly focused GMPCS operators after the industry reorganization.

In the course of a public-notice proceeding it conducted on GMPCS licensing, the Telecom Regulatory Commission of Sri Lanka faced objections from the recently privatized incumbent that any grant of a GMPCS license would violate its "monopoly" over international telephone services. The actual language of the privatization agreement, also incorporated into the license, was that "no other license... for the provision of international telephonic services in and from Sri Lanka prior to 5th August 2002." The final decision of the Commission held that GMPCS services that did not involve the use of earth stations in Sri Lanka did not require system licenses under Sri Lankan law (TRC, 1999c). Objections such as those raised by the Sri Lankan incumbent neglect the broader social ramifications of introducing competing and socially beneficent technologies, in their shortsighted preoccupation with ambiguous exclusivities. While the Telecom Regulatory Commission found no grounds for these objections in the course of the multi-round public proceeding conducted in 1998-99, it appears that implementation of the announced progressive policy on GMPCS has been stalled since 2000.

6 Conclusion

A comprehensive view of regulation under liberalization should include a focus on disaster preparedness and recovery. This is important not only for its intrinsic importance, but also in terms of enhancing the stable conditions necessary for investment and because of its contribution to building the legitimacy of the regulatory process. This paper has highlighted several important lessons that may be learned from examination of the theory and practice of regulation related to disaster preparedness and recovery. More regulatory resources must be devoted to this subject, but a pre-

condition is the recognition by the knowledge communities in the field of telecom policy and regulation that the subject is an important one.

7 References

- Anderson, P.S. & Gow, G.A. (2001, June 28). The wireless revolution: Emerging opportunities and hidden risks for the emergency management communities. Paper presented at 5th International Conference on Technology, Policy and Innovation, den Haag, The Netherlands. At: <http://www.delft2001.tudelft.nl/paper%20files/paper2054.doc>
- Free Press Journal (1999, November 3). Orissa cyclone's path and fury according to prediction. *IndiaWorld*. <http://www.indiaworld.co.in/news/features/feature205.html>
- ITU (2001). *Trends in telecommunication reforms 2000-2001*. Geneva: International Telecommunication Union.
- ITU (2000). Most pressing issues facing regulators. Document 41. Rev-E of Development Symposium for Regulators, Geneva 20-22 November. At: <http://www7.itu.int/treg/Events/Seminars/2000/Symposium/English/Document41Rev-E.pdf>
- Levy, Brian & Spiller, Pablo (1994). The institutional foundations of regulatory commitment: A comparative analysis of telecommunications regulation. *Journal of Law, Economics & Organization*, 10(2): 201-246.
- Prosser, Tony (1997). *Law and the regulators*. Oxford UK: Clarendon Press.
- Samarajiva, Rohan (1997). Institutional reform of Sri Lankan telecommunications: The introduction of competition and regulation. In *Telecommunication systems in Western Asia and the Middle East*, ed. E. Noam, pp. 38-61. New York: Oxford University Press.
- Samarajiva, Rohan (2000a). Establishing the legitimacy of new regulatory agencies, *Telecommunications Policy*, 24(3): 183-87. At: <http://www.tpeditor.com/contents/2000/24-3.htm>

Samarajiva, Rohan (2000b). The Role of Competition in Institutional Reform of Telecommunications: Lessons from Sri Lanka, *Telecommunications Policy*, 24(8/9): 699-717. At:

<http://www.tpeditor.com/contents/2000/24-8+9.htm>

Samaraweera, Mangala (1998). Address by Minister of Posts, Telecommunications and the Media at the Workshop on Effective Use of Telecommunications in Emergency and Disaster Management, 30th November 1998, Colombo. Appendix 11 of TRC, *Final Report of Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka*. Colombo: Telecommunications Regulatory Commission of Sri Lanka (January 1999).

Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations (1998).

<http://www.itu.int/icet/1998-06/>

Telecommunications Regulatory Commission of Sri Lanka (1997). Operator's license

granted to "Sri Lanka Telecom Limited" to run a telecommunication system under the Sri Lanka Telecommunications Act No. 25 of 1991 as amended by the Sri Lanka Telecommunications Act No. 27 of 1996.

Telecommunications Regulatory Commission of Sri Lanka (1999a). *Final Report of Pilot Study on the Use of Telecommunications in Disaster and Emergency Situations in Sri Lanka*. Colombo: Telecommunications Regulatory Commission of Sri Lanka.

Telecommunications Regulatory Commission of Sri Lanka (1999b). News Release: Donation of Telecommunication Equipment to National Hospital and the release of the final report of the "Pilot Study on the use of Telecommunications in Disaster and Emergency Situations in Sri Lanka."

<http://www.trc.gov.lk/news.html>

Telecommunications Regulatory Commission of Sri Lanka (1999c). News Release: Sri Lanka issues satellite phone decision.

<http://www.trc.gov.lk/news/html>

