1. Appropriate Technology for Water and Sanitation: Basic Principles

Basic concepts

Water and sanitation

When we talk about water and sanitation, it is good to specify what we mean.

- *Water* can be used for drinking, cooking, processing foods and beverages, cleaning, irrigating, and washing. In this toolkit, we cover water related to household consumption
- *Sanitation* refers to the sourcing, collecting and processing of human excreta.

Related to water and sanitation is hygiene, which is a very important condition for health, the safe use of water and the proper use of sanitation.

Household and community products

When we talk about products it is important to understand the difference between household and community-based products, services and solutions:

- Household-based solutions are products or services that are used by households: the end users are members of a household. The products and services are often possessed by families or individuals.
- Community-based solutions are products or services that are used by a community: the end users are members of a community (which may be a village or slum, or parts of these). The products or services are possessed and/or operated by the community.

For example, the ceramic filter produced by Basic Water Needs India, one of the entrepreneurs involved in the toolkit, is a typical household product, while the WaterPyramid produced by Aqua-Aero WaterSystems B.V. is a typical community-based product.

Centralized and decentralized

Products or services solving water- and sanitation-related issues are generally separated into centralized and decentralized solutions/products. Centralized products often involve complex and extensive water and sewage systems. Decentralized products are small-scale stand-alone products and are not connected to a system. This toolkit focuses on products providing a decentralized solution.

Further reading:
www.irc.nl
http://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_India

Appropriate Technology

Definition

It is becoming increasingly clear that low-income countries offer a potentially interesting market, also referred to as the “bottom of the pyramid” (BOP). Many innovative entrepreneurs and organizations have developed affordable and sustainable products or projects for this market. However, introducing products on these markets has proven to be difficult, usually because it requires a fundamentally different approach to product development, sales and distribution, pricing, service, and maintenance than in high-income countries. To be successful, products must be fully purpose-built or adapted to local needs and conditions; in other words, these markets require “appropriate technologies”.

Appropriate Technology (AT) is defined as “technology that is designed with special consideration for the environmental, ethical, cultural, social and economical aspects of the community it is intended for. With these goals in mind, AT typically requires fewer resources, is easier to maintain, has a lower overall cost, and has less impact on the environment.”

Appropriate Technology (“AT”) Protocol

Together with different stakeholders from the Dutch water and sanitation sector Aqua for All has developed an “Appropriate Technology” protocol. According to this protocol, criteria for determining whether a technology can be considered appropriate are:

- Accessibility (for low-income individuals and communities)
- Functionality
- Quality
- Sustainability / Enabling environment (having the least possible ecological impact)
- Manageability

Tool 1: AT protocol
This tool can also be found on the website of AT@Work (www.atatwork.org)

Key success factors

The four Dutch entrepreneurs involved in this toolkit have found the way to their markets for water and sanitation products in India. But their success did not come easily; it required a lot of hard work, perseverance, ingenuity and willingness to learn. Based on their experiences, certain aspects of the products can be identified that are essential for success:

- Physical accessibility of the product. BOP markets lack proper infrastructure. Smart distribution of the product using existing networks of partners is a critical success factor when launching a product on BOP markets.
- Financial accessibility of the product. Although the price per liter of clean water produced is affordable, the up-front investment can be a big hurdle. Low cost (and often local) production and low cost operational usage are important conditions to meet.
- Easy operational usage of the product. Environmental circumstances in developing countries are often harsh and users are not well educated. Products must be robust and easy to operate.
- Availability of spare parts. When broken, products must be easy to fix by local craftsmen. Replacement of specific parts (like filters) must be easy to perform. Setting up an effective and efficient after-sales organization is an important condition for success.

Interesting examples of Appropriate Technologies and products can be found in the “Smart Solutions” booklets published by the Netherlands Water Partnership (www.nwp.nl).

Further reading:
http://en.wikipedia.org/wiki/Appropriate_technology

Doing Business at the Bottom of the Pyramid

People at the BOP are more likely to use surface, ground or rain water and less likely to have access to piped water. An alternative, especially in (semi-)urban areas, is to buy from mobile water vendors. But this option typically involves a significant price penalty. One study showed that in eight major cities water vendors charge prices 8–16 times those charged by public utilities (UNDP 2006). Another study, covering 47 countries, found that mobile

distributors such as tanker trucks charge unit prices up to 10 times the price of piped water. In rural areas, water availability as well as cost is often an issue.

Small-scale decentralized water and sanitation solutions initiated by private sector players can play an important role in solving these issues. To build successful businesses it is important to understand the needs of customers and how these can be transformed into effective demand. Understanding the local business environment, the institutional context and the role of actors involved will facilitate the process of setting up businesses catering to the BOP. These aspects are explained below.

Understanding demand and customer constraints

Most poor people need to spend a high proportion of their income on necessities, partly because resources are scarce. In some areas, they spend a high proportion (up to 25%) of their income on clean water (WEDC 2005). Millions of women and girls around the world spend hours every day fetching drinking water. Also, unsafe water and improper sanitation harm the health of consumers, leading to high health care costs and opportunity costs (related to not being able to work). Access to safe water and proper sanitation is therefore key for these people. This implies very attractive market potential in terms of volume. The challenge is then to understand what products might meet the needs of consumers in low income countries:

- What are current water consumption patterns and how are they serviced?
- What are the constraints of current water and sanitation supply (money, time, quality, security, accessibility of supply) that the customer wants changed?
- What priority does the customer give to spending money on water and sanitation in relation to other needs like food, communication, health care, etc.?
- Do customers use water to run a business (food stall, water sales) or would they be interested in doing so? A positive answer will create a need for larger quantities.
- Can the customer prefinance equipment (e.g. water purification unit, tanks, latrines, etc.)? If not, what kind of credit provision would fit their situation? What is the credit need?

Transforming a need into effective demand

Everybody needs safe drinking water and proper sanitation. But this does not mean everybody wants to pay for good water services or decent sanitation. Consumers will only pay when they value the product or service in an economic way. Five important conditions have to be met (the AT protocol closely relates to these aspects):

- Safe water and proper sanitation must be high on their list of daily priorities. In spite of what we might think, this is not always the case. Food, clothes, a job or even a cell phone may be ranked higher and this may change from day to day.
- People must understand the economic and social benefits of drinking safe water or using proper sanitation. Education and awareness raising provided by local trusted partners are key in explaining these benefits to the local population.
- The value proposition (see Step I, Chapter 2) of the product or service must be very clear compared to the current situation, not only with respect to the product but also to the application of the product, the social benefits and product-related services.
- The product or service must be affordable. Calculating the Total Cost of Ownership and comparing the outcome with alternatives in the market is an essential step. You should focus on people who are able to spend a small amount on water and sanitation products. The ultrapoor (living on < 1 USD a day) often rely on donor support or emergency aid and cannot be served cost-effectively, unless if NGOs pay for the product or service
- Products or services must comply with the AT protocol (see tool 1).

Understanding the business environment and the institutional context
Having an extended network in a BOP market is essential, but building networks takes time. It is important to realize that you need a local partner who understands the market, how people work together, the way relationships work, and the organizations that are important to work with.

The challenge in BOP markets is how to reach your customers physically. BOP markets are often located in rural areas or slums; both lack proper infrastructure (roads, transport), communications (Internet, TV, radio) or financial services (banks). Setting up your own network is costly, so you have to plug into existing distribution networks.

For the water and sanitation sector in particular, understanding the institutional market context is essential. Control over water resources provides a strong power base in developing countries: whoever controls water resources can provide access to water. Market entrance of water (technology) providers, such as AT related products, can therefore be seen as a threat to the power basis of established parties. In most cases, these will be governments or government-owned institutions. Besides, water is linked with health and because health is often seen as a public issue, government policies will be in place and must be complied with.

As governments (or semi-governmental bodies) have a broad set of instruments to defend their market position, they have been known to frustrate market entrance of AT related products. This risk is even higher for foreign companies that enter the market, as governments often target them to demonstrate market protection and national pride. Alternatively, having institutional support will speed up and scale up successful market introduction of AT related products.

Working together: actors involved in a BOP market
As mentioned above, entrepreneurs need to understand the importance of working together with different actors in a BOP market. Customers demands, the issues related to water and sanitation, and the products or services depend on the local context. This context must be understood well. Specific actors are:

- Local, regional or national government, starting at the community level, who run large water and sanitation programs
- Local and other NGOs working close together with communities and providing donor-driven support, who understand the BOP market and know how to approach your future clients
- Small SME banks or Micro Finance Organizations, who show increasing interest in financing water and sanitation activities
- Women's Self Help Groups, because women, being part of a household, play an essential role in water and sanitation
- Local and other research or capacity building centers, educating locals and conducting research into water- and sanitation-related issues

Further reading:
Info Sheet 1**:** BOP strategies

http://en.wikipedia.org/wiki/Bottom_of_the_pyramid
http://en.wikipedia.org/wiki/Appropriate_technology

Lessons learned in reaching the world's poorest

Christian Seelos, director of the Platform for Strategy and Sustainability at IESE business school wrote an interesting essay on business lessons in reaching the world's poorest. His recommendations:

- Look for organizations (NGO's, businesses) in low-income markets that are already serving the poor.
- Build relations with a number of organizations (especially NGO's, businesses and governmental organizations) as early as possible; businesses become more visible and credible when engaging with organizations who are already working at the BOP.
- Understand how business is done locally and how different stakeholders act and react at the BOP.
- Once relationships have been built, identify and manage possible bottlenecks in working with partners involved in BOP markets.
- Start to think about "Western" competencies suitable to replicate in Southern BOP markets. This may naturally fit higher-income clients, but this approach will generate revenues and mitigate business risks, buying you time to solve the bottlenecks in your local partner's strategy.
- Ensure your business model supports an increase in the real income of people at the BOP by involving them, e.g. in the distribution or production of your product.
- Partnerships are not static. As the local environment changes, potential opportunities and threats may emerge that can affect the sustainability of your partnership. Share insights on these issues with your partners.

The lessons learned by the entrepreneurs involved in the toolkit underline these recommendations. However, they added three important aspects in interviews:

- Focus on the affordability of your product.
- Your product must be easy to repair.
- Spare parts must be easy to obtain.

These aspects ensure that your customer has easy and sustainable access to your product.

Further reading:
"Company lessons in reaching the world's poorest", Christian Seelos, March 17, 2008
http://intouch.emeraldinsight.com/