Step 3

Preparing Community's Environmental Profile

Once the planning team is established and the vision defined, it is time to turn to the community's current environmental needs. The planning team should clearly identify the environmental needs within the community and collect information on these issues. Answering the following questions can help the planning team identify the community's needs:

- What are the boundaries of the environmental planning area?
- What environmental problems affect the community?
- Do any environmental problems threaten public health, the environment, or the quality of life in the community?
- How effective are the community's environmental facilities?

A thorough Environmental Assessment

The thorough community environmental assessment provides a view of the present condition of the community through asking the question "Where is the community now?" and taking stock of its social, economic, and environmental assets. It helps the field worker and the community members prepare community's environmental profile. It enables the community to identify and rank problems based on risks to the environment, quality of life, and economic vitality. The community will also be better prepared to set priorities for future actions.

The key to success in evaluating a community's assets is getting the right people involved. Broad community participation will help ensure that the information you collect is complete and correct. And, tap into local experts -- college professors, local and outside environmental experts, engineers, planners, and others knowledgeable about the community's cultural, social and natural resources.

A Community Assessment will result in:

- A delineation of the planning area boundaries.
- An identification of community values.
- An inventory of natural and human-made features

including sensitive areas and opportunities.
- An evaluation of economic conditions in the community.
- An evaluation of public facility and infrastructure capacity and effectiveness (e.g. wastewater treatment facilities).
- Linkages among social, economic and environmental issues.
- A way to compare the client/target with other communities.

Once the community comes to know *where it is*, it can more clearly see *where it is going*. The next step, thus, is to ask, "Where Is the Community Going?", and look at trends in the community and predict its future based on those trends.

There are many issues to be considered by the field workers and the community members when undertaking an assessment particulalry getting the right people involved, planning area boundaries and gathering information.

The inventory for making **Community's Environmental Profile** must consider the following:

- Natural Resources which should be protected such as unique habitats, wetlands, drinking water sources, rivers, lakes and streams, and other sensitive environmental features.
- Cultural Resources And Recreational Facilities which contribute to the uniqueness of the community or support tourism.
- Public Facilities which contribute to the protection of human health and the environment such as solid waste, water treatment, and wastewater facilities.
- Problem Areas which may pose a risk to environmental quality or human health.
- Historic Land Use patterns which have influenced growth and development in the community.
- Social, Demographic, & Economic Characteristics which are identified for making planning decisions and determining the impacts of planning decision making.
- Environmental Health includes becoming aware of environmental risks and factors within the community and learning how to reduce the personal and the family's exposure to these risks.

Community assessment gives a good understanding of the community's current conditions, identified problem areas and possible ranking of areas according to risk to the environment, quality of life, and
economic vitality.

Answering "Where is the community Going ?" will help the community predict, based on current trends and activities, the direction you are headed. It allows community members to visualize their future if nothing is done to intervene. What can you expect if current patterns of land development, population change, natural resource consumption, and commercial and industrial activities continue? Are these trends sustainable?

The trends statement can be depicted in many ways. You may wish to illustrate several possible scenarios. Tools may include graphs, tables, text, maps, and computer or hand-drawn illustrations. Once you have illustrated the community's probable future scenarios, it is time to ask "Where Does the community want to Be?"

What Are the Boundaries of The Environmental Planning Area?

Defining the boundaries of the community's environmental planning area will help the the community organisation determine its environmental needs. The community's environmental
planning area should include:

- "Problem" areas that might have actual or potential public health and ecological impacts, such as waste disposal sites and industrial areas (if any).
- Areas and resources that are needed to preserve and protect, such as drinking water supplies and rivers.
- Facilities and resources that are used to protect public health or environmental quality, such as solid waste and wastewater facilities, which are usually not a regular feature in our villages.

With the active involvement of the community the field workers shall define the boundaries of the community's environmental planning area in any suitable way and choose the approach that makes sense for the community.

Advantages of Beginning Small

Begin with a geographic area small enough to ensure that the community has the resources and authority to carry out the plan it develops. For example, they could define the environmental planning area as the **area within the village boundaries,** if the community is incorporated. They might also wish to add nearby areas that are not within the town or village boundaries but that might influence or be affected by the village environmental planning for example, **areas served by drinking water, wastewater, solid waste, or other facilities.**

The Regional Advantage

Alternatively, one might wish to use **District or Union council boundaries** to define the

environmental planning area. Regional boundaries offer the opportunity for several localities to work cooperatively on common environmental and infrastructure issues and to share costs. If one is considering a regional approach, he shall consult with the neighbouring communities to see whether they are interested in collaborating with the community. Check with government departments , too; without their support, a lack of authority will limit the value of a regional approach. Where permitted, special purpose districts may solve this problem.

Physical Characteristics and Natural Conditions

Planning area can be limited by using **physical characteristics** rather than village or Union Council boundaries. This approach is appropriate for regions where a mountain ridge, for example, tends to separate the villages on one side from towns on the other. If this is the case in a community, the field worker shall consider limiting the community's environmental responsibility (facilities) to the area on the side of the mountain or other natural feature that separates the two regions. To prepare for the planning process, be sure to examine the natural conditions within the planning area to identify locations that might be more or less vulnerable to environmental damage.

Adjusting the Area as Appropriate

In general, a community organisation should begin with its community boundaries, if possible. These boundaries can be adjusted if needed, for example, if new data on projected growth becomes available, or if one or more issues suggest that they should consider a combined (regional) approach. Once they have defined the boundaries of the environmental planning area, they can identify the environmental concerns within this area.

Do Any Environmental Problems Threaten Public Health, Ecosystems, or the Quality of Life in the Community?

A key step in defining the community's needs is determining whether any environmental problems pose a serious threat to the residents and surrounding ecosystems. The planning team can develop a list of environmental problems by thinking about possible threats to the health of residents (such as unsafe drinking water), specific pollutants or pollutant sources in the community (such as pesticides used near drinking water wells, and natural resources being affected by pollution (such as a river with degraded aesthetic qualities and a declining fish population). They shall also think about threats to residents' quality of life, such as loss of recreation areas.

The list of environmental problems should include not only concerns that exist today but also possible future problems. For example, a town's drinking water well might not be contaminated now, but possible releases of pollutants from particular sources near the well might contaminate the well in the future. Such ***potential*** risks should be included in the list of environmental concerns. To help determine potential risks, "what if " questions, shall be asked.

It's a good idea to involve the broader community in this step. People outside the planning team might have concerns that haven't been considered. If these concerns are never heard by the team, public support for the comprehensive environmental plan might suffer. If a communitywide meeting is held to define a community vision, the field workers would probably came up with a list of residents' concerns at that time. If not, conducting a special open meeting of the planning team shall be considered to involve interested members of the public.

After developing a comprehensive list of environmental problems, the team should determine which are the "high-risk" problems: which pose a serious threat to health, the environment, or quality of life. This will help the team to target the resources wisely when putting the environmental plan together.

How Effective Are The Community's Environmental Facilities?

The most basic step in identifying a community's needs is the evaluation of the community's environmental facilities, such as solid waste, drinking water, and wastewater. The environmental facilities might also include structures involving little or no capital or equipment, such as buffer strips, wet ponds, and swales for runoff management.

The planning team should work with the people who manage and operate the environmental facilities to identify problems. A facility might perform ineffectively if it is too small to serve the number of people in the community or if it is operated improperly or inefficiently. Some problems might even pose a risk to health, ecosystems, or quality of life. For example, the use of fertiliser could leach chemicals into ground water that constitutes the village's drinking water.

Measuring the trends

To get a start, here are categories of trends the field workers and community activists may wish to consider:

- Socio-Economic Trends
- Environmental Trends
- Civic Participation Trends
- Sustainability Trends

Measures of Socio-Economic Trends

Generally in Pakistan, projections on population, employment, income, housing, and poverty are usually not developed by the planning office or state planning or economic development departments. If the community is growing, what are the needs for infrastructure such as schools, roads, solid waste disposal, water supply, and wastewater treatment? Here is a good place to make linkages to

natural resources. If water quality is not great already, what might happen when 100 more houses are added? Can the water treatment system handle more houses? What about the stormwater system?

If the community has a stable or declining population, other questions apply. Can the community construct or maintain roads adequately? Can you afford to wire the high school for computers?

Measures of Environmental Trends

Land use and development patterns are among the key trends to measure. The pattern of development is usually less predictable in our communities due to lack of zoning law or regulation. The predictions shall thus be based on evaluating factors such as the historic patterns of development and redevelopment, what land is on the market, availability of infrastructure, and employment patterns.

The goal in doing either a formal build-out analysis or something less formal is to create maps showing probable or possible land use scenarios for 5, 10, or 20 years in the future. This information can be used to to evaluate how changes in population and land use will affect natural resources. For instance, if the predictions show that commercial development is extending along a particular highway, look for wetlands or sensitive habitats in the area. Are they protected? If not, the community members may wish to mark them as vulnerable to development. Also consider the potential for upland areas to be developed into houses, the need for roads to be widened, and impacts of stormwater on streams.

Maps of the future scenarios will be based on maps of current conditions. Changes can be indicated by using plastic film as an overlay, or by coloring-in changes on copies of the original maps. The field workers need to be cautious about how they show the risk of development. Some landowner may be sensitive about other people predicting the future of their land! The field workers may consider using categories such as high, moderate or low potential for development.

Measures of Civic Participation

While examining environmental and socio-economic trends, the field workers only have part of the picture of a community's future. The other part is understanding how people work together. Evaluating trends in community involvement requires simply looking at the community and talking to people. Religious leaders, leaders of nonprofit organizations, teachers, students, etc. are good people to ask about their perceptions of how people are working together

to support the community. Some of the measures one might want to track are:

- Community participation
- Community leadership
- Volunteerism
- Ethnic and racial diversity and the quality of relationships between different groups.
- Educational quality and accessibility

Measures of Sustainability: Making connections between economic, social, and environmental trends.

The goal of evaluating economic, environmental, and cultural trends is to integrate them into an overall evaluation of the sustainability of the community, watershed, or region. The key is to consider how these separate issues are related, and to think of the long term. While studying the community, the field worders shall look for key indicators that provide an integrating function. These will vary in each community. Perhaps volunteerism, or water consumption will be among the key indicators that integrate the many bits of information they collect, and will help they evaluate if they are heading toward sustainability.

Is The List of Needs Adequate to meet the community' vision for the Future?

After doing the work suggested in this chapter, the community organisation will have defined the community's environmental needs using three approaches: what problems pose the greatest threat to the community's residents and natural resources, how well the environ-mental facilities are serving the community, and what standards you need to set and meet. One will probably see a lot of overlap among these three lists. The community organisation needs to combine all three into a "master list" of needs that eliminates duplication and is easier to work with. The community needs to revisit its vision to make sure that the goals expressed there are addressed by the list of current needs. If an important item is missing, the community needs to add it to its list of current needs. For example, if the community organisation envisions economic or population growth in the coming years, they need to make sure that they evaluate whether expanded capacity of the drinking water, wastewater, and solid waste facilities is needed.

Step 4

Finding Feasible Solutions for The Community

Once the community needs are identified and its mission is refined the community vision for the future, it's time to look for possible solutions. A destination on the road map is pinpointed and convinced many people in the community to make the journey. Now it's time to look at the vehicles the community organisation can use to get there.

This chapter helps the community and field workers begin to figure out which solutions will work for the community. Although most small communities do not have every problem discussed in this chapter, and many will have problems that are not discussed, some of the best solutions for the typical problems faced by small communities are presented. This chapter shows how to evaluate available options, taking into account such factors as cost and local environ-mental constraints. Some of the possible "vehicles" for reaching the destination are technological (structural), such as new treatment technologies. Others are management (nonstructural) solutions—setting up a water conservation program or an educational program about household hazardous waste, for example. A solution to one problem might affect (positively or negatively) another problem. At this step, one should determine all solutions that are feasible for a community and estimate what they might cost and what they might achieve. This information will be critical when its time to set priorities for action.

Technology and Management Options for Small Communities: An Overview

The list of solutions that can be applied to environmental problems is nearly endless. This chapter presents a brief description of some of the solutions to issues that nearly all small communities face. The field workers will need to find out more about these solutions if they think they might be suitable for the community. The goal here should be to gain information about thesolutions that might be suitable for a particular community, including:

- What each solution can achieve.
- What factors can limit a solution's effectiveness.
- What the capital and operating costs are.

- How easy or difficult implementation is.

Pollution Prevention

Preventing pollution—rather than trying to treat it after it happens—should be a basic principle of the community's environmental plan. Pollution prevention is the process of identifying areas, processes, and activities that create excessive waste byproducts to try to minimize or eliminate the amount or toxicity of these byproducts. This approach will help us avoid the costs of cleaning up pollution. Here are just a few examples:

- **Conserve water**! A communitywide effort to conserve water can help the town in several important ways. Heavy pumping of an aquifer over time can cause changes in the amount they can pump and the chemical quality of the water they pump. High water usage also means that more wastewater is generated that needs to be managed. Some simple steps—such as starting a leak detection program and using water-saving devices in homes—can help prevent these problems and help avoid the cost of developing additional drinking water and wastewater facilities.

- **Don't dump used oil**! No matter how little in quantity, used oil should be disposed of in a manner so that it won't pollute the environment. Even small amounts of used oil poured on the ground, down the drain, or into the water can contaminate the drinking water supply of an entire community. The used oil should be taken to a collection centre or service station that can handle it properly. The community is responsible for providing a market or use for this used oil for ensuring its safe disposal.

- **Safely dispose of household hazardous waste**! Many common household products (e.g., most cleaning fluids, disinfectants, pesticides, and paint thinners and removers) contain hazardous constituents. Dumping these household hazardous wastes down the drain, into the garbage can, or on the ground can contaminate ground water, surface water, and soil. Many communities have started household hazardous waste collection programs (or worked with other communities to start them) to gather these wastes and dispose of them safely.

- **Save energy**! This is something every community member can do to prevent pollution. Burning these fuels creates air pollution. If less energy is needed, less air pollution is produced. Saving energy can also save the money. The community should promote energy conservation through public service announcements and other means.

- **Protect the area around the drinking water wells**! If you protect the water source before it gets contaminated, they can avoid some major costs.

- **Don't be a throw-away community!** Landfill space is becoming limited, and building a new landfill that protects water, soil, and air from contamination is expensive. At the same time, people keep generating more and more trash. Try to reuse materials instead of throwing them away. Try to recycle glass, plastic, aluminum, and paper. Don't buy products with extra packaging that has to be thrown away. A community can provide leadership in such efforts by developing purchasing programs that reduce waste and maximizing the use of recycled materials.

- **Don't litter!** If everyone helps, the cost of litter collection and management can be reduced.

The community organisations' environmental plan should also include teaching community residents about pollution prevention. Pollution prevention is a "mind set"—a way of looking at the world and the way we live. If everyone reduces pollution in his or her own life, the community, its environment, and the future will benefit.

How a solution might affect other environmental problems they face or other important community considerations.

- What opportunity costs are associated with various options. (Opportunity costs are the costs of the next best alternative—what they are giving up by choosing the option they choose.)

Evaluating Costs for Technology and Management Options

To evaluate the costs of possible solutions, the field workers and community organisation need to consider several cost factors:

- Unit costs
- Capital costs (the costs of constructing, purchasing, or upgrading equipment or facilities).
- Annual operating costs (the costs of running equipment and facilities on a day-to-day basis).

To make meaningful cost comparisons, the facility size must be comparable between options and must be sufficient to handle the maximum material flows (drinking water, wastewater, solid waste, recyclables) anticipated over the estimated life of the facility.

All cost factors—unit costs, capital costs, and operating costs—should be evaluated together. There might be a tradeoff between capital costs and operating costs. A well-designed facility with higher initial costs usually provides better performance and has lower operating and maintenance costs than a lower capital-cost, high-maintenance facility.

Narrowing the Options

Once the community organisation has a list of possible generic options for the key environmental issues facing the community, they need to eliminate the options that are not feasible. First, eliminate any option that will not work because of factors specific to the community. These factors could include:

- Population density.

- Distance from significant population centres.
- Type of water bodies and land features.
- Water quality, chemistry, and quantity.
- Soil type and geology.

Looking at Characteristics of Soil and Ground Water in A Community

To determine whether certain technology options are feasible, it is important to understand the characteristics of soil and ground water in the community. For ex-ample, some soil conditions, such as shal-low bedrock or water table, might require the use of special onsite wastewater systems in answered areas. By the same token, a shallow water table is more easily contami-nated than a deep water table. The vulner-ability of ground water affects site selection for landfills, underground storage tanks, and a variety of potentially contaminating industrial/commercial activities. restricted.

Make community and the field workers must make sure that they understand exactly what each remaining solution can achieve and whether it will create any new problems. Reviewing this information for each solution still on the list might cause they to remove some solutions from consideration. Finally, a community organisation might want to use a combination of solutions for some problems. Different solutions can complement each other or be used to handle different aspects of a problem. Once the options are narrowed, the field workers will have a list of the solutions that are feasible for the community, along with a good idea of what they cost and what they can achieve.

Finding Solutions: Drinking Water

A community needs an adequate supply of safe drinking water. The solutions to consider fall into two categories: quality (source protection and treatment) and quantity (conservation, leak detection, and expansion of supply).

Drinking Water Quality: Protecting the Source

About 95 percent of rural communities use ground water as a drinking water source. The best way to protect ground-water resources is a **wellhead protection program**. A wellhead protection program seeks to manage the land area through which water enters the ground water that provides the drinking water. For communities that use ground water as a drinking water source, a wellhead protection program minimizes contamination of this valuable resource.

Similarly, a community can protect its drinking water source through a **watershed protection program** if the drinking water is drawn directly from a lake, river, or other body of surface water. The **watershed** is the area of land from which water drains into that source of surface water. Through a watershed protection program, the community can protect its surface water resources by limiting contamination in surrounding areas. Both

wellhead protection and watershed protection are forms of pollution prevention, which can directly benefit the community. Wellhead and watershed protection programs involve:

- Forming a community planning team.
- Delineating the wellhead or watershed area.
- Identifying and locating potential sources of contamination in the wellhead protection area or watershed.
- Managing the area to prevent contaminants from entering the water supply. This includes regulatory (such as zoning), nonregulatory (such as public education), and financing strategies (such as purchase of development rights).
- Reviewing the protection program every year and developing a contingency plan for alternative water supplies.

These programs are the "ounce of prevention" that can help avoid some very expensive cures—installing treatment, cleaning up the source, or finding a new water source, all of which are far more costly than preventive measures. In most cases, the community members alone have to help themselves to implement simple, inexpensive preventive measures that go a long way toward protecting the drinking water source.

Drinking Water Quality: Treatment Technologies

Drinking water must be treated to protect the health of the people who drink it. Different types of treatment processes tend to be used for ground water than for surface water. The major types of drinking water treatment include disinfection, organic removal, inorganic removal, and filtration. Although filtration is sometimes used for ground-water sources, this process is primarily used with surface water.

Proper **disinfection** kills disease-causing microorganisms (viruses, bacteria, and some parasites). The process that small communities use most often is chlorination, in which chlorine gas or hypochlorite solutions are added to the water. **Removal of organic contaminants** (such as pesticides and solvents) **and inorganic contaminants** (such as nitrate and lead) is important if the drinking water contains any of these substances at a level that might be harmful to human health. For small communities, the most suitable technologies for removal of organic contaminants might be aeration, which strips certain organic compounds from the water to the air, or granular activated carbon (GAC) treatment, in which water passes through specially treated carbon particles that have an extensive surface area onto which the organic particles can attach. **Filtration** removes particles of solid matter from water, usually by passing the water through sand or other porous materials. Filtration also helps to control biological contamination. Cloudy water

(cloudiness is measured as turbidity) can contain harmful microorganisms and reduces the effectiveness of disinfection. where seriously needed, the environmental programmes need to introduce such methodologies and proposals for such projects shall be submitted to potential donors.

Drinking Water Quality: Restructuring Options

Small communities may at times feel overwhelmed by the cost and complexity of owning and operating a water treatment and distribution system. Every community wants to get the best possible service at the lowest possible cost. Many small communities don't even have access to drinking water and they have found that they can achieve this goal by restructuring their water system. Restructuring refers to changes in ownership, management, or operations that allow a system to improve service and/or lower costs. There are many different restructuring options available to small communities. For example, a community may wish to join together with some of its neighbours to form a "mutual aid" network. Through such a network, communities can share expensive equipment and staff.

Drinking Water Quantity: Conservation

People can do many simple things to use less water, for example, use low-flow shower and taps heads and toilets, place a filled plastic bottle or toilet dam in the toilet tank, or shut off the tap while brushing teeth. Every gallon saved is one less gallon pumped, treated, and delivered to the consumer. A water conservation program can consist of conducting public education, or promoting conservation through financial incentives, such as higher water rates or scaled charging systems in communities where the community organisations have developed their own drinking water supply systems. For example, a powerful tool to keep water demand in check is regressive user charges, which charge customers who use more water a higher fee per gallon used. These charges penalize usage beyond basic requirements and encourage people to use less so that they can save money.

Drinking Water Quantity: Finding a New Supply

Except for communities with large growth potential or a major new water-consuming user water conservation, reuse options, and regressive user charges may be enough to keep a community from having to seek a new water supply. To justify these programs to members of the community, explain that the programs avoid major capital expenses that go along with developing new water supplies. If a major increase in the demand for drinking water is expected, however, a new water supply might be necessary. This could be an excellent long-term alternative if a relatively pure supply is close and available. Depleting a natural resource, however, always has a price. Keep in mind, too, that increasing the supply will increase the cost of drinking water and will also affect wastewater management costs.

Finding Solutions: Wastewater

Domestic wastewater must be properly managed to avoid public health problems. Three types of wastewater handling systems can be used in small communities: onsite systems, cluster systems, and centralized systems. A community might need a combination of these systems, such as onsite systems in outlying areas, cluster systems in small residential subdivisions, and centralized systems in more populated or commercial areas.

Onsite Systems

Septic systems handle the wastewater from one residence on site. Septic systems consist of a tank that retains the wastewater solids and a drainage field (leachfield) where the tank effluent is distributed. In the leachfield, natural processes purify the liquid as it drains through the soil. This system has been introduced by some community development programmes in the rural areas.

Conventional septic systems work best on large lots with deep, permeable soils. A variety of alternative onsite system designs are available to accommodate a range of difficult site and soil conditions. The most appropriate system depends on factors such as how permeable the soil is, how high the water table is, and how shallow the bedrock is. In most cases the community development programmes overlook these requirements and provide the same kind of facilities in all communities irrespective of their environmental conditions.

Poorly sited, designed, installed, or maintained septic systems can result in surface ponding that continues for an extensive period is considered a health hazard and requires corrective action. Because maintenance is the only factor that can be controlled once an onsite system is installed, a program of periodic inspection and/or pumping is advisable. This approach, combined with public education to ensure that owners are putting only appropriate materials down the drain, is the easiest to implement. Repairs and replacements should always be done by professionals, since exposure to inadequately treated sewage and hydrogen sulfide gas presents a health risk.

Cluster Systems

In some areas individual onsite systems are inappropriate, either because lots are too small or because other land characteristics make them impractical. In this situation, a cluster system might be appropriate. A cluster system normally uses low-cost alternative sewers to collect wastewater from homes in the area and transport it out of the village or to a reliable, low-cost, easily operated treatment/disposal facility. This type of system can be suitable for communities of up to 100 homes but is often used for smaller groupings. Several types of alternative sewer systems can be used to collect and transport wastewater from residences. The treatment facility is usually a larger version

of an individual onsite system, such as subsurface soil absorption systems or sand filters.

As with any treatment system, a maintenance program is essential to ensure proper operation of a cluster system. Compared with conventional collection and treatment systems, cluster systems require minimal maintenance. The maintenance program, however, should always be in place and clearly spelled out to the community members who use the cluster system.

Centralized Systems

In more densely settled areas, where multiple cluster systems are needed and onsite systems are not practical, a centralized wastewater system might be necessary. Constructing conventional sewers to collect the wastewater, however, is almost never practical for small communities because of the high cost. Conventional sewers usually account for over three-quarters of the total cost of a conventional wastewater collection and treatment system. The high cost of constructing the sewer system might be acceptable on a per-household basis.

Many types of technologies are available for treating wastewater at a centralized plant. Natural treatment technologies use natural processes associated with soils, vegetation, or wetland environments to treat wastewater and include land treatment, lagoons, slow sand filters, and constructed wetlands. These systems generally require larger land areas than mechanical systems. Wastewater must be treated (usually by sedimentation or lagoons) before application to land, filters, or wetlands.

All treatment systems produce some amount of sludge, which must also be treated and/or properly managed. Sludge treatment systems reduce sludge volume by removing water (dewatering). They can reduce the number of disease-causing organisms in sludge and reduce its attraction for insects, rodents, and other animals through digestion, composting, or adding lime. Spreading treated sludge on the land to improve soil or placing it in a landfill are the most common disposal methods for small communities.

Finding Solutions: Solid Waste

The best approach to solving a community's solid waste problem is integrated solid waste management—using a **combination** of techniques and programs to manage the municipal waste stream. An integrated system is designed to address a specific set of local solid waste management problems, and its operation is based on local resources, economics, and environmental impacts.

The idea behind integrated solid waste management is that a combination of approaches can be used to handle targeted portions of waste stream. Locals should consider a series of activities, each of which is designed to **complement** the others. For example, a recycling program can have positive impacts on the development of a waste-to-energy facility. Source reduction, recycling, combustion, and landfilling can all have positive impacts on the local waste management problem.

To reduce waste management problems the community should first consider source reduction— reducing the amount and toxicity of the solid waste generated. Recycling of useful waste materials is the next most desirable approach. Finally, composting, incineration, and landfilling complete the solid waste hierarchy. Suitable combinations of these alternatives are considered an integrated management program.

Although not a general trend in Pakistan, for small communities, **regional cooperation** in solid waste management offers several advantages. Communities that join forces can share the resources needed to promote reduction at the source and operate recycling and composting programs. For example, communities would be able to obtain better contracts for selling recyclable materials with the higher volume of materials resulting from regional cooperation. With landfilling, regional cooperation can result in greater efficiency and cost savings in collecting and transferring trash and in operating the solid waste facility. Larger facilities are more attractive to private industry, which can relieve individual towns of the responsibilities of operating these facilities.

Pollution Prevention: Source Reduction, Recycling, and Composting

Source reduction, recycling, and composting reduce the total volume of waste that must be disposed of, thereby lowering disposal costs and extending the life of a disposal facility (landfill).

Source Reduction

Source reduction is an approach that changes the way products are manufactured, purchased, and used so that less solid waste is generated. Community members can reduce waste generation by:

- Reusing plastic and paper shopping bags, lunch bags, and containers. For

example, local merchants can cooperate by offering a reward for each bag returned.

- Eliminating unnecessary packaging.
- Using long-life and energy-efficient products (such as light bulbs).
- Avoiding disposable products if reusable items are available (such as razors and batter-ies).
- It would take some time bu the community could also consider using "pay-as-they-throw" rates for garbage collection to reduce the amount of garbage.

Recycling

Some solid wastes can be collected separately and sold to manufacturers as raw materials
for making products. Recycling collection programs range from simple, low-technology dropoff centres to complex separation at material recovery facilities. Critical to the success of a recycling program is the availability of markets for collected materials. Without proper markets, storing, transporting, and disposing of the recyclables that have been collected can result in significant costs. They will need to identify marketable materials and the potential volume of each, and find potential buyers for the materials. In general, marketable recycling materials include:

- Aluminum and other metal cans
- Glass bottles
- Some plastic bottles
- High-grade office paper
- Newspaper and magazines
- Cardboard Metals
- Wet cell batteries (such as car batteries)

For the recycling process to go full circle, the recyclable materials that have been collected must actually be reused. Small communities can help "close the loop" by purchasing products with recycled content and encouraging community members and local industries to do the same; this helps create markets that ensure collected recyclables are reused.

Recycling Options for Small Communities

Collection System	Description	Advantages/Disadvantages
Recycling in conjunction with other public service	Recyclables are collected with other public services, such as solid waste collection.	• Profits from sales of recyclable materials are internalized within the solid waste management program.
Regional facilities	Collected materials are pooled in a regional recycling centre or facility.	• Practical in areas with sparse population. • The recycling programme has independent budgeting and money raising power. • Able to handle more recyclable material, which are more marketable for buyers.
Private recycling operations	Recycling is done through private entities, such as industry or waste management firms	• Reduces capital investment in collection equipment. • Can be selective in accepting recyclable material.
Public recycling drives with volunteers	Recycling programs are run as fundraising or public service activities.	• Increases public involvement and awareness.

Recycling alone will not solve a community's solid waste problems, but it can divert a significant portion of the waste stream from disposal in landfills or combustion facilities. For a community of 1,000 people, recycling the materials listed on the previous page would typically reduce the amount of waste disposed of in a landfill by about 5 percent.

Composting

Yard wastes (leaves, grass, weeds, and remains of plants) account for close to 20 percent (by volume) of the municipal solid waste stream. Yard wastes can be easily decomposed by bacteria and fungi to form a humuslike product useful as a soil amendment for gardening, landscaping, and agriculture. A centralized yard waste composting program can be relatively inexpensive and easy to operate, and can help reduce the amount of solid waste bound for disposal. You can encourage homeowners to compost yard waste on their property if a centralized system is not practical. Because home composting might attract unwanted animal life or breed insects if not done properly, a public education or assistance program is important.

Solid Waste Disposal

The most common methods for solid waste disposal are landfilling and incineration and both are not done properly in our communities. Landfilling involves placing wastes in a large, specially designed cavity, then covering them with soil (or approved alternative materials) each day. The daily cover prevents attraction of animals and insects. The landfill be lined with more than one layer of impermeable materials (synthetic plastic and natural clay) to prevent the contamination of ground water by liquid leaching from the landfill. But we have not observed any landfill site like this so far.

Incineration involves burning combustible solid wastes (such as paper and plastic materials) in a large, specially designed furnace. The waste is reduced to an ash, which must then be disposed of, usually in a landfill. Proper incinerators can generate valuable energy as a byproduct.

Regional landfills and incineration facilities can provide practical and cost-effective regional solutions for several small communities. Capital and operating costs for these facilities are shared by a larger number of users, reducing the cost to individuals in any one community.

Finding Solutions: Hazardous Waste

Improper disposal of household hazardous waste (HHW), including used oil, can have major environmental consequences for small communities, especially for drinking water supplies. A number of small communities have begun HHW collection programs and used oil recycling programs to prevent pollution from these substances.

Household Hazardous Waste Collection Programs

Many common household products contain hazardous constituents. These products become HHW once the consumer no longer has any use for them. The average household is estimated to generate more about 10 pounds of HHW per year. As much as 50 pounds can accumulate in the home, often remaining there until the family moves or does an extensive cleanout. HHW can pose risks to people and the environment if it is not used and stored carefully and disposed of properly. Education can focus on:

- How HHW contributes to pollution.
- Which kinds of products contain hazardous constituents.
- Which alternative products contain fewer or no hazardous constituents.
- How to reduce the amount of HHW generated in the home (such as using up household products or giving away what cannot be used).

- How to properly store, handle, and dispose of products in the home containing hazardous constituents.

Communities usually begin a HHW program by designating a specific day for residents to drop off HHW. Organizing a collection event, perhaps with neighbouring communities, is an important first step in reducing and managing risks associated with HHW.

Finding Solutions: Nonpoint Source Pollution

Nonpoint source (NPS) pollution comes from many different sources and affects both surface water and ground-water quality. NPS pollution can especially be a problem when it affects drinking water supplies. Even water bodies that are not used for drinking water, however, can become so degraded that they can no longer be used for desirable purposes, such as fishing and swimming.

Because of the strong relationship between drinking water and NPS issues, many of the technology and management options presented in this chapter for drinking water are also useful for NPS pollution. NPS pollution control should be part of wellhead and watershed protection programs. The most important aspects of NPS pollution control programs are:

- Identifying sources of NPS pollution.

- Developing management strategies to control NPS pollution. As with wellhead and watershed protection, this includes regulatory strategies, nonregulatory strategies, and financing strategies, as well as control methods that the local government can use directly.

- Educating the community on NPS pollution problems and strategies to reduce those problems.

Sources of NPS Pollution

Many different activities and land-use patterns create NPS pollution. Commonly, NPS pollutants are carried by rain that run into lakes, streams, and other water bodies. Stormwater runoff can carry soil, fertilizers, pesticides, oil and other car fluids, trash, and other materials that affect water quality. Runoff increases when natural vegetation, which captures and uses much of the rainwater, is removed. Problems also occur when natural lands are developed and covered with houses and hard surfaces such as asphalt that do not absorb water. Rainwater that falls on these surfaces quickly runs into surrounding areas. This problem is worsened when contaminants on these surfaces are washed with the runoff into surrounding water bodies.

Runoff is also a major problem on surfaces that cannot absorb water quickly enough, such as exposed soil. This is a particular concern because runoff over bare soils causes erosion, which increases water quality problems and wastes valuable soil resources. Air

pollution also contributes to NPS water pollution. Contaminants that are released to the air settle or are ultimately washed out of the air by rain or snow.

Management Strategies for NPS Pollution

There are two practical ways to reduce NPS pollution:

- Reducing contaminants that are applied to the soil or released to the air.
- Keeping stormwater runoff to a minimum.

For small communities some of the most common contaminants that contribute to NPS pollution are pesticides and fertilizers. Most pesticides contain toxic substances that can contaminate drinking water and poison plant or animal life. Fertilizers can cause excessive levels of nitrate in ground water and can cause excessive algae growth in surface water bodies. Too much algae reduces the oxygen and sunlight available in the water, which harms naturally growing plants and animals. When too much of a pesticide or fertilizer is applied to plants or soils, the excess is washed away into receiving waters. When pesticides and fertilizers are used before a rainstorm, much of what has been applied can be immediately washed away. Using too much of these substances and using them at the wrong time also wastes money.

The best way to reduce NPS pollution is to reduce the amount of nonabsorbent and minimally absorbent ground cover. A good approach is to surround areas such as parking lots with plant-covered strips that can capture and soak up runoff. Finally, exposed or bare soil should be limited as much as possible. Stalks, leaves, and other plant residue can be left to cover the soil after crops are harvested, or quick-growing plants such as grasses can be planted on exposed soils. These methods protect the soil for the next growing season and help reduce pollution of nearby water bodies.

Reducing Nonpoint Source Pollution: Options for Small Communities

Program Type	Description	Advantages	Disadvantages
Protective zoning	Areas within the community are separated into land-use zones and districts. Sensitive areas, such as wetlands and strips along rivers, lakes, and other water bodies, are identified. Potentially damaging activities in these areas, such as excessive pesticide use and development, are restricted	Water bodies susceptible to NPS pollution can be directly protected. Environmentally beneficial land-use practices can be encouraged, while land-use practices that cause environmental problems can be discouraged or eliminated.	Does not affect current land-use practices that are causing pollution. Can be controversial because it affects how residents can use their land. Requires significant administration and enforcement.
Acquisition	Sensitive areas, or buffer zones around sensitive areas, are purchased by the community. The community can then directly control activities in these areas to reduce NPS pollution.	Offers the most direct protection for water bodies susceptible to NPS pollution. Can achieve other goals, such as flood management, creation of open space for recreation, and preservation of ecologically important settings.	Potentially high costs.

Educating the Community

Because NPS pollution control strategies can help both the environment and community residents, educational programs can be extremely successful. Before people will change their actions to reduce NPS pollution, they need to be made aware of how their activities affect local water bodies. They also need to be educated on how to best reduce NPS pollution. You can make a big difference by educating community residents. Use public service announcements and press releases to spread the word about the causes of NPS pollution problems. Set up a committee that can provide advice to local residents on how best to reduce NPS pollution and save money at the same time. Send out pamphlets that outline the problems and possible solutions. Educational programs can be both popular and powerful. Communities around the country have used educational programs to spur actions that protect their valued water-ways. People are willing to help once they are armed with the knowledge they need.