9

Capacity Analysis and Capacity Development

9.1 From Development Aid to Capacity

Capacity and capacity development have been topics of intense discussion in the international development community over the past 50 years. More recently, both concepts received renewed attention after the 2001 New Partnership for Africa's Development initiative launched in Lusaka, Zambia, on the role of capacity in sustainable development; the 2005 Paris Declaration on Aid Effectiveness; the 2008 Accra Agenda for Action; and the 2011 High Level Forum on Aid Effectiveness in Busan, South Korea. All four meetings closely linked capacity development and aid effectiveness and focused on defining the meaning of capacity at the country level. It has been determined that capacity development must also be looked at on smaller scales: individual, organizational, and the enabling environment (OECD 2006).

Several definitions of what capacity is have been proposed in the development literature. For instance, the World Health Organization (Milèn 2001) defines capacity as "the ability of individuals, organizations or systems to perform appropriate functions effectively, efficiently and sustainably."

The Canadian International Development Agency sees capacity in its various expressions and at different scales ranging from the individual to social systems as

> *the abilities, skills, understandings, attitudes, values, relationships, behaviors, motivations, resources and conditions that enable individuals, organizations, networks/sectors and broader social systems to carry out functions and achieve their development objectives over time.* (Bolger 2000)

The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ 2007) looks at the link between capacity and sustainable development as "the ability of people, organizations and societies to manage their own sustainable development processes."

A common element that emerges in all three definitions is that capacity is synonymous with *ability*, i.e., ability of stakeholders to achieve certain development goals and satisfy their needs. Further distinction can be made between the ability of a community to cope with various situations (*inherent capacity*) and that to adapt to new needs, challenges, changes, and opportunities (*adaptive capacity*). It is generally agreed that

- Capacity is critical to the success of human development.
- All communities have various forms of capacity that can and should be built upon.
- Capacity is acquired and built over time.
- Capacity is a strong attribute of resilient communities.
- Capacity can be assessed (qualitatively or quantitatively) using performance indicators where the performance can take multiple forms, such as "decision making, leadership, service delivery, financial management, ability to learn and adapt, pride and innovation, organizational integrity and many others" (Morgan 1998).

The other related concept that has received much interest in the field of human development is how to acquire capacity through *capacity development*. Since the 1990s, development agencies have emphasized that their main focus is no longer on development aid, technical assistance, or technical cooperation, but rather on community capacity building and capacity development. That evolution is best illustrated in Table 2-4, which shows the evolution of the UNDP approach to capacity development (UNDP 2009). In that approach, the focus of capacity development is described as "empowering and strengthening endogenous capabilities" through transformation rather than "lending and granting money to developing countries." Since the 1990s, a lot of discussion has taken place in development agencies on how to conduct capacity development so that it results in a "sustainable and authentic" process of change and transformation leading to increased individual, community, organizational, and societal capabilities that last. In this chapter, capacity building and capacity development are used together. This is not always the case in the literature, however. For instance, the UNDP makes a clear distinction between capacity building and development (UNDP 2008). This chapter looks at both in an interchangeable way.

Capacity building and capacity development can mean different things to different people and development agencies. There are still discussions about how to define capacity development, what modes of delivery exist, and how to demonstrate and verify the results of capacity development. Of all the definitions proposed in the literature, four of them have been retained. The first definition is one proposed by the World Federation of Engineering Organizations, where capacity building is referred to as

> *the building of human, institutional and infrastructure capacity to help societies develop secure, stable and sustainable economies, governments, and other institutions through mentoring, training, education, physical projects, the infusion of financial and other resources, and most importantly, the motivation and inspiration of people to improve their lives.* (WFEO 2010)

The UNDP (2009) defines capacity development as follows: "a process through which individuals, organizations and societies obtain, strengthen, and maintain the capabilities to set and achieve their own development objectives over time."

Another definition, used by the Canadian International Development Agency (CIDA), sees capacity development as "the approaches, strategies and methodologies used by developing countries, and/or external stakeholders, to improve performance at the individual, organizational, network/sector or boarder system level" (Bolger 2000).

Finally, a definition proposed by GTZ (2007) directly links capacity development to sustainable development as "a holistic process through which people, organizations, and societies mobilize, maintain, adapt and expand their ability to manage their own sustainable development."

Even though development agencies have somewhat different definitions of capacity building and capacity development, they seem to agree on key underlying principles, which when combined define a process that

- Does not happen by itself and is not random;
- Builds on local ownership, self-reliance, and existing local capacities;
- Promotes genuine partnership and broad-based participation;
- Accounts for the context in which it takes place;
- Understands capacity within a system and strategic management context;
- Allows for ongoing learning and adaptation and integration of complex issues;
- Ensures long-term commitments and partnership and is built to last;
- Creates a potential to act over time; and
- Is scale (physical and temporal) dependent, meaning that what works at one scale does not necessarily work at another scale.

These definitions and principles indicate that there cannot be a single approach to capacity building or capacity development that would work at all the scales of interest: individuals, communities, organizations, and society. Because the focus of this book is about small-scale community development projects, the rest of this chapter focuses on capacity development at the scale of developing communities and their components, i.e., households and individuals. Within that context, it is fair to say that given the range of issues that developing communities face (see Chapter 2), capacity development is likely to take a considerable amount of time (measured in years) and require creative design and planning tools to produce tangible results. Furthermore, within that context, capacity development is likely to start from a low-capacity and high-vulnerability baseline.

Acquiring (building) capacity within the context of small-scale projects can be seen as a participatory locally generated process at the end of which communities are expected to possess the necessary resources and knowledge to (1) address their own problems, (2) be self-motivated and self-sustaining, (3) cope and adapt to various forms of stressors and shocks, (4) satisfy their own basic needs, and (5) demonstrate livelihood security. In other words, capacity development is seen as a strategic means to an end that is about sustainable communities. In that process, capacity builds on what exists, however small that may be. From that baseline, it can be created, strengthened, and adapted to new challenges faced by the community.

Even though the emphasis is at the community level, it is important to remember that capacity development is multidimensional because there are many forms of capacity that can be addressed in a community, such as financial, technical, social, intellectual, leadership, environmental, and institutional. Often, these categories of capacity are themselves linked to each other because of the systemic nature and complexity of communities, as discussed in Chapter 6. Capacity development at the community level is likely to depend on what takes place at other scales within the community, across communities, and at the regional or national level. As a result, capacity development needs to be considered "from a systems perspective, with an appreciation of the dynamics and inter-relationships among various issues and actors in different dimensions" (Bolger 2000).

Capacity has been mentioned many times throughout this book. It was first encountered in Chapter 1 in the overall definition of risk because a community is at less risk when its capacity is higher. It was also described as an essential attribute of sustainable communities in Chapter 2. Capacity was also discussed in Chapter 5 in relation to the appraisal phase of the ADIME-E framework where capacity appraisal was presented as a methodology to define what the community baseline is in terms of assets, needs, knowledge, skills, resources, structures, and strengths. From the results of the community appraisal, the participatory action research team can determine whether or not capacity building can happen and what may be preventing it. In Chapter 11, capacity is described as an acquired attribute necessary for a community to (1) cope with or adapt to unusual conditions and transient dysfunctions associated with hazard events and (2) return to a functional balance and new normal. This process is discussed within the context of community resilience.

In this chapter, capacity analysis is presented as a tool to further understand the dynamic that exists between the current capacity of a community (its enabling environment) and its ability to support the comprehensive work plan outlined in Chapter 8. The proposed solutions outlined in that plan must match the current level of community development. More specifically, a need exists to assess whether the community has the strength, knowledge, resources, and capability to (1) accept the proposed solutions and recommendations outlined in the focused strategy and planning stages of the project, (2) implement those solutions, and (3) carry out the corresponding action plan in a sustainable way with long-term benefits. An outcome of that analysis is the identification of local weaknesses and/or potential challenges that could prevent the total or partial implementation of the recommended solutions. Finally, this step is followed by the formulation of a capacity development program to overcome the limitations that are part of the constraining environment.

Of particular interest in capacity building is how the community progresses in its development. As the community livelihood improves through capacity building or development, more sophisticated solutions can be implemented. Therefore, questions arise about (1) what level of capacity development the community aspires to (against its existing capacity), (2) over what time frame, and (3) how it addresses existing gaps between current and desired capacities. Answers to those three questions help identify, rank, plan, prioritize, and implement community development interventions in capacity building over time. These answers also help in selecting the most appropriate technologies for the community (Chapter 13).

In summary, capacity analysis helps in refining and improving the solutions and project action plan discussed in Chapter 8. At the same time, capacity analysis may also reveal missing information and issues that were ignored or overlooked in the community appraisal phase, and additional community appraisal may be needed. At the end of the process, a stronger understanding of the community emerges about what it can do, what it cannot do, and how it needs to be strengthened. In general, the results of capacity analysis can be expressed in quantitative (capacity factors) or qualitative terms (high, medium, or low).

This chapter looks at two steps involved in capacity building and development within the context of small community projects: (1) assessment of capacity assets and needs and (2) formulation of a capacity development response. Both steps are part of a larger iterative cyclical process for capacity development (Figure 9-1) proposed by the UNDP (2009), which can be used at various scales from large-sector country development programs to local projects. This chapter emphasizes a methodology originally proposed by researchers at the University of Virginia (Ahmad 2004; Bouabib 2004; Louis and Bouabib 2004) to assess the capacity of developing communities to carry out the delivery of local community municipal sanitation services (MSS) projects. As demonstrated in this chapter, the methodology is generic enough to be used to address other types of

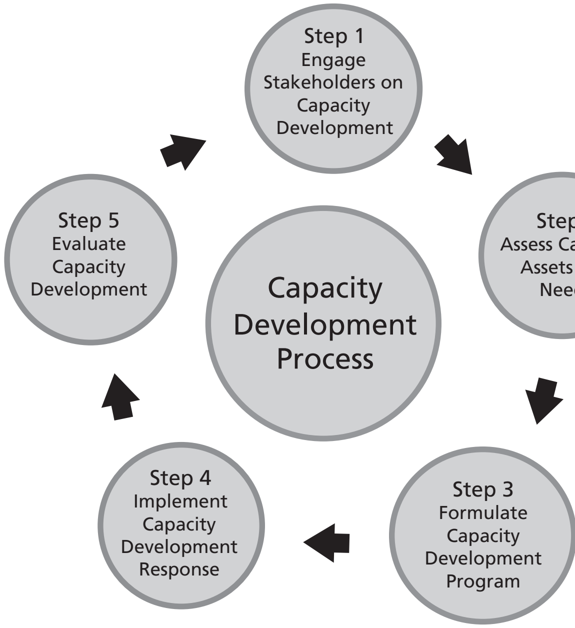

Figure 9-1. Five Steps in the Capacity Development Cycle

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community services. Two additional capacity analysis frameworks proposed by the World Federation of Engineering Organizations (WFEO) and the UNDP are briefly addressed as well.

9.2 Capacity Assessment

The ability of a community to identify, evaluate, and address its own problems and needs; develop solutions; and implement an action plan in partnership with outsiders depends largely on its enabling environment. That environment can be seen as the foundation or baseline on which capacity is built over time. Clear indicators for measuring progress from the baseline along with targets and benchmarks need to be in place and integrated into the project logic discussed in Chapter 8.

As discussed in Chapter 5, the enabling environment is mapped in the community appraisal phase of the ADIME-E framework. The main goal of that appraisal is to learn as much as possible about the community through the collection of data, the transformation of data into useful information, and the analysis of that information. It provides a context of the community's enabling environment in terms of culture, leadership, level of development, and human condition. Finally, it gives some indication about the level of capacity the community is interested in achieving.

In general, the resources, knowledge, skills, assets, and strengths that contribute to the enabling environment of a community can be broken down into different but equally important categories of capacity. As remarked by Lavergne and Saxby (2001), these categories consist of *tangible* components (e.g., infrastructure, education, natural resources, health, and institutions) and *less tangible* ones (e.g., skills, social fabric, values and motivations, habits, attitudes, traditions, and culture). They may also include *core capabilities*, which "refer to the creativity, [leadership], resourcefulness and capacity to learn and adapt of individuals and social entities."

It is noteworthy that no universally accepted terminology exists among development agencies to categorize the different forms and expressions of community capacity. For instance, the Tearfund (2011) suggests identifying five forms of capacity: individual, social, natural, physical, and economic. In this chapter, we use seven groups of capacity, following a terminology proposed by Louis and Bouabib (2004): institutional, human resources, technical, economic and financial, energy, environmental, and social and cultural. An eighth group of capacity called service capacity is used to measure the level of a given service (e.g., energy; water, sanitation, and hygiene (WASH); and shelter) compared with accepted international standards. In general, the capacity components selected in the capacity analysis must be appropriate to the type of project being addressed.

UVC Framework

Professor Garrick Louis and coworkers at the University of Virginia, Charlottesville (Ahmad 2004; Bouabib 2004; Louis and Bouabib 2004) developed a detailed methodology to determine the capacity of a developing community to conduct municipal sanitation services (MSS) projects. As remarked by Bouabib (2004), these services may include

- Drinking water supply (DWS), which includes "the construction, operation and maintenance of public water systems, including production, acquisition and distribution of water to the general public for residential, commercial and industrial use";
- Wastewater and sewage services (WSS), which is defined as "the provision, operation and maintenance of sanitary and storm sewer systems, sewage disposal and treatment facilities"; and
- Management of solid waste (MSW), which is "defined as the collection, removal and disposal of garbage, refuse, hazardous, and other solid wastes."

In general, these three types of services need to be considered together at the community level. As outlined many times in the development literature and further discussed in Chapter 15, the quality and quantity of these services determine to a great extent public health and economic development in any society (SIWI 2013). The approach, referred to as UVC here, can be generalized to other types of projects and services besides MSS, such as education, health, energy, or food, as discussed by Faeh et al. (2004).

The UVC approach focuses on one group of services at a time: DWS, WSS, or MSW. For each group, eight categories of community capacity are considered, as shown in Figure 9-2, which is a more detailed version of Figure 5-5. These categories were selected because they are likely to have an influence on the type of services (e.g., MSS) being investigated. In Figure 9-2, the categories of capacity can be estimated qualitatively (high, medium, or low), or quantitatively. Furthermore, capacity cannot fall below minimum human standards, such as the Sphere standards (Sphere Project 2011).

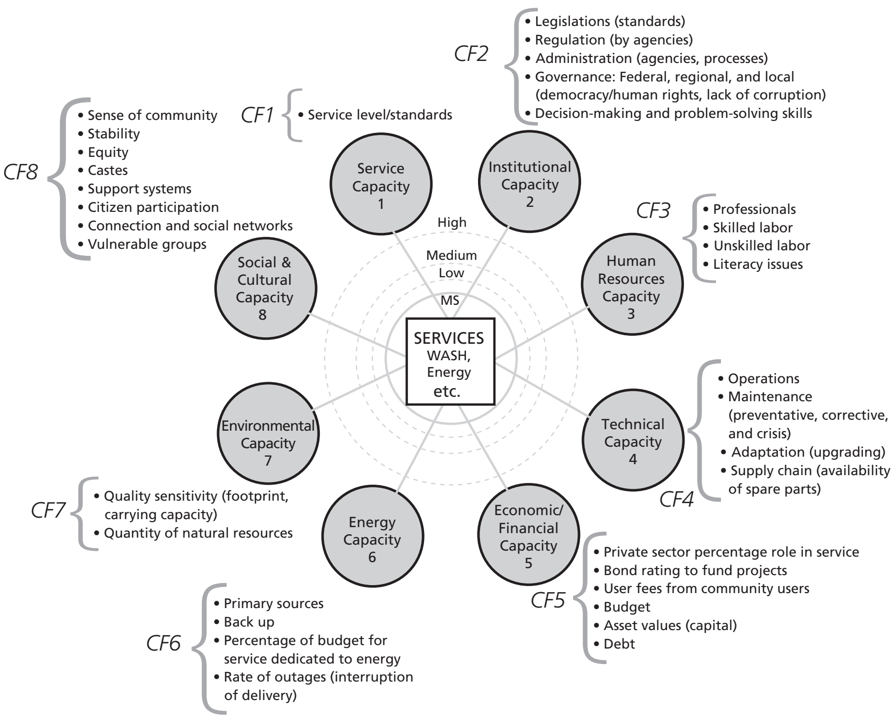

Figure 9-2. Categories of Capacity for a Community to Conduct Service Projects

Source: Adapted from Louis and Bouabib (2004), with permission from University of Virginia.

In each category of capacity, several requirements are listed that contribute to that category. The categories of capacity are described below.

- *Service capacity* measures, for a given type of service, the gap between the actual levels of service provided in the community and published standards that guarantee an “acceptable level of health concern for the community.” Bouabib (2004) gives the example of water service where the water supply of the community would be compared with a 50 L/person/day standard, guaranteeing that “basic personal and food hygiene are assured as well as laundry and bathing … and a low level of health concern.” Water would be available within 100 meters of consumers. Similar standards exist for wastewater and sewage and solid waste. According to Bouabib (2004), wastewater treatment systems must be able to accommodate 80–90% of water supplied (e.g., 32–45 L/person/day). For solid waste, a capacity to process 0.5–1.5 kg/person/day is suggested. This level is discussed further in Chapter 15.
- *Institutional capacity* defines the components of the institutional framework that need to be in place to provide the services. The requirements include a body of legislation; associated regulations, regulatory standards, and codes; administrative authority; administrative process; and stable and good governance.
- *Human resources capacity* relates to the labor that is available to provide the services and its level of training. The requirements include professional, skilled labor, unskilled labor, and level of illiteracy.
- *Technical resources capacity* relates to the logistics and tactics necessary to address the components of technology that enters into the implementation of the solutions. The requirements include operations, maintenance, upgrading or adaptation, and supply chain (spare parts).
- *Economic and financial capacity* represents the financing of the services, the availability of loans, and the financial assets in the community. More specifically the requirements include percentage of the private sector providing services and the existence of bonds, user fees, budget, asset values, and debt.
- *Energy capacity* deals with the available energy, its availability, its costs, and reliability necessary to provide the services. The requirements include primary source, backup sources, percentage of budget associated with energy, and rate of outage.
- *Environmental capacity* looks at the availability of natural resources (e.g., water and forest) needed to implement the solutions, the carrying capacity of the environment, the level of stress it can sustain, and making sure that the services do not substantially affect or deplete natural resources.

- *Social and cultural capacity* deals with the community structure and components, its social networks and cohesion, its capacity of organization, the households and their interactions, and gender and equity issues.

Once the capacity categories have been identified, a capacity factor (CF) is calculated for each capacity category as the weighted sum of its requirements. Using the example proposed by Louis and Bouabib (2004), let's consider the DWS technical capacity. As shown in Table 9-1, it consists of four requirements: operations; maintenance (preventive, corrective, and crisis); adaptation (to constraints); and supply chain (spare parts). Each requirement is rated on a scale ranging between 0 and 100, broken down into five rating groups with 20 units each. Descriptors of each rating group for the four requirements are listed in Table 9-1.

The capacity factor CF_4 (4 is the fourth category of capacity in Figure 9-2) is determined as the weighted average of four requirement ratings C_{4j}, as follows:

$$CF_4 = \Sigma C_{4j} w_j \ (j = 1, 4)$$

where w_j is a weighting factor associated with requirement rating C_{4j}. Table 9-2 shows an example of technical capacity calculation for the Guatemala project discussed in Chapter 5.

In general, each one of the eight capacity factors CF_i (i = 1–8) shown in Figure 9-2 can be determined as follows:

$$CF_i = \Sigma C_{ij} w_j \ (i = 1\text{–}8 \text{ and } j = 1, n_i)$$

where n_i is the number of requirements in each capacity factor CF_i. Once calculated, the capacity factors can be plotted in the form of a radial vector diagram, such as the one shown in Figure 5-6. This diagram provides a visual quantitative map of the community capacity baseline for the selected service: DWS, WSS, or MSW. It also helps identify the strong and weak components of community capacity for a given service, where interventions are needed, and where such interventions are most likely to have a positive effect on capacity building. In Figure 5-6, for instance, technical capacity and financial/economic capacity are both low. Capacity factors and detailed requirements for DWS, WSS, and MSW can be found in Bouabib (2004).

According to the UVC framework, in the inventory of capacity categories for a given type of service, the one with the lowest capacity factor determines the so-called technology management level (TML) of the community, i.e., the stage (or level) of community development (or readiness) for that service. This conservative approach uses a weakest link criterion (or a pessimistic rule criterion). Other criteria could be used to determine the TML, as suggested by Bouabib (2004).

Table 9-1. Breakdown of Technical Capacity Factor into Four Components for Drinking Water Supply

	Score	1–20	21–40	41–60	61–80	81–100
4	Technical Capacity					
C_{41}	Operations	Manual collection and untreated water use	Pumping water	Pumping water Control water quality	Monitor water systems Control water quality Control pipes	Monitor water systems Control water quality Monitor pipes network Monitor treatment
C_{42}	Maintenance	None	Disinfection Minor repair	Check water systems Major repair	Check/maintain water systems Major repair Maintain pipes	Check/maintain water systems Check/maintain network Check/maintain water meter
C_{43}	Adaptation	None	Rarely	Occasionally	Usually	Frequently
C_{44}	Supply chain	None	National supplier	Regional supplier	National manufacturer Regional supplier	National manufacturer Local supplier

Source: Louis and Bouabib (2004), reproduced with permission from University of Virginia.

Table 9-2. Example of Scoring for Technical Capacity Factor

Capacity Factor	Subfactor	Very Poor 0–20	Poor 21–40	Medium 41–60	High 61–80	Excellent 81–100	Score
Technical	Operations	No operations running	Few operations are running poorly	Few operations running well	All operations running well	All operations running well with backups in place	45
	Maintenance	No maintenance	Infrequent and/or poor maintenance	Low-level maintenance fairly regularly	Maintenance for most operations	Maintenance for all operations on regular basis	25
	Adaptation	No adaptation	Adaptation after many years or to very small degree	Adaptation as needed	Good adaptation regularly accessed	Excellent adaptation with many members involved throughout process	25
	Supply chain	No supply chain	Sporadic supplies from outside	Fairly consistent but inadequate supplies from outside	Supplies in community and adequate supplies from outside community	Supplies needed within community and easy access to other needed supplies outside community	55
						Subtotal score	37.5

Source: Guatemala project 2011.

In the UVC framework, communities are divided into five level-of-development groups based on the value of the TML, as shown in Table 9-3. As an example, the capacity diagram of Figure 5-6 shows that technical capacity has the lowest capacity factor of 37 (TML = 37; actual value is 37.5, as shown in Table 9-2). In Table 9-3, the community development level is equal to 2. Another example of capacity analysis by Ahmad (2004) is shown in Table 9-4 and is associated with a village in the Philippines where the minimum capacity factors are related to environmental and sociocultural factors. For that case study, a minimum value of 10 related to the environmental and sociocultural capacity (TML = 10) brings the community level of development down to 1, according to Table 9-3.

As we will see below, the TML is an outcome indicator that limits, for a given type of service, the range of technical solutions that could be used to provide that service. If the technology is not appropriate for the community, i.e., it does not match the ability of the community to use the technology, either the technology is inappropriate or the community's ability in its level of development has to be changed. As capacity development takes place over time, the TML and the range of appropriate solutions are expected to increase.

Other categories of capacity and requirement types besides those shown in Figure 9-2 can be introduced into the UVC model. Furthermore, not all capacity types and associated requirements are equally important on a given project and need to be included in the capacity assessment. The need depends greatly on the type of project and its scale and the community context. Finally, the capacity factors do not always have to be expressed in a quantitative manner if it is not possible to quantify the various requirements, which is often the case. Qualitative measures of capacity such as low, medium, and high would also be appropriate, as long as descriptors support the ranking.

Table 9-3. Community Development Levels

Minimum Capacity Factor Score	Level	Explanation
1–20	1	No local capacity to manage the service
21–40	2	Capacity to manage systems for small collections of residential units
41–60	3	Capacity to manage community-based systems
61–80	4	Capacity to serve multiple communities from a centralized system
81–100	5	Capacity to manage a centralized system, along with individual service to more remote units

Source: Adapted from Louis and Bouabib (2004), with permission from University of Virginia.

Table 9-4. Capacity Analysis (Capacity Scores, CS) for a Village in the Philippines

Community Assessment (Sample), Bacoor, Philippines							
		Level 1	Level 2	Level 3	Level 4	Level 5	
Capacity Factor Score		0–20	21–40	41–60	61–80	81–100	Capacity Score
Institutional	Body of legislation				70		70.0
	Assoc regulated			41			41.0
	Admin agencies	20					20.0
	Admin processes	20					20.0
	Governance	20					20.0
	Institutional CS						34.2
Human Resource	Professionals		21				21.0
	Skilled labor		21				21.0
	Unskilled labor					100	100.0
	Illiterate					100	100.0
	Human Resource CS						60.5
Technical	Operations		25				25.0
	Maintenance	5					5.0
	Adaptation and modification		21				21.0
	Supply chain—related services		21				21.0
	Technical CS						18.0
Economic	Private sector %		40				40.0
	Bonds	0					0.0
	User fees		21				21.0
	Budget			41			41.0
	Asset values			41			41.0
	Debt	20					20.0
	Economic CS						27.2
Energy	Primary source				61		61.0
	Backup	20					20.0
	% of budget				61		61.0
	Outage rate	20					20.0
	Energy CS						40.5

Table 9-4. Capacity Analysis (Capacity Scores, CS) for a Village in the Philippines (*Continued*)

Community Assessment (Sample), Bacoor, Philippines							
		Level 1	Level 2	Level 3	Level 4	Level 5	Capacity
Capacity Factor	**Score**	**0–20**	**21–40**	**41–60**	**61–80**	**81–100**	**Score**
Environmental	Quality & sensitivity	10					10.0
	Quantity	10					10.0
	Environmental CS						10.0
Social & Cultural	Communities	10					10.0
	Stability	10					10.0
	Equity	10					10.0
	Castes	10					10.0
	Social & Cultural CS						10.0
Service	Gap		21				21.0
	Service CS						21.0

Source: Ahmad (2004), with permission from University of Virginia.

WFEO Framework

The World Federation of Engineering Organizations (WFEO 2010) introduced six essential so-called pillars of capacity, which according to them "must always be in place if a nation is to have sufficient and stable technical and decision making capacity to meet the prerequisites of sustainability." Unlike the UVC approach, which focuses on the community at the project level, the WFEO approach focuses on what it would take for a country to have a healthy engineering infrastructure development and operation. This approach is particularly important to developing countries that need to create standards and best practices in their path to development. More often than not, such standards do not exist or are rarely enforced. The six pillars of engineering capacity are the following:

- Individual capacity, expressed in terms of technical training, information, and connectivity to the outside world;
- Institutional capacity, in terms of professional organizations, statutory boards, councils, foundations, and research and development;
- Technical capacity, in terms of standards, codes of practice, codes of ethics, technical literature, software, and hardware;
- Decision-making capacity that allows decisions to be made at different levels from individuals to governments;

- Business capacity where businesses are in place to support and contribute to infrastructure development, including retail and wholesale; and
- Resource and supply capacities in terms of access to equipment, materials, resources, raw and manufactured material, and in terms of quality and quantity.

No ratings and indicators specific to each form of capacity have been proposed by the WFEO to assess and rate qualitatively or quantitatively each capacity type listed above.

The UNDP Capacity Assessment Framework

The UNDP (2005, 2007, 2008) uses a different approach to capacity assessment that is more appropriate at the country level (programmatic and planning) rather than at the project level. A special effort has been made to show how the framework coincides with others proposed in the development literature (UNDP 2008). The more global perspective of the UNDP capacity assessment framework complements the UVC approach, which is more project specific.

Using the enabling environment as a point of entry, and once local ownership of the capacity development outcome has been established, capacity is assessed along two dimensions. In the first one, instead of considering specific capacities, the UNDP approach looks at existing core issues representing "areas where capacity change happens most frequently within and across a variety of sectors and themes" at the country level. These issues include (1) institutional arrangements, (2) leadership, (3) knowledge, and (4) accountability. The second dimension in the UNDP approach is to assess the functional capacities that are necessary "for creating and managing policies, legislations, strategies and programmes." They include stakeholders' engagement; situation assessment and vision and mandate definition; formulation of policies and strategies; budgeting, management, and implementation; and evaluation.

9.3 Capacity Development Response

According to UNDP (2009), effective capacity development response starts with addressing three basic questions: "(i) to what end do we need to develop the capacity, what will be the purpose; (ii) whose capacities need to be developed, which group or individual needs to be empowered; and (iii) what kinds of capacities need to be developed to achieve the broader development objectives." Such questions are appropriate at all scales, ranging from the country to the project levels. In the ADIME-E framework, the action plan discussed in Chapter 8, including the logframe analysis, should provide answers to those three questions. As discussed in the following, further analysis may need to be carried out to refine these answers.

Two steps in the capacity development response are outlined. The first step considers whether the proposed action plan outlined in Chapter 8 matches the current stage of community development and the solutions match the enabling environment. The second step explores strategies about what needs to be implemented to improve the enabling environment over time, and correspondingly what new solutions are more appropriate in that new environment. The UVC framework is used to illustrate these two steps, using MSS projects as an example.

Matching the Solutions with the Level of Community Development

Using the UVC framework again, once the stage of community development, measured by the TML, has been determined for a given service, the next step is to check whether the proposed solutions in the action plan discussed in Chapter 8 match the level of community development. For a given type of service, DWS, WSS, or MSW (or any other type of service) a technology requirement level (TRL) is determined. It is an indicator that essentially tells decision makers, out of all the technical solutions available to address a given service, which are likely to fit better with the current stage of community development. Those solutions serve as a starting point in the overall capacity development response. This approach is summarized in Figure 9-3 and explained in detail in the following.

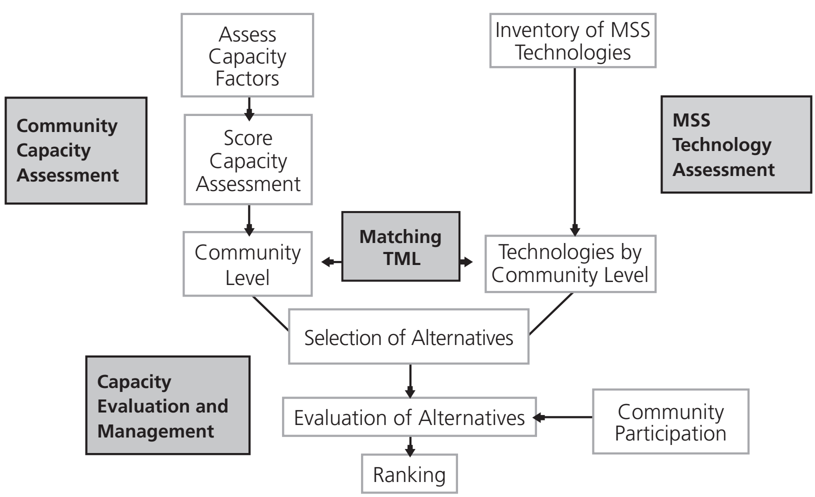

Figure 9-3. Combining Community Capacity Assessment and Technology Assessment

Source: Adapted from Ahmad (2004), with permission from University of Virginia.

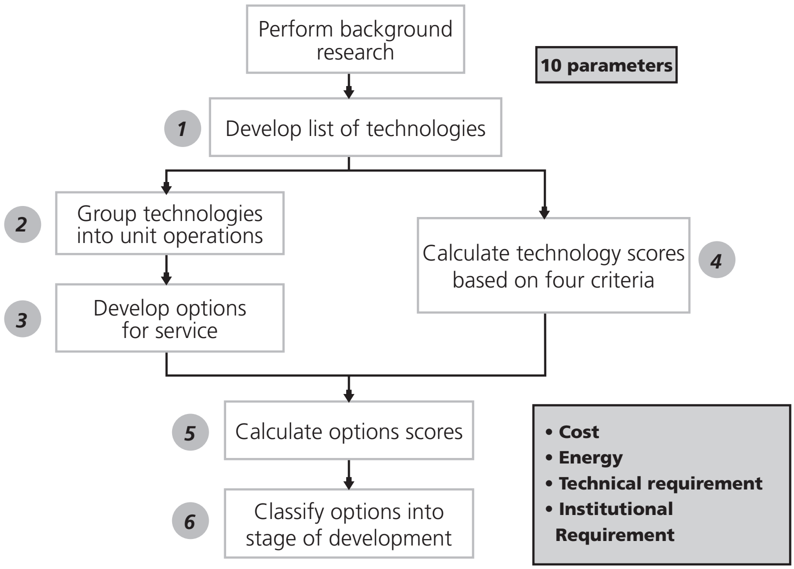

Figure 9-4. Six Steps in Technology Assessment

Source: Adapted from Ahmad (2004), with permission from University of Virginia.

Figure 9-3 shows two converging tracks. The left-hand track is used to determine the enabling environment and results in the TML, as discussed. The right-hand track, which is discussed here, starts with a review of technologies that are available for the service being addressed. A six-step process (Figure 9-4) results in classifying the service options and determining a TRL value. The entire approach is described in more detail in Ahmad (2004).

Step 1: List the Technologies

The first step is to list all of the technologies for the service of interest. In his thesis, Ahmad (2004) gives an inventory of some technologies that should be considered with DWS, WSS, and MSW services. Each technology is described in terms of various characteristics. Examples include components, blueprints, cost, operation and maintenance, energy requirements, technical knowledge requirements, institutional and societal requirements, and environmental considerations. Other characteristics may need to be added, such as performance under different past conditions or advantages and disadvantages.

As discussed in Chapter 15, the WASH literature contains many examples of technical solutions that can be used at the small-project scale. The reader may want to consult a series of booklets on innovative low-cost WASH technical solutions produced by the Netherlands Water Partnership entitled *Smart Water Solutions* (NWP 2006b); *Smart Sanitation Solutions* (NWP 2006a); and *Smart*

Hygiene Solutions (NWP 2010). Other references include Pickford (2001), Jordan (2006); Laugesen and Fryd (2009); and Mihelcic et al. (2009).

Step 2: Define Unit Operations

Technologies are simply tools involved in the process of providing a service. They are important components of the unit operations (or processes) that contribute to the provision of that service:

- In DWS, bringing water to the customer consists of five unit operations: source, procurement, storage, treatment, and distribution.
- In WSS, there are four unit operations: collection, transfer, treatment, and disposal.
- In MSW, there are four unit operations: storage, transfer, disposal, and recovery. As remarked by Ahmad (2004), there may be several disposal and recovery phases.

The term "unit operation" is used to regroup technologies toward the provision of service. Tables 9-5a, 9-5b, and 9-5c show three lines of operations for DWS, WSS, and MSW, respectively.

Step 3: Create Service Options

For any given suite of unit operations in a service, various service options can be created. A service option is defined as "a series of technologies that when used together, lead to the provision of a municipal sanitation service" (Ahmad 2004). Looking at Tables 9.5a–c, the number of service options can be quite large if all technology combinations are possible. They include 4,200 DWS service options, 1,296 WSS service options, and 525 MSW options. Not all options are possible, and the next step is to reduce them to a manageable number.

Step 4: Calculate Technology Score

The various technologies used in the unit operations are rated based on four criteria (Table 9-6): cost, energy required, technical, and institutional factors (Ahmad 2004).

- *Cost* refers to the initial cost and annual operation and maintenance costs.
- *Energy required* relates to the energy requirement of the technology.
- *Technical* is about the technical knowledge required to install, operate, and maintain the technology.
- *Institutional factors* relate to the organizational structure that needs to be in place at the community level for the technology to succeed.

Based on the rating (low, medium, high) for each criterion, a certain number of points are assigned to each technology: 1 point for low, 5 points for medium, and 10 points for high. Finally, for each technology, a normalized score (score/[4 × 10]) is determined, as shown in Table 9-7 for the DWS technologies.

Table 9-5. Unit Operations for (a) DWS, (b) WSS, and (c) MSW

Source	Procurement	Storage	Treatment	Distribution
Rooftop water harvesting	Bucket	None	None	None
Ground level catchment	Handpump	Barrel	Chlorination	Household water connections
Subsurface dam	Handpump—Deep well	Tank	Slow sand filter	Piped water (gravity)
Surface water abstraction	Rope and bucket w/ windlass	Reservoir	Boiling	Piped water (pumped)
Spring water captation	Motorized pump	Cistern	Ultraviolet light	
Hand dug well	Standpump			
Drilled well				

(a)

Collection	Transfer	Treatment	Disposal
None	None	None	Burial
Bucket	Small bore/settled sewerage	Constructed wetlands	Composting
Vault/Cartage	Conventional sewerage	Soil aquifer treatment	Pit privy
Septic/Tank	Drainage field	Oxidation ditch	Ventilated improved pit latrine
		Rotating biological contractor	Double vault compost latrine
		Trickling filters	Aqua privy
		Upflow anaerobic sludge blanket	Pour flush toilet
		Activated sludge process	Cistern flush toilet
		Stabilization ponds	Drainage field

(b)

Storage	Transfer	Disposal	Recovery
None	None	None	None
Household bin	Human power	Waste discarded at source	Composting
Communal bin	Animal power	Open burning	Refuse-derived fuel
	Noncompactor trucks	Open dumps	Pyrolysis
	Compactor trucks	Controlled dumps	Recycling/reuse
		Sanitary landfilling	
		Incineration	

(c)

Source: Ahmad (2004), with permission from University of Virginia.

Table 9-6. Classification of Service Options

Criteria	Level 1 (Low)	Level 2 (Medium)	Level 3 (High)
Cost	Low cost	Moderate cost	High cost
Energy Required	No or minimal energy	Medium energy	High energy
Technical	Low level of technical knowledge	Medium level of technical knowledge	High level of technical knowledge
Institutional	No formal organization needed. Low level of organization	Moderate level of organization	High level of organization

Level	Points
Low	1
Medium	5
High	10

Source: Ahmad (2004), with permission from University of Virginia.

Step 5: Calculate Option Scores

For each of the 4,200 DWS service options, 1,296 WSS service options, and 525 MSW service options, an option score is calculated as follows:

$$\text{Option Score} = \frac{\sum x_i + w[x_1\ x_2\ \ldots.\ x_N]}{N + w}$$

In this equation, x_i is the score based on the technology for each unit operation $i = 1, N$ where N is the number of unit operations for the service option. In our case and according to Table 9-5, $N = 5$ (DWS score), 4 (WSS score), and 4 (MSW score). In the equation, w is a reward factor weight that is larger than 0 when all unit operations are present. If one of them is missing, the second term in the numerator is automatically equal to zero, thus creating a built-in handicap and lower score.

Step 6: Calculate the Technology Requirement Level

The option score is then converted into a technology requirement level (TRL) value, as shown in Table 9-8. Only service options that have a TRL less than or equal to the technology management level (TML) of the community are retained as viable options. In other words, according to this methodology, only alternative service options that match the level of development of the community can be selected. This process reduces the number of potential alternative service options considerably.

Table 9-7. Examples of Technology Scores for each DWS Technology

Unit Process	Technologies	Cost	Energy	Technical	Institutional	Score	NScore
Drinking Water Supply							
Source	Rooftop water harvesting	Medium	Low	Medium	Low	12	0.30
	Ground level catchment system	High	Low	Medium	Low	17	0.43
	Subsurface dam	Medium	Low	Medium	Medium	16	0.40
	Surface water abstraction	Low	Low	Low	Low	4	0.10
	Spring water captation	Low	Low	Medium	High	17	0.43
	Hand-dug well	Medium	Low	Medium	Low	12	0.30
	Drilled well	Medium	High	High	Medium	30	0.75
Procurement	Bucket	Low	Low	Low	Low	4	0.10
	Handpump	Low	Low	Medium	Low	8	0.20
	Handpump—Deep well	Low	Low	High	Low	13	0.33
	Rope and bucket w/windlass	Low	Low	Low	Low	4	0.10
	Motorized pump	Medium	High	High	Low	26	0.65
	Standpost	High	Low	Medium	High	26	0.65
Storage	Barrel	Low	Low	Low	Low	4	0.10
	Tank	Medium	Low	Low	Low	8	0.20
	Reservoir	High	Low	Medium	Medium	21	0.53
	Cistern	Low	Low	Low	Low	4	0.10
Treatment	Chlorination	Low	Low	Medium	Medium	12	0.30
	Slow sand filter	Low	Low	Medium	Low	8	0.20
	Boiling	Low	Medium	Low	Low	8	0.20
	Ultraviolet light	Medium	High	High	High	35	0.88
Distribution	Household water connections	High	Low	High	High	31	0.78
	Piped water (gravity)	Medium	Low	High	High	26	0.65
	Piped water (pumped)	High	Medium	High	High	35	0.88

Source: Ahmad (2004), with permission from University of Virginia.

Table 9-8. Example of Service (DWS) Option Scoring Process Leading to Stage of Development

No	Source	A	Procurement	B	Storage	C	Treatment	D	Distribution	E	Score	Stage of Dvlpt
1	Rooftop water harvesting	0.3	Bucket	0.1	None	0	None	0	None	0	0.078	1
2	Rooftop water harvesting	0.3	Bucket	0.1	None	0	None	0	Household water connections	0.775	0.230	2
3	Rooftop water harvesting	0.3	Bucket	0.1	None	0	None	0	Piped water (gravity)	0.65	0.206	2
4	Rooftop water harvesting	0.3	Bucket	0.1	None	0	None	0	Piped water (pumped)	0.875	0.250	2
5	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Chlorination	0.3	None	0	0.137	1
6	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Chlorination	0.3	Household water connections	0.775	0.289	2
7	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Chlorination	0.3	Piped water (gravity)	0.65	0.265	2
8	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Chlorination	0.3	Piped water (pumped)	0.875	0.309	2
9	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Slow Sand Filter	0.2	None	0	0.118	1
10	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Slow Sand Filter	0.2	Household water connections	0.775	0.270	2
11	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Slow Sand Filter	0.2	Piped water (gravity	0.65	0.245	2
12	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Slow Sand Filter	0.2	Piped water (pumped)	0.875	0.289	2

Table 9-8. Example of Service (DWS) Option Scoring Process Leading to Stage of Development (*Continued*)

No	Source	A	Procurement	B	Storage	C	Treatment	D	Distribution	E	Score	Stage of Dvlpt
13	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Boiling	0.2	None	0	0.118	1
14	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Boiling	0.2	Household water connections	0.775	0.270	2
15	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Boiling	0.2	Piped water (gravity)	0.65	0.245	2
16	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Boiling	0.2	Piped water (pumped)	0.875	0.289	2
17	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Ultraviolet light	0.875	None	0	0.250	2
18	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Ultraviolet light	0.875	Household water connections	0.775	0.402	3
19	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Ultraviolet light	0.875	Piped water (gravity)	0.65	0.377	2
20	Rooftop water harvesting	0.3	Bucket	0.1	None	0	Ultraviolet light	0.875	Piped water (pumped)	0.875	0.422	3

Option Score	Stage of Development
0.0–0.2	1
0.21–0.4	2
0.41–0.6	3
0.61–0.8	4
0.81–1.0	5

Source: Ahmad (2004), with permission from University of Virginia.

Step 7: Evaluation of Alternatives

Using the aforementioned methodology, the focused strategy solutions, and the comprehensive action plan discussed in Chapter 8 for the problem at stake can be refined and improved. There is now a better understanding of the appropriateness of the solutions to the level of community development. The solutions in the final project action plan are obtained from those outlined in Step 6, combined with additional input through community participation. If necessary, a multicriteria utility matrix similar to the one discussed in Chapter 7 can be used. The criteria in the matrix may be the same as those discussed in Chapter 7, or new ones may be introduced, including new weighting factors.

Finally, a second filtering process consists of looking at the technical feasibility of the selected solutions. This step is usually done by technical personnel with expertise in the service area(s) being addressed.

Remarks

In the approach proposed by UVC, the TML defines the level of community development for a given service and is controlled by the weakest capacity category, which is a strong constraining factor. The approach also assumes that once the weakest link is resolved, the next weakest link becomes the constraining factor. In reality, this is rarely the case and a combination of capacity in different categories may contribute to the current enabling or constraining environment and may have to be addressed simultaneously. The problem is that the combination is not always well defined. This problem may require significant experience on the team and sometimes several rounds of trial and error.

Capacity Development Response Strategies

Because the enabling environment was measured using the TML, a community is limited as to the number of service options it can realistically handle in its current state of capacity. This limitation is indeed a common characteristic of small communities in developing countries because most of them are likely to rate at a development level of 1 or 2. An overall goal of capacity building and development is therefore to increase the enabling environment so that more effective solutions can be implemented over time. In the aforementioned example of the MSS project approach, stronger solutions are likely to yield better community health. According to Bouabib (2004), starting with a development level of 1 or 2, a community should seek to reach an MSS service level of 3 over a period of 2–5 years and a level of 4 or 5 over a period of 10–20 years, which is a realistic time frame in sustainable community development.

In general, the process of increasing the enabling environment of a community through capacity building takes time. As suggested by the UNDP (2009), indicators that monitor progress toward a clear, desirable outcome need to be included with verifiable means. The acronym SMART, discussed in Chapter 8, applies to these indicators as well. In developing countries, the longer the process of capacity development, the more likely it is to create challenges when dealing with the community stakeholders and external donors.

The tradeoff in small-scale community projects is likely to be between ensuring short-term and long-term solutions and balancing between quick project successes (with smaller returns) or long-term successes (with larger returns). In doing so, various strategies of capacity development may be followed (Morgan 1998). Within the context of small-scale projects in developing communities, they may consist of

- Eliminating capacity components that are more restraining than enabling,
- Making better use of and improving existing capacity,
- Building or strengthening existing capacity by adding resources, and/or
- Enabling the creation of new forms of capacity and their use through experimentation and learning.

The degree of success of the various strategies of capacity development depends on many factors and involves some components of risk. Among other things, any strategy must be owned by local stakeholders in the community who are directly involved in capacity development and are committed to its success. As remarked by Morgan (1998), no strategy works if it is imposed on "skeptical participants."

The success of capacity development strategies also depends on *what* components (tangible vs. intangible) in each category of capacity are being addressed and *how* they are being addressed. No magic formula or quick fix exists that guarantees success in capacity development. More specifically, the tangible components of capacity (e.g., infrastructure, natural resources, health, or institutions) are easier to influence, especially from the outside, which makes the results of capacity development more predictable. This notion applies to the technical MSS solutions discussed earlier in this chapter.

However, the less tangible components, such as behavior change, values, or motivation, cannot be influenced by outsiders, who can at best serve as facilitators of resourcefulness, e.g., provide resources and advise on process rather than deliver the expected outcomes (Lavergne and Saxby 2001). Such components have the potential to derail a project. As a result, special measures such as monitoring and evaluation need to be taken to prevent the creation of undesirable results that may negatively affect community livelihood.

9.4 Chapter Summary

In summary, capacity analysis helps in refining and improving the solutions and project action plans discussed in Chapter 8. More specifically, it addresses the ability of a community to handle the action plan in terms of skills, knowledge, capabilities, and resources. Capacity analysis also assesses whether the community is able to overcome any constraining environment and move forward in its development.

At the end of the capacity analysis, there is a better understanding of the community's enabling environment, what it can do, what it cannot do, and how it needs to be strengthened. In general, the results of capacity analysis can be expressed in quantitative (capacity factors) or qualitative terms (high, medium, or low). Finally, it is important to remember that the capacity development program must be created through a participatory and locally generated process.

Because of the inherent nature of developing communities, it is likely that the capacity baseline is low from the beginning. It is also likely that the rate of capacity development moves slowly as well. However, there are ways to fast-track the development if a special effort is made by outsiders, in participation with the communities, to identify using appreciative inquiry with the positive deviant individuals and groups in the community; i.e., those change makers who are successful at addressing problems because of their uncommon habits, behaviors, and attitudes (Pascale et al. 2010). The challenge then becomes understanding the reasons for success of the positive deviants and how to encourage others to adopt their behaviors and attitudes through behavior change and thinking differently.

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