CHAPTER 1

Concepts in Research Capabilities Strengthening: Positive Experiences of Network Approaches by TDR in the People's Republic of China and Eastern Asia

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Contents

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Abstract

Strengthening human and physical resources for health research is an important function of any sustainable public health approach. The process of successfully embedding research into health systems in developing countries calls for the participation of competent, national scientists, with input and support where appropriate from international research institutions. Without a research-friendly environment, it is not easy for institutions and control programmes to engage and deliver products that can contribute to improving general health status. For example, monitoring is an important component of disease control but this can now be built upon to design surveillance systems capable of reporting activities in real time based on geographical information systems and continuous internet access. Informed surveillance can take on a stronger role than just capturing transmission foci to also become instrumental in directing swift responses in a spatially explicit and cost-effective manner. Further, whenever assessments of impact and control measures for different diseases are similar as they are, for example, with respect to schistosomiasis and food-borne trematode infections, the amalgamation of separate control programmes becomes realistic even if diverse strategies were originally developed for the diseases in question. Developments like this are guiding the expansion of research capabilities to espouse the integration of multidisciplinary research into national disease control programmes. The deployment of public-private partnerships as vehicles for operational progress and the endorsement of regional networks as platforms for driving research, while at the same time supporting and promoting training and dispersion of new knowledge, represent further manifestations of innovation in disease control. Some Asian examples of how this can be accomplished are provided.

1.1. INTRODUCTION

The well-known fact that diseases do not respect borders reinforces the need to improve available health structures, especially those associated with controlling the spread of infectious diseases. Effective programmes for the control of endemic diseases are integral to any national or political authority concerned with health, thanks to support from agencies engaged in the promotion of public health such as the World Health Organization (WHO) (http://www.who.int), the Council on Health Research for Development (COHRED) (http://www.cohred.org), the Global Forum on Health Research (http://www.globalforumhealth.org) and the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) (http://www.who.int/tdr). These and other aligned organisations lay emphasis on the critical role of basic and applied research in improving public health infrastructure and argue that the strengthening

of human and physical resources for health research is a primary function of any sustainable health system. National control programmes are eager to take action, but often lack the multidisciplinary research component needed to bring in and effectively utilise, let alone develop, new control tools. The process of successfully embedding research into the health systems of developing countries calls for the participation of competent, national scientists, with input and support where appropriate from international research institutions. The choice of approach for research capacity building in countries involves issues on resource needs and is also heavily dependent on the level of maturity of the national research system. Above all, without a research-friendly environment, institutions can neither grow nor deliver research-associated products that can contribute nationally and internationally to the general health of the public. As the examples outlined in this chapter demonstrate, in undertaking research capability strengthening (RCS) in an effective and holistic manner, the outcomes are not restricted to providing new human and capital infrastructure, but in changing perceptions and attitudes that can lead to immediate practical outcomes, for example, facilitating the integration of multidisciplinary research expertise into the national disease control programmes.

International aid organisations generally advocate capacity-enhancing activities as an integral part of their support. An improved research capacity, however, is less specific than many other activities and has to be embedded in practical research problems rather than being discussed in an abstract manner. Furthermore, real self-sustaining progress cannot be achieved without producing a critical mass of researchers and institutions. Scientists clearly need infrastructure in the form of institutions and equipment but, more than anything else, they need interaction between themselves as well and with the global community of active, international researchers. To promote this, TDR has long supported activities that have been organised around a strong RCS component as part and parcel of its mission to support research to reduce the impact of tropical diseases in the developing world (Box 1.1). RCS constitutes a cross-cutting activity with the overall objective to increase participation of research institutions in developing countries in the conceptualisation, design and use of new tools for the prevention and control of communicable diseases. The long-term mission is to increase self-reliance and facilitate identification of needs and development of solutions to the public health problems caused by a range of tropical diseases, all of them infectious diseases of poverty. This can be achieved by supporting the building of a human resource stock in countries that can respond to health requirements by generating new scientific knowledge, technologies and evidence for policy and its implementation. Networking, the creation of public-private partnerships, and promoting equal opportunities among scientists constitute the core elements of such a strategy (Gustavsen and Hanson, 2008).

BOX 1.1 TDR Grants for Research Capacity Strengthening (RCS)

By mandate, 25% of TDR's funding should be directed towards capacity building, a feature that is unique among research funding agencies which normally spend more on research itself than on its infrastructure. Overall, TDR spends over 50% of its total budget in developing countries. TDR's current personal grants are awarded on a competitive basis and awarded for studies leading to a postgraduate degree or for acquiring specialised skills. Institutional strengthening grants are awarded on the basis of the scientific soundness of collaborative research proposals with explicit capacity-building and human resource development components. An important objective of this type of grant is to help research groups establish linkages, partnerships or networks with other groups having complementary scientific interests and capabilities. The linkages or partnerships may be with groups in the developing endemic countries or other countries. Specific calls for applications for these grants are made annually. Applications for RCS support come mainly from researchers who are nationals of developing countries, particularly from countries with lesser developed research capacities.

1.2. COLLABORATION THROUGH NETWORKS

The *raison d'être* of networks is the multilevel research collaboration they promote. This power of networked activity is further manifested through the rapid dissemination of scientific advances, propagation of evidence reviews and discussion of relevance evaluations. It is also possible to use networks as flexible, interactive grids of excellence that promote informal, yet rigorous, discussion and debate, avoiding more conventional, bureaucratic approaches, to highlight challenges in disease control and provide independent guidance on priority areas. This contributes to viewing diseases in the wider context of the social and epidemiological panorama, rather than in a narrow biomedical context, which increases the chances of achieving long-term improvements in public health. Information access is critical to good collaborative networks. Despite specifically developed search engines, proliferation of scientific results over the Internet continues to be shackled with slow and inefficient mechanisms in many developing countries. Without rapid access of the best available evidence, practical implementation constantly risks falling behind to the detriment of controlling endemic diseases. It can frequently take more than a decade for new knowledge generated by randomised, clinical trials to be implemented in medical practise. To counteract such 'clogging of

resources', regional knowledge bases, with broad participation by research and control experts and policy makers, need to be constructed. For example, such knowledge bases can facilitate the distribution of continuously updated risk maps covering endemic areas for the various endemic diseases. Marrying epidemiological data with a map-presenting vehicle, an interactive map service based on satellite/aerial imagery as, for example, attempted in Uganda (Stensgaard et al., 2008), could lead to the distribution of user-friendly tools that would make a difference for public health.

The network paradigm discussed here aims to strengthen collaboration within and between endemic countries in order to improve health by the promotion of rapid growth of key technologies and development of evidence-based policies. Speedy progress and building of local technical standards depend on organisation of networks with mechanisms promoting information-sharing such as websites, databases, formal publications and annual meetings (Leonardo and Bergquist, 2002; Olveda et al., 2010). Approaches to the improvement of local research capacity are best viewed and understood as a part of a framework for national and international development. As such, the building of research capacity can be defined as the ongoing process of empowering individuals, institutions, organisations and nations to:

- define and prioritize problems systematically;
- develop and scientifically evaluate appropriate solutions; and
- share and apply the knowledge generated.

Taking these steps permits health and development needs to be addressed in an equitable and sustainable manner. TDR has found that it is helpful to develop multidisciplinary, integrated research initiatives within its priority areas, while at the same time optimising and focusing on capacity-building investments with participating institutions in developing countries. More details can be obtained from the TDR website (http://www.who.int/tdr).

The very first institutional support from TDR was awarded in East Asia. In the 1970s, the Mahidol University, Faculty of Tropical Medicine and the Chiang Mai University, Faculty of Medicine in Thailand, received a RCS grant together with the Institute of Malaria, Parasitology and Entomology in Vietnam and the Ministry of Health in Myanmar. Since then, TDR has invested approximately US$ 12 million in RCS in the Mekong region, US$ 4.5 million of which has been used to support research training through individual and institutional grants. Current activities in the area of research training and capacity-building in East Asia are focused on the Greater Mekong region and surrounding countries, that is, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Myanmar, The Philippines, People's Republic of China (P.R. China), Thailand and Vietnam. the principal partners include the

WHO Regional Offices for the Western Pacific (WPRO) (http://www.wpro.who.int) and South East Asia (http://www.searo.who.int), the TROPMED Network of the Southeast Asian Ministers of Education Organization (SEAMEO), the Asian Collaborative Training Network for Malaria (ACTMalaria) and the Regional Network for Asian Schistosomiasis and Other Helminth Zoonoses (RNAS^{+}).

1.2.1. SEAMEO TROPMED

The TROPMED Network (http://seameotropmednetwork.org/) is a regional, cooperative network with an interest in health promotion and disease prevention with offices in the Philippines, Malaysia, Indonesia and Thailand. It was established in 1966 by the SEAMEO to facilitate education, training and research in tropical medicine and public health (Waikagul, 2006). Its four regional offices are the focal points for the network, each specialising in a different activity:

- Tropmed Indonesia—community nutrition;
- Tropmed Malaysia—microbiology, parasitology and entomology;
- Tropmed Philippines—public health; and
- Tropmed Thailand—tropical medicine.

The TROPMED mission is to train health workers to support research on endemic and newly emerging diseases. Its main functions are to advocate relevant health policies, promote closer links between staff in the countries in the region and support measures that improve the health of the people in the Southeast Asian region. Over the past 15 years, in collaboration with the Faculty of Tropical Medicine, Mahidol University and other regional institutions, the TROPMED network regularly organised the 'Seminar on Food-borne Parasitic Zoonoses' once every 3–5 years. The Parasitology Association of ASEAN Countries now rotates the 'ASEAN Congress of Parasitology and Tropical Medicine' between the countries of the network. In addition, the Faculty of Tropical Medicine at Mahidol University arranges the annual 'Joint International Tropical Medicine Meeting'. Full accounts of the presentations at these meetings are published as supplementary, special issues of the Southeast Asian Journal of Tropical Medicine and Public Health, which is the official journal of the SEAMEO TROPMED network.

1.2.2. ACTMalaria

The idea of forming a malaria-associated network was first discussed at a meeting on 'Human Relations Development for Malaria Control' in November 1996 in Chiang Mai, Thailand. This meeting was convened in collaboration with WHO by the Malaria Division of the Department of

Communicable Disease Control, Ministry of Public Health, Thailand. Participants included representatives of the Faculty of Tropical Medicine, Mahidol University, the College of Public Health, Chulalongkorn University, the Faculty of Medicine, Chiang Mai University, the Asian Development Bank (ADB), the World Bank (WB), the Malaria Consortium/UK, Belgian Aid and the SEAMEO TROPMED network. The national malaria control programmes of Bangladesh, Cambodia, Indonesia, Lao PDR, Thailand, Vietnam and the Yunnan province in P.R. China were all represented by their programme directors. National and international training needs and cross-border collaboration were identified as overarching issues resulting in the suggestion to form an 'ACTMalaria' with the overall aim to eliminate malaria as a major public health problem in the region.

The ACTMalaria network (http://www.actmalaria.net) promotes cooperation and collaboration with the purpose to strengthen capacity building and information exchange for the improvement of the quality and effectiveness of malaria control programmes. The principal objectives are to:

- provide collaborative training for member countries to meet the needs of malaria control in Southeast Asia;
- facilitate communication between member countries regarding malaria problems affecting common geographical borders;
- strengthen regional and national technical and management capacities in malaria control in the member countries; and
- broaden the base of ACTMalaria partnerships with other organisations and institutions.

The first coordinating secretariat was established in Thailand and consisted of professionals in malaria and/or education who gave their time to the organisation on a part-time basis with a Technical Coordinator managing the day-to-day activities. ACTMalaria established its website, started a newsletter and rapidly grew into an international organisation drawing attention to its collaborative approach in solving cross-border malaria problems. By 1997, a curriculum had been developed and the network started to offer training courses, the most important being an 11-week 'Management of Malaria Field Operations'. The following year, during an institutional strengthening workshop, supported by the Nurses Association of Thailand, The Nursing Division, Ministry of Public Health and WHO, ACTMalaria became an independent organisation with financial support from the Ministry of Public Health, Thailand. The proposed structures and strategies discussed at the meeting were endorsed by the member states at a follow-up meeting in 1998, and a memorandum of understanding was signed in May, 1999 in Depansar, Indonesia. The membership in ACTMalaria has since grown further by the inclusion of Singapore, the Philippines and Timor Leste.

An external evaluation of ACTMalaria in 2000 called for further strengthening of the organisation in response to increased expectations from its members and partners. the led to the transfer of the headquarters of the organisation to the Philippines where it obtained legal status as a non-stock, non-profit organisation, registered with the Securities and Exchange Commission (SEC) on August 13, 2003. In this process, the organization was renamed the ACTMalaria Foundation, with its functions defined in its new statement of cooperation drafted by the members based on by-laws and articles of incorporation approved by the SEC in the Philippines.

1.2.3. RNAS$^+$

When first introduced to the scientific community 10 years ago, the Regional Network for Asian Schistosomiasis (RNAS) was a limited circle of collaborating scientists from Cambodia, P.R. China, Indonesia, Japan, Lao PDR and the Philippines exclusively focused on research, surveillance and control of schistosomiasis due to infection by *Schistosoma japonicum* (in P.R. China, the Philippines and Indonesia) or *S. mekongi* (in Cambodia and Lao PDR) (Leonardo and Bergquist, 2002; Zhou et al., 2002). However, at its fifth meeting in Bali in 2005, the number of participants had grown substantially and it was felt that it was time to widen the scope. By then, the RNAS network had made its mark and become a role model for initiatives for research and control in tropical diseases, which encouraged the expansion of its mandate to accommodate other negleated tropical diseases (NTDs) as well as a broader membership. The inclusion of cysticercosis, clonorchiasis, opisthorchiasis and fascioliasis along with three more member countries, South Korea, Thailand and Vietnam, transformed RNAS to RNAS$^+$ (Zhou et al., 2008) (http://www.rnas.org.cn/). The new network had a broader set of target diseases but retained its main objectives, that is, to:

- coordinate and secure support for research on surveillance and control of the RNAS$^+$ target diseases in humans and animals in the region;
- encourage research on diagnostics, development of vaccines and new drugs;
- encourage the use of geographical information systems (GIS) and remote sensing for the production of risk maps;
- offer short specialist courses on methodology in health research;
- disseminate information widely about ongoing research and training activities; and
- develop standardised protocols for diagnosis and drug treatment.

The main financial support for RNAS$^+$ comes from TDR, but there is also a strong interest in the network by regional governments, WHO, WPRO, the Danish Centre for Experimental Parasitology, Copenhagen,

Denmark, the Swedish International Development Cooperation Agency (SIDA), Stockholm, Sweden, the Queensland Institute of Medical Research (QIMR), Brisbane, Australia, and the Swiss Tropical and Public Health Institute (Swiss TPH), Basel, Switzerland.

The stepwise broadening of activities from a single focus to include all zoonotic, helminth NTDs in the region by 2007, has worked out well, and the alignment of the RNAS$^+$ research agenda with the WPRO 'Research Strategic Plan Draft on NTDs' (http://www.rnas.org.cn/new_detail/new_detaile.asp?id=237) has contributed to the success. However, the progress over the last decade has been stronger than what was originally expected from a small network with limited funding, and RNAS$^+$ is now faced with a situation where the means to control many of the different target diseases are becoming available, while the financial resources for immediate action across the board are not quite at hand (Olveda et al., 2010). The stakes are higher, and the larger vision requires increased support to permit a continuous exchange of ideas and data between national researchers and control managers across country borders on a daily basis. Nevertheless, thanks to modern computers and the ever-improving services offered by the Internet, RNAS$^+$ has been able to move forward despite a restricted budget.

1.2.4. TropIKA.net

The 'Tropical Disease Research to foster Innovation & Knowledge Application' (TropIKA.net) (http://www.tropika.net) offers new opportunities to promote information exchange, networking and collaboration in the Asian and other regions. It is the fruit of consultation with stakeholders in infectious diseases of poverty and about perceived problems related to communication and information shortcomings in health research. With a view to alleviating problems of this nature, TDR suggested that a knowledge/management, Web-based platform be designed for the acquisition and review of essential knowledge on:

- public health research needs and scientific opportunities;
- research-based evidence in support of control and policy;
- high-profile research activities and control projects;
- international research funding and support opportunities; and
- innovations for interventions and control of infectious diseases of poverty.

TropIKA.net is designed to enhance access and to share essential knowledge with health researchers and policy makers dedicated to improving control of infectious diseases of poverty. It is hosted by TDR, but the network functions as an independent platform accumulating up-to-date information from meetings, journals, blogs, virtual libraries,

expert views, partners, newspaper, etc. This platform is shared by TDR, the Latin-American and Caribbean Center on Health Sciences Information, Brazil (BIREME/PAHO/WHO) (http://www.paho.org/English/HDP/Bireme), the Access to Research Initiative (HINARI) (http://www.who.int/hinari/), the Global Health Library (GHL) (http://www.globalhealthlibrary/), the Virtual Health Library (VHL) (http://www.jam.paho.org/LIBRARY/Virtualhealthlibrary.htm), the Scientific Electronic Library Online (SciELO) (http://www.scielo.org/index.php?lang=en) and open-access journals such as the PLoS Neglected Tropical Diseases (http://www.plosntds.org). So far, users from more than 100 countries of the world have accessed the TropIKA.net platform.

The information available on TropIKA.net is meant to be shared with health researchers and policy makers dedicated to improving control of infectious diseases of poverty. The main goal of the network is to be used as an interactive knowledge platform for infectious diseases of poverty at health forums. The comparative advantage of TropIKA.net is:

- superior access to scientific information on infectious diseases of poverty;
- up-to-date contents in a context that makes sense for health researchers and policy makers;
- broad-based participation of disease-endemic countries in discussions and the formulation of current and emerging research priorities including agenda setting; and
- provision of a comprehensive resource about best practises and authoritative summaries of research findings that have implications for infectious disease control.

1.2.5. China NDI

Inspired by the success of the African Network for Drugs and Diagnostics Innovation (ANDI) (Mboya-Okeyo et al., 2009), a spin-off of this TDR-fostered concept has been set in motion to also promote Chinese-led research and development P.R. China in tropical diseases. The reason for choosing P.R. China as an important hub of an Asian network is based on the understanding that mechanisms to support translation of research and innovation could rapidly be developed there and immediately be brought to bear on the large, national research capacity available. A few supporting examples may suffice: Chinese scientists have shown how the drug praziquantel alters the metabolism in the worm causing schistosomiasis and they have also confirmed that its efficacy is antibody-dependent (Xiao et al., 1987, 2010). In addition, the natural product Qinghaosu, now used in the form of artemesinins for the treatment of resistant malaria the world over (Klayman, 1985), has been used for

centuries in ancient P.R. China as a cure for different ailments. In the diagnostic field, a number of new immunodiagnostic tests have been developed and this area flourished when technology advanced to the point that monoclonal antibodies could be produced leading to serology being integrated into the national schistosomiasis control programme in P.R. China at a very early stage (Xiao et al., 2005; Zhao et al., 1993).

The Chinese Network for Drugs and Diagnostics Innovation in tropical diseases (China NDI) (http://www.asiandi.org/china) was initiated to exploit Chinese-led research in the development of infrastructure and scientific collaboration to leverage existing activities and deliver affordable new tools for the control of tropical diseases. Launched in Shanghai at a meeting in October, 2009, the network started well, with 150 Chinese research leaders representing 52 institutions around the country in attendance. Cooperation and networking with respect to drugs, diagnostics and vaccines for bacterial, viral, protozoan and helminth infections was at the centre of the discussions. High-level representatives from the Ministry of Science and Technology, Ministry of Health, the Chinese Center for Disease Control and Prevention (China CDC) affirmed the significance of the new innovation network and expressed the need to take it further. They fully agreed with the opening statement from Dr Ridley, Director of TDR, that 'the China NDI initiative is the first step in a vision of building a broad-based Asian innovation network promoting knowledge exchange for health and development'.

Sustained investment in health innovation in P.R. China will no doubt contribute to the creation of economic and social benefits, including career paths for national scientists, for the whole region of Southeast Asia. China NDI is planned to be a results-driven, public–private partnership designed to generate and manage intellectual property arrangements that encourage and reward local innovation. It will be coordinated by a secretariat based in the National Institute of Parasitic Diseases (IPD), China CDC, Shanghai, P.R. China. China NDI will source, manage and grant funding to support network activities, while proactively establishing sustainable funding mechanisms for its operations. As suggested by key scientists actively involved in the China NDI venture, a database of available regional knowledge of NTDs and other diseases of poverty, as well as scholarly literature, funding information, research reports, etc., is planned to be up and running by the first meeting of China NDI in June, 2010.

1.3. UTILITY OF PARTNERSHIPS

Breaking with the simple concept of industrialised countries providing foreign aid to developing countries, a number of different stakeholders and multilateral collaborative activities are now involved in promoting

regional and sub-regional networks and inter-sectoral partnerships. Apart from governments, industrial corporations, international organisations, non-governmental organisations (NGOs), the media and target populations can now all be seen as stakeholders in these activities. For example, TDR has long been a strong proponent of public–private partnerships and participates regularly in their development through curriculum development, training support and provision of funds for research support. Several well-functioning partnerships for drug development, both in industrialised and developing countries, have been successfully negotiated (Ridley, 2003).

Traditionally, single-disease partnerships organise the control of some of the major endemic diseases in the world such as trachoma, onchocerciasis, lymphatic filariasis and schistosomiasis (Amazigo, 2008; Fenwick et al., 2009; Gustavsen et al., 2009; Mecaskey et al., 2003). However, economy of scale and common approaches encourage integration among these existing programmes as this would facilitate and improve efficiency, effectiveness and delivery of health interventions. As a consequence, a multipurpose, public–private management strategy has started to develop (Brady et al., 2006; Fenwick, 2006; Lammie et al., 2006; Utzinger et al., 2009) and parasitic diseases control is now moving in the direction of integrated programme approaches. This change is driven by a new type of collaboration in which international donor agencies work together with commercial, pharmaceutical companies and private foundations such as the Bill & Melinda Gates Foundation (Seattle, WA, USA) (Hotez et al., 2007).

Inspired by current discussions in the media, which include the general public, pressure groups and the scientific community, political authorities have become responsive with regard to the fact that NTDs afflict more than a billion of impoverished people worldwide, that is, about 15% of the world's current population. Along with this growing political awareness, the Bill & Melinda Gates Foundation (http://www.gatesfoundation.org) and the United States Agency for International Development (USAID) (http://www.usaid.gov/) have provided new funding for the integration and scale-up of NTD control programmes, and the Sabin Vaccine Institute has created the Global Network for Neglected Tropical Diseases Control (GNNTDC) (http://www.gnntdc.sabin.org/), making the key concepts of the NTDs and their control well-known.

Although noticeable progress is being made against the NTDs, continued success depends on a policy environment that supports appropriate levels of engagement and collaboration from all participants. Grépin and Reich (2008) argue that lack of a common understanding of integration for disease control programmes may be a significant impediment towards implementing integration. They have presented a

conceptual framework to help guide the discussion about integration of NTD control partnerships providing specific examples of potential opportunities and actual cases of integration of NTDs, and places these examples within the conceptual framework. An important example of this new collaboration between public and private organisations is the donation of medicines by pharmaceutical companies, enabling access to treatment for millions of people worldwide.

1.4. ROLE OF INFRASTRUCTURE

TropIKA.net has recently launched an electronic 'stakeholders commons' to provide interactive facilities for dialogue and input to an action framework. To further encourage this approach, and to persuade more partners, a 'Stakeholders Meeting on Strengthening Research Partnerships for Neglected Diseases of Poverty' was held in March, 2009 in Berlin, Germany (http://apps.who.int/tdr/svc/stewardship/stakeholder -consultations). The meeting was hosted by TDR and the Government of Germany through the Federal Ministry for Economic Cooperation and Development (BMZ) and included representatives from Ministries of Health, Ministries of Research and Science and Technology, as well as participants from research institutions and universities and health research funds. One of the early outcomes is the Research Partnerships for Neglected Diseases of Poverty, a consultative initiative aimed at enhancing cohesion of North–South and South–South alliances, and collaborations between donors, developing country partners, international agencies and civil society.

The Regional Consultation on Infectious Diseases of Poverty in Western Pacific Countries, organized by TDR in Vientiane, Lao PDR in October, 2009, stressed the need for development of new tools to control the tropical diseases of poverty and strengthen research capacity in developing countries. TDR's new strategy to deal with challenges arising from the impact of emerging, re-emerging, neglected infectious diseases and climate change on health, has translated in the idea to foster an effective global research effort on the infectious diseases of poverty, in which disease endemic countries play a pivotal role. Support for the development of networks that can be sustained in accelerating critical research and management skills in disease endemic countries is emphasised in the quest to strengthen the capacity of endemic countries for research. Examples of research disciplines where enhanced networking might improve the situation include bioinformatics, social sciences and health systems.

1.4.1. Implementation of operational research

The utility of operational research was clearly demonstrated by the 10-year World Bank Loan Project (WBLP) on schistosomiasis control in P.R. China in the 1990s (Chen et al., 2005; Yuan et al., 2000). In the aftermath of WBLP, it was obvious to any of its participants that a well-functioning control programme cannot be without this important component that drives the continuing development of control approaches. A relatively large amount (2.8% of the US$ 153 million of the total project funding) was allocated for operational research (Yuan et al., 2000), and the national control programme benefited handsomely producing breakthroughs in many areas such as in the testing of new control strategies, role of serology in diagnostics, initiation of the use of GIS for the mapping of endemic areas, vaccine and drug development and a larger role for surveillance, to mention just a few examples (Bergquist and Tanner, 2010). Thus, the WBLP effect continues to be felt long after the end of the project in P.R. China and will influence control programmes outside its borders. The current economic improvement of the Chinese economy is naturally a contributing factor for the success of its national control programmes, but the role played by operational research to move control activities forward should not be underestimated.

Implementation research was not only important in P.R. China but also contributed strongly to the past successes in control of schistosomiasis in the Philippines. The multidisciplinary approach made possible with input from TDR, the Rockefeller Foundation (http://www.rockefellerfoundation.org/) and the creation of Tropical Medicine Research Centers (TMRC) with grants from the US National Institutes of Health (http://www.nih.gov/) fostered strong collaboration between national research institutes and research groups within and outside the region, including countries. Figures 1.1 and 1.2 show the input from TDR in P.R. China for research projects and capacity building from 1979 to 2008. Out of US$ 13.6 million invested, 68% was used for the RCS.

1.4.2. Priorities in research and training

Networking takes place at several levels and its role in the interaction between partnerships, stakeholders and control programme managers is to identify priorities such as disease mapping, operational research and surveillance and training activities, taking advocacy and infrastructure into account as leading components (Fig. 1.3). Schistosomiasis, HIV/AIDS, tubesculosis and hepatitis B are currently the highest priority category in P.R. China and the impact of these diseases ranks high in the whole region of Southeast Asia. Other NTDs such as echinococcosis (hydatid disease), Kala-azar (visceral leishmaniasis), soil-transmitted

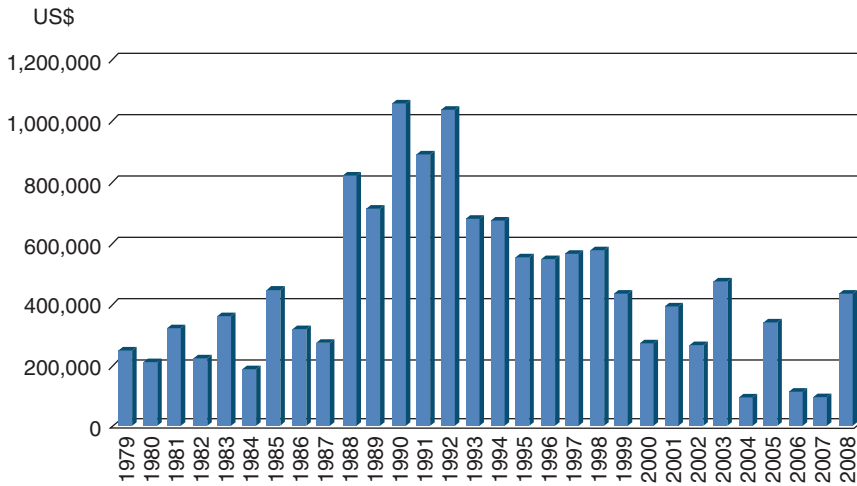

FIGURE 1.1 TDR-supported research projects in P.R. China from 1979 to 2008 by category.

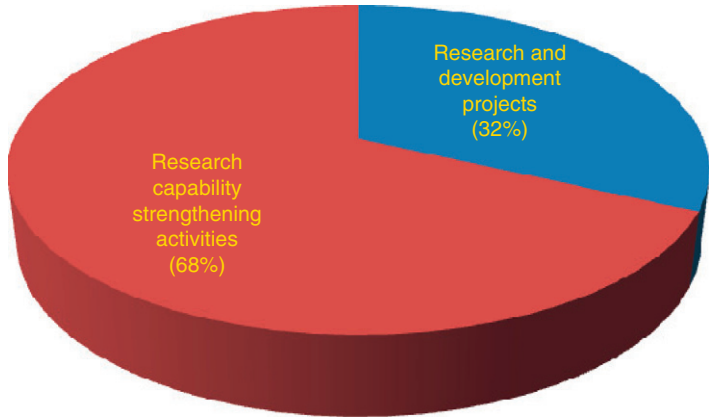

FIGURE 1.2 TDR-supported projects in P.R. China from 1979 to 2008.

helminthiases and food-borne trematodiases are also important problems (Ohta Waikagul, 2007; Sripa et al., 2010; Steinmann et al., 2010). Although control of malaria and LF has been successful in P.R. China, reaching the status of elimination (Sudomo et al., 2010), they are rampant in many of the other countries of the region. Considering the epidemiological context and the goals of existing national control programmes, a multitude of research activities are on the wish list. However, in an effort to narrow the field down, we find that on an average, about six needs dominate

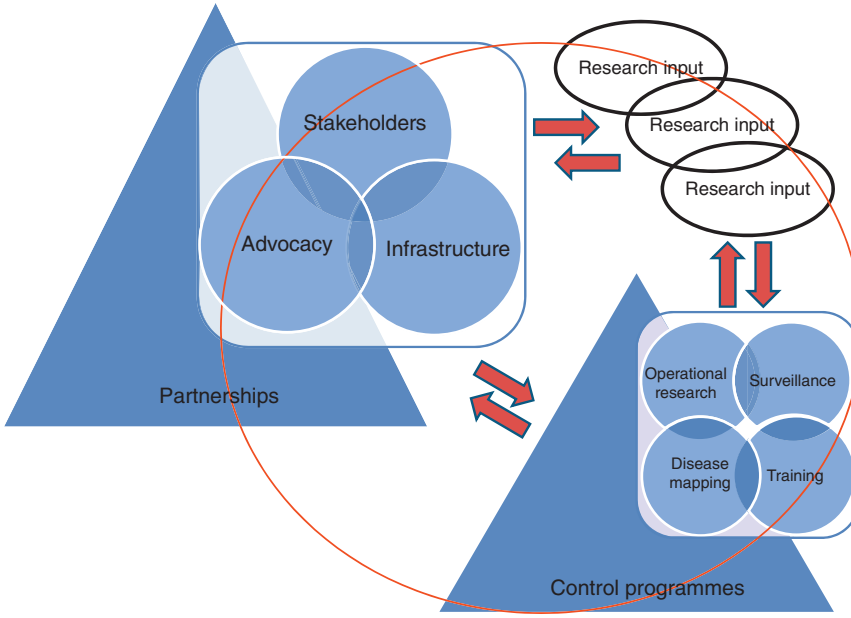

FIGURE 1.3 Relationships and interactions in networking within the RCS context.

the agenda in most of the countries of Southeast Asia, and these are as follows:

- improved research capacity and infrastructure such as databases of the most prevalent diseases, bioinformatics and a regional network for information-sharing;
- implementation research related to control strategies that include standardised, improved diagnostic techniques, ecological epidemiology and innovative surveillance systems;
- development of new drugs and vaccines for malaria, schistosomiasis and other NTDs;
- genome studies on parasites and their intermediate hosts, ecology and population dynamic of vectors;
- improved control of vectors/intermediate hosts; and
- treatment policies for co-infections with opportunistic, parasitic diseases, including HIV and tubesculosis co-infection.

1.4.3. Control and surveillance

Surveillance is more than monitoring and can almost be regarded as an intervention in its own right. The great success in schistosomiasis control in P.R. China is admirably illustrated by the periodic epidemiological

surveys that enabled the dynamic trends of schistosomiasis to be closely pursued. These surveys assisted the analysis of changes in endemicity, which permitted the control strategies to be adapted to the situation at hand (Li et al., 2005). Feedback and response mechanisms of this kind contribute to the evolution of surveillance as a discipline, while mathematical transmission models can highlight the indicators at play. Li et al. (2005) also note that cost-effectiveness studies can provide clues to which are the most financially feasible, yet effective control options.

The utility of serology is well illustrated by research in the Yunnan and Sichuan provinces, which has shown that epidemiology in the mountainous areas differs from that in the plains. Steinmann et al. (2007) reports that *S. japonicum* seroprevalence is significantly associated with sex and age and that inhabitants of villages situated at higher altitudes are at a comparatively lower risk. Serologic screening with positive results, followed up by stool examination (Zhu, 2005), confirms that the mobile populations (fishermen and their families) represent a growing problem for schistosomiasis control (Tao and Li, 1999). These observations show that chemotherapy on its own cannot easily contain such 'endemic hot spots'.

1.5. CONCLUSIONS

Network mechanisms promote information-sharing and growth of key technologies, leading to the development of evidence-based policies. Broad partnerships, including public–private partnerships, can contribute to the sustainability of long-term control programmes, with international organisations facilitating coordination, and regional networks providing important platforms for the interaction and stimulation of control activities and research.

The building of research capacity can be defined as a process of empowering individuals, institutions, organisations and nations to progress towards improved, technical standards and taking an ownership of the issues that they need to address to solve their health problems and meet the needs of their population. This requires research support and capacity strengthening that facilitates the integration of multidisciplinary research into control programmes and works towards a closer relationship between control measures and implementation research (Zhou et al., 2006).

Current control activities directed against several diseases in several East Asian countries demonstrate that it is possible not only to control many of the region's endemic diseases but also to move towards their elimination. However, sustained control at this stage will require the development of new capacities and the adoption of new technologies (Ohta and Waikagul, 2007; Zhou et al., 2008). Perhaps nowhere is this more important

than to consider building upon traditional monitoring of disease to develop a surveillance system capable of capturing population dynamics in real time as well as social changes and environmental alteration.

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