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The Urban Environment and Community-based Ecological Solid Waste Management

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The ecological approach emphasizes that the problem of solid waste management involves not only technical but social solutions as well. People generate wastes but they can also be the source of solution to the problem. Although non-government organizations have long been advocating the ecological approach – mobilizing and training communities on the rudiments of sorting, segregation, recycling and composting, only recently did the government recognize the importance of the approach through legislation. Republic Act 9003 or the Ecological Solid Waste Management Act of 2001 recognizes the role of the public in solid waste management and that change in individual and community behavior is needed to improve our waste management. The paper examines the implementation of the ecological approach in certain community settings by a number of academic institutions, NGOs and local governments. It found that social factors – people, leadership, mandates or authority, political will and commitment – constitute the foundation of the initiative. Community organizing and social preparation should take place from the inception and throughout the different stages and processes of implementation. The technical know-how and resources must be available for the system to be operational. The management factors – structures, policies, manpower, funds and other resources, the supervision and monitoring processes – or the instruments that will put the initiative in motion, should also be present. A weak or missing element in the initiative could make it falter or even cease operations.

Introduction

The *problematique* of the urban environment is complex. Generally, the urban environmental condition is often described in terms of the pollution of air, land, and water, depletion of resources, adverse effects on health, and degradation of physical settings. In particular, however, there is a chain of factors that affect conditions in the urban setting – the most significant of which are the increase in urban population and accelerated economic activities.

Indeed, production and consumption constitute the vital economic processes that affect the environment. The 1992 Earth Summit at Rio de Janeiro in Brazil (United Nations Conference on Environment and Development) theoretically and empirically established the links between development and environment, highlighting the adverse effects of the former to the latter, and its impact on other dimensions of human life, including health. Production processes in business and industry not only

extracted from and depleted natural resources but also led to increased waste generation. Urban lifestyles related to consumption of new products and services generated new types of wastes and increased the volume of wastes. With outmoded waste management systems, cities and urban areas in many parts of the world were suddenly confronted with urban environmental degradation related to increase in the volume of wastes.[1]

In the Philippine setting, the environmental problem with solid waste management became public in the mid-1980s when uncollected "garbage" - as solid waste is loosely called - proliferated indiscriminately piled along streets and vacant lots, clogged drainage and caused flooding. Back then, Manila's open dumpsite called Smokey Mountain hosted the communities of scavengers who earned income from retrieving re-usable materials and lived nearby under deplorable conditions. The dumps also caused serious environmental degradation. No less than the President took action with the creation of the Presidential Task Force on Solid Waste Management in 1987 to address what was becoming a crisis situation. In 2000 attention was again directed at the solid waste management system following the trashslide tragedy in the open dumpsite at Payatas, Quezon City which caused deaths and injuries to nearby inhabitants.[2]

The conflicts between national and local governments and between civil society non-government organizations and the state as to what constitutes the appropriate and alternative solution reflect the political aspect of solid waste management. From the executive arena, the dynamics of conflict moved to the legislative for the passage of a law on solid waste management. Proponents of alternative ecological systems grappled with legislators on the provisions of proposed bills. Eventually, Republic Act 9003 called the Ecological Solid Waste Management Act was passed in July 2000, reportedly as an aftermath of the Payatas trashslide.

In the years before the government even became conscious of the problem, NGOs have already acted on their own to painstakingly advocate the ecological approach to solid waste management. The NGOs defined and described the ecological approach as the process of waste resource recovery and reuse to conserve natural resources and the environment and promote sustainable development. They trained and mobilized

communities to voluntary action and to pilot test the ecological approach that involved sorting, segregation, recycling, and composting. They aimed at waste reduction, even zero waste.[3] Demonstration projects served to provide evidence of the ecological approach's workability. The advocacy's effectiveness is definitely reflected in the provisions of Republic Act 9003. The law officially recognized and adopted the elements and processes of ecological approaches. However, there are multiple factors to consider to implement this new law whose rules and regulations were just recently approved in 2002. RA 9003 stipulates that the ecological systems require a change in the behavior of the individual, the community, the private sector—business and industry and in production and consumption process. The law designated new roles and responsibilities for local and national governments. It also made community or social participation mandatory.

No longer is solid waste management a technical and an engineering-related concern, or simply an administrative service delivery problem for the government. It has become a social problem and therefore a social responsibility since the people can make the environment conducive to human health and habitat. Prior to the passage of RA 9003, the demonstration of alternative ecological system took place in selected communities. The "community" referred to the people in a given setting, such as households, a school or academic institution, a public market, an office and other institutions whether public or private.

This paper presents the nuances of the processes and the factors in the implementation of the ecological approach in community setting by citing known pilot cases and initiatives. The elements of the community-based system, stakeholders, processes, results, and the factors that can help explain the results, were identified and analyzed. The elements found in the actual cases that are deemed vital to an operational community based ecological solid waste management system were then integrated to the comprehensive framework.

Sources of data were various empirical studies, conference papers, proceedings of workshops and round table discussions. Data from different cases and sources, as cited, were analyzed focusing on the issues, elements, indicators of successful or effective implementation. Primary data were also taken from follow-up interviews, discussions, and

personal visits to the areas mentioned in these studies. Additional data gathering was made to update the information obtained from these.

The synthesis or integrated framework can serve as an operational model. It is empirically-based and to be validated by implementation. Also, it can be viewed as a checklist of elements considered to be vital when planning or designing, managing, monitoring, and evaluating community-based undertakings.

The Metro Manila Urban Environment

Metro Manila's urban environment exemplifies the critical problem with solid wastes and solid waste management. It is composed of the historic and oldest city of Manila, and the other that came next, Quezon City, Caloocan City, Pasay City; those reclassified cities in the 1990s, namely, Mandaluyong, Pasig, Makati, Marikina, Muntinlupa, Paranaque, Las Pinas; and the municipalities of San Juan, Malabon, Navotas, Pateros, Taguig, and Valenzuela. The recent transformation of municipalities into cities indicates the pace of urbanization and development. According to the Local Government Code, to qualify as a city, the municipality must have reached a population of at least 150,000 and an annual income of P20 million, aside from occupying a contiguous area of at least 100,000 square kilometers.

Metro Manila's economy has registered an upward trend resulting from domestic investment and foreign direct investments in the business sector. This imposes another burden on the solid waste management system[4] and consequently on the urban environment. With its 9.5 million population[5] still increasing, waste generation is expected to rise even more.

Estimated per capita waste generation was at 0.5 to 0.6 kilograms in 1995.[6] The high income group registered an estimated waste of 500g/person/day; middle income, 451g/person/day; and low income group, 344g/person/day.[7] In 1995, Metro Manila's generation of solid wastes reached an alarming volume of approximately between 5,000 to 5,565 metric tons. Of the three cubic meters per metric ton generated per day, approximately 166,905 cubic meters of solid wastes were bound for final disposal in various open dumpsites.[8] Of these, approximately 15-20

percent remain uncollected, particularly in slum areas, and indiscriminately thrown in open public spaces and inland water channels.[9]

The situation worsened when open dump disposal sites were ordered closed. Two sanitary landfills, in Carmona in Cavite (expected lifespan 1993-1997) and San Mateo in Rizal (expected lifespan 1991-1997) were shut down but the order was complied with only by 2001. Hence, Metro Manila urgently needed to find alternative disposal sites. Flooding has been traced to clogging of drainage systems due to solid wastes littered on streets and other spaces.

Long before and during the crises years of the 1990s, concerned NGOs deplored the government's perspectives and policies and began the advocacy and ground work for awareness-building, training, and community mobilization for ecological solid waste management. Non-traditional ecological systems were promoted which offered an alternative to the prevailing post-World War 2 system.

Ecological Approach: Socio-Political, Physical, Biological, and Technical Dimensions

The urban environment was the initial target setting for the application of the ecological approach. But it can also be applied to rural environment since wastes are also generated from agriculture activities. Considering the various aspects of this approach, a multidisciplinary and even interdisciplinary approach is necessary. At the outset, the natural and environmental sciences are the disciplines that could most likely explain environment and ecology, while engineering could address the technological and technical aspects. The social sciences now find an indispensable locus in SWM with the new thrust in people's participation and decentralization or devolution of some state powers to local government concerning service delivery.

Socio-Politico-Economic Dimensions

Social, political, and economic factors generate problems in waste management. But they can also catalyze and mobilize solutions.

"Where there are people, there are wastes", is an often quoted statement that brings out the social, economic, and cultural facets of wastes and waste management. People and their activities are the

sources of wastes; they generate wastes at various sources of human activity. In the urban setting, as population increases, waste generation also tends to increase.

Urbanization is characterized, among others, by increasing industrialization and commercialization of the economy. Consequently, the city or urban area hosts a booming population not only due to natural growth rate but also due to migration caused by factors including the rural people's drive for economic progress and prospects for a better life.[10] Consumption patterns related to availability of local and international goods and services generate wastes. New urban lifestyles have paved the way for the "consumer and throw-away society". [11] New types of wastes-solid, liquid, toxic, hazardous - and their increased volume constitute a major urban environmental problem. Solid wastes have become a critical problem due to the incapacity of long established systems to cope with their collection, storage, transport, and essentially, disposal. Hence, there is need for alternative systems.[12]

National and local governments address environmental concerns through policy-setting and service-delivery. Local government manages solid waste management from collection and hauling to transporting to open dumpsites.[13] They have long been practicing the traditional system of mixing wastes at their sources.[14] The system was practiced in Metro Manila until the 1980s after the SWM was transferred to Metro Manila Development Authority s (MMDA) responsibility. However, collection and transport of garbage to disposal sites were retained at the local government level.[15]

The passage of the ESWM Act was characterized by conflicts between NGOs and local governments over the issue of which SWM system is appropriate. Sometime in 1987, the Presidential Task Force on Solid Waste Management and the Department of Environment and Natural Resources announced the closure of open dumpsites, upgrading of dumpsites to controlled landfills, and operation of new sanitary landfills in Metro Manila. Non-government organizations opposed incineration and sanitary landfill technologies and systems. They advocated for the closure of open dumpsites and vigorously pushed for the national adoption of recycling and composting.[16] Nonetheless, unless RA 9003 or the Ecological Solid Waste Management Act is fully implemented, open dumping is expected to prevail in many parts of the Philippines.

Outside the mainstream, NGOs' initiatives were often not reported. Some efforts were not fully implemented since they were pilot or demonstration cases and their vital elements were not pursued. Some of them, nonetheless, provided insights on what factors should be addressed.

Physical, Biological, Technical Dimensions

Essentially, ecological waste management system must be understood in terms of the following: ecosystem, ecology, environment, and sustainable development. These concepts are linked to social participation that constitutes people as its core element. As defined, the environment is *"all that which is external to the individual human host"*.[17] This includes the physical, biological, social, cultural conditions under which an organism lives.[18] Ecology refers to the relationship between man and nature, including all that is ethical, political, and cultural;[19] the study of the relationship of living organisms to their environment, ecosystem, or the conditions of existence.[20]

The ecosystem is the *bounded entity with self-stabilizing mechanisms and an internal balance evolving over time; the system of dynamic interdependence among the living organisms and their environment"*.[21] The Philippine Agenda 21 defines ecosystem as the *"complex web linking animals, plants, air, water, and every other life form; system in a steady state of dynamic balance which means that by altering any one part, others are affected."*[22] The "eco" part in "ecology" relates to the environment; while "system" refers to its character as a system.[23] The interdependence of man and the environment is enough reason for society to take action. Ecological waste management is a system involving human behavior and processes in recovering wastes and restoring their usefulness in various ways. In this way, the volume of wastes indiscriminately disposed is reduced.

Paper, glass, metal, plastics, textile, wood/grass, food wastes, ash/soil, are classified as solid wastes (garbage) in the Asian Metropolis although there are more grouped and detailed classifications.[24] Solid wastes can also be classified in terms of the nature of its sources (e.g. municipal wastes for those collected in local governments). In Agenda 21, solid wastes include all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings, and

construction debris.[25] Wastes are either biodegradable (can decompose back to nature) or non-biodegradable (cannot decompose but can be recycled). Recycling and composting are two major ecological systems that can be applied to manage these types of wastes.[26]

Recycling involves recovery of wastes that can be returned to production or re-crafted for re-use. On one hand, composting involves scientific knowledge on the processes of dealing with biodegradable wastes. Both systems are people-based. Although machines and technologies are utilized, they still require persons who will manage, sort and segregate wastes at their source. Segregated materials are no longer considered wastes but resources, having value as useful materials. This first step of sorting and segregation involves a mind-set, values, and practices. This comes from the realization that solutions to SWM problems start with human actions at the frontline and not at the backend.[27]

The Recycling Movement argues that there can be a zero-waste scenario wherein re-use of wastes could lead to their diminution and reductio, thus increasing the life span of disposal sites. Choosing a disposal site is not only a technical but also a social issue. Any SWM system, such as open dumping (throwing and stacking of wastes in any vacant land, rivers and seas, or inland streams) or the more sophisticated sanitary landfill, affect the communities. It can pollute water sources, air, and land, and can have impact on human health and other natural resources.[28] Moreover, locating and selecting disposal sites have been politicized as characterized by conflicts between and among local governments, the Metro Manila Development Authority (MMDA), and local communities.

Sustainable Development Framework

The 1992 Rio Earth Summit defines sustainable development as a "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" Agenda 21 resulting from the Summit called all state-signatories to implement national agenda, which are in line with the sustainable development framework. Governments, institutions, non-government organizations, and sectors within the local population have been enjoined to cooperate with the United Nations. By incorporating a chapter on "environmentally

sound management of solid wastes", it affirmed that solutions to effect changes in lifestyles, production, and consumption patterns, must go beyond mere safe disposal or recovery of wastes

Advocacy, Policy and Social Participation

Even before the Rio Earth Summit, concerned groups have already been clamoring for changes in the country's solid waste management system. The crises in the 1980s proved that the government's system was outmoded and could no longer cope with the increasing volume of solid wastes.[29] However, the national government's initial policy during that time was merely to close open dumpsites, upgrade them to controlled dumpsites and set up sanitary landfills, two of which were at their experimental stage at San Mateo, Rizal and Carmona, Cavite. In 1995, consultations between the government and non-government organizations resulted in the formulation of the Integrated Solid Waste Management Policy Framework, which included the ecological approaches of recycling, composting, and modern system of sanitary landfill. Consequently, landfills were required to be subjected first to environmental impact assessment to be acceptable and operational.[30] Back then, stakeholders also imposed moratorium on the use of incineration.

Various environmental non-government organizations such as the Recycling Movement of the Philippines, Green Peace, Green Forum, and Earth Savers advocated vigorously for an appropriate ecological approach. As a result, bills were filed at the House of Representatives and the Senate, and later reconciled to form what is now called the 2001 Ecological Solid Waste Management Act (RA 9003). The role of the public in SWM is stipulated in the law: *"Solid waste management shall refer to the discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes"*.[31] The law mandates the National Solid Waste Management Commission to promote public and private sector participation.[32] People from non-government organizations and different sectors such as business and industry, academe, inventors, youth, women, among others, should be represented in the National Ecology Center.[33] The same requirement for representation is also applied on solid waste management boards at the provincial, city, and municipal levels.[34]

The Individual and the Community

There is a need to change individual and community behavior at the ground level. Solid waste management is a matter of social transformation. "Community" refers to a spatial dimension constituting the geographic boundary of school-educational institution, household-residential community, and office-institution-establishment community. It includes persons participating in the ecological waste management process.

The ESWM Act provides for the mandatory segregation of solid wastes at source including household, institutional, commercial, and agricultural sources.[35] Nonetheless, the dynamics of this system is hard to imagine. While technical and mechanical processes can be pictured from the law, difficulties can be anticipated because recycling and composting are relatively new and their support systems have yet to be set up. Social processes—education, training, organizing, mobilizing, and capacity building of the people, local government, and participating organizations-constitute an important part of operationalizing this ecological approach. People play an important role as shown in the cases of NGO and community-based SWM initiatives. Prior to RA 9003, there were expectations that these projects could be sustained by a national policy mandate. Although there is already a law, the replication, mobilization and sustainability of these initiatives have yet to be seen. Implementation can be guided by the experiences of NGOs regarding what systems work and do not work.

Cases of Community-based Initiatives

Applications of ecological solid waste management are referred to in this paper as interventions or projects undertaken by the community. Although there are reported cases, there is neither a comprehensive list nor adequate comparable documentation and science-based studies of these interventions. Awareness of their existence are obtained by way of mass media, conferences and seminars, referrals and information relayed through individuals, non-government organizations, government agencies, or by reputation.

Members of the Recycling Movement of the Philippines, a non-government organization, are known for their nationwide lectures and training programs on ecological waste management. They organize and

mobilize voluntary community-based projects in various homeowners associations (in residential subdivisions, villages), schools, and offices or institutions. Another NGO, the Sagip-Pasig Movement, works to rehabilitate the Pasig River by organizing urban poor communities. Some academic institutions have also become catalysts within their own school community. They mediate social transformation in nearby household communities. Some projects of these organizations are affiliated with local government units and some multisectoral initiatives. Common features can be drawn from various cases.

School Community Setting

Eight educational institutions (Centro Escolar University, Miriam College, St. Paul's College, St. Bridget's School, Philippine Women's University (QC), Philippine Science High School, and Project 6 Elementary School) were examined for their internal operational system.[36] The UP Diliman initiatives in one unit were also included but a wider scope of units was covered in another study.[37] Of these, five have been able to sustain the project while the others experienced some momentary problems or were stopped.

In the school setting, the concept of "community" refers to faculty, students, non-academic staff, and all other persons within its premises engaged in ecological waste management. The following are considered input and process factors necessary to set up and implement the system:[38]

- Political will of administrators in decision-making, leadership, and continued support of school's top officials;
- Integration of the eco-waste system in school planning and activities; responsibilities are shared and integrated into the administrative personnel's work, in the curricular and co-curricular activities of the school;
- Community-organizing or formation of core group of committed implementers;
- Acceptance of SWM initiatives by the members of the community;
- Information dissemination and training for comprehensive awareness of waste management and technology linked to the environment;
- Participation of all sectors, including parents ;

- Monitoring and follow-up by the implementers of the system, behavior responses, and outcomes;
- Availability of resources and logistics such as bins for sorting and segregation, and strategic location; and
- Linkages with junkshops and buyers of waste resources.

Tedious social processes were documented in the study. Weaving the system into the individual's lifestyle and directing the organization's culture toward habits of sorting and segregation depended on complementing factors -school's policies, awareness-building mechanisms, logistics, and consistent monitoring and management.

The political will of decision makers was a vital first step to achieve the mandate and authority for action. Nonetheless, this required "champions"—strong advocates who are committed to the cause from beginning to end. The importance of a "champion" or an "advocate" lies on the fact that when he is gone, even temporarily, intervention stops or slows down.

Community organizing within the constituency of the school did not only require information dissemination but also consultative and participative activities to stimulate awareness and obtain some sense of "collective ownership" of the intervention. Simple ceremonies or rituals in the school such as "clean up day" or "launching day" served to establish the mandate.

Integration of SWM agenda into school policies, curriculum, and activities made a difference. Through this, constituencies did not need additional time to accomplish ecological waste-related activities. In the cases of the Project 6 Elementary School and the Philippine Science High School, eco-waste system was aptly integrated into science classes' lessons while composting-related activities were included in practicum classes. In other cases, recycling was sustained until materials were sold or re-used and proceeds were used by the school.

System management for logistics and monitoring cannot be overlooked. The setting up of separate bins in strategic places for different types of wastes and keeping these clean may look inconsequential but proved to be vital in motivating and reinforcing behavior. Individual behaviors summed up into collective behavior that helped sustain the

system. Furthermore, the positive results were showcased as incentives and sanctions were not applied. In the final analysis, the linkage to buyers of waste resources made the endeavor worthwhile. The system was considerably viable given the lessons learned. Otherwise, as it happened for some time, the materials would have been kept in storage for long periods and regular collectors would have simply mixed back the wastes. This could have caused the enthusiasm to die down.

The results indicated modest successes. For instance, composts were produced at Project 6 Elementary School; Philippine Science High School's experiment with the trichoderma produced bio-organic fertilizers, and they were sold. Recyclables at Miriam College, Centro Escolar University, and Philippine Women's University (QC) produced some incomes that were used for some school needs.[39]

Nevertheless, the most important result is the change in people's behavior — the development of values, attitudes, and positive habits of sorting and segregation. This accounted for the observed cleanliness and sanitation of the premises, the reduction of volume of disposable wastes, and the reaping of material benefits, how minimal as they may be.

The case of the University of the Philippines-Diliman is instructive. Although limited, the study of SWM in the university described the difficulties and prospects of a university-based model of ecological solid waste management. The "community" refers to the residential households and the school community. In a limited focus, it would only include the school community or only independent sub-units (colleges, departments, offices) within the school community in narrower sense. The cases of five college units of UP-Diliman showed common intervention elements and problems.[40] These were information and education, practice of sorting and segregation through logistics of color-coded bins in strategic places, linkages with buyers of waste resources, and sale of recyclables.[41] Such implementation process did not readily guarantee the sustainability of the eco-waste system. Problems like the mobility and turn-over of the student constituency, inadequate information and lack of awareness, low interest and commitment among some sectors, weak linkages to buyers of recyclables, and lack of compost site dampened the implementers' enthusiasm. Nonetheless, from 1999 up to present, one college continues to neatly put in place labeled bins for different types of wastes.

Residential Household Community Setting

Pioneering non-government organizations, academic institutions, local government units (barangay, municipality/city level, and provincial), church, and community associations organized residential communities in some parts of Metro Manila. Efforts of these organizations began even before the filing of legislative bills and the passage of the ESWM Act in 2001. The list includes The Sagip Pasig Movement, Recycling Movement of the Philippines, Green Peace, and Philippine Support Services Agency, among others. During the period of the legislative process, the Catholic Bishops Conference of the Philippines-National Secretariat for Social Action launched some of its pilot projects in selected areas.[42] Academic institutions like the University of the Philippines in its Diliman and Manila campuses also supported the initiatives by introducing the eco-waste approach to nearby communities.

Pioneering local governments developed the SWM system in communities. Some of their activities with multi-sectoral participation eventually became models of the ecological approach. The barangay can be a frontliner in delivering services and mobilizing communities, such as in the cases of barangays Sun Valley in Paranaque and Talayan in Quezon City. The municipality of Sta. Maria in Bulacan served as a demonstration site for composting while Olongapo City in Pampanga exemplified the recycling system. There were also efforts among homeowners associations in upper income residential subdivisions, such as in a part of the Sun Valley Subdivision, at the Blue Ridge Subdivision, and in Forbes Park in Makati City.

NGO as Driving Force

Since the mid-1990s up to present, the Sagip Pasig Movement has proven the viability of its work among the urban poor communities, which constitute the informal settlers along the Pasig River and in other parts of Metro Manila. As part of the movement's rehabilitation program, communities and industries were prohibited from throwing wastes into the Pasig River. Sagip Pasig initially organized 42 barangays that later on expanded to 153 barangays. The system worked because there was a sustained community empowerment, close supervision, and monitoring of operations.[43] Key informants stressed that the NGO's accomplishments can be attributed to the sustained capacity-building among the SAGIP staff for strategic planning, project management, and training. The

communities' integrated activities consisted of waste sorting and segregation, recycling, and composting. They succeeded because of good linkage with waste buyers where earnings were derived. Moreover, the evidence of waste reduction and clean surroundings encouraged the continuity of efforts.

Academe as Driving Force

Attempts for community-based eco-waste interventions by academic institutions also worked for a time but were not sustained for various reasons. For instance, in 1995, the UP Manila Studies Program and the Manila Studies Inter-University Network in collaboration with two member-institutions and with external funding from La Tondeña Foundation, initiated a project in a barangay located in Intramuros, Manila.[44] UP Diliman likewise initiated a project on scientific and technological literacy and waste management project in a nearby community called Pook Palaris with a funding from UNESCO.[45] Comparable processes and difficulties can be observed from both cases. Project teams in both groups first conducted a community diagnosis, sought the mandate of local institutional and political authorities--the local barangay officials, the nearby school and university officials, and engaged the collaboration of other interested organizations and the community itself for multisectoral participation. This is followed by training on segregation, crafting of recyclables to new products such as paper, and recycling for the participating representatives of the respective communities, barangays, and organizations.

Operations involved sorting, segregation, recycling, composting (in the case of the UP Diliman community), information dissemination, attitude and values formation, and linking with junkshops. However, as key informants reported, the intervention stopped due to common and unique difficulties encountered by the projects. Community organizing and preparation were inadequate. The presence of an external catalyst was short-term. In the case of the Intramuros community, the lack of security of land tenure among the people affected their commitment to improve the conditions of their physical environment. Furthermore, the barangay elections, changes in political leadership, and administrative problems among the collaborating groups and implementers, contributed to sustainability problems.

LGU as Driving Force

In the case of LGU-led interventions, the operations were directly enforced in communities. The key to the intervention was the political will of elected local officials. This can be seen in official policy decisions and ordinances that mandated the use of the local government's resources and logistics for the implementation of the ecological system within its jurisdiction.

The local government's policies in barangays Sun Valley and Talayan, municipality of Sta. Maria, and Olongapo City, mobilized the communities to sort and segregate wastes into biodegradable and non-biodegradable. Olongapo City concentrated on non-biodegradable collection, while Sta. Maria concentrated on biodegradable wastes management. Households that do not comply with the system cannot avail of the collection service. These local government units maintained storage site for sorted non-biodegradable wastes for recycling purposes. Except for Olongapo City, all of them also maintained an area for composting of biodegradable wastes. Local governments with the advantage of local funds and other resources, hired workers and purchased necessary equipment and materials to manage recycling and composting.

Income from the sale of recyclables and organic fertilizer proved the LGU's capacity to transform its out-moded system into an alternative system. However, its sustainability was confronted with major threats: change in political leadership due to elections, weak enforcement of system, and fluctuating levels of people's participation.

Integrated Framework

As driving force, NGO such as the Sagip Pasig demonstrated comparative advantage in its capacities to sustain long-term assistance to the communities. The local government's comparative advantage lies in its political will to enforce policies and ordinances, to utilize resources, and directly implement an alternative system as part of its service delivery mandate. On the other hand, schools or academic institutions at all levels enjoyed the prerogatives of integrating the ecological waste management system into the school curriculum and into the initiatives in nearby residential communities. However, the academe lacked the

organizational capacities for long-term engagement to catalyze and sustain school-based and residential community-based actions.

The pioneering cases should be instructive as they revealed the loopholes that weakened, slowed down, and even fully stopped the eco-waste system's operations. Lessons point to the need for continuity of community organizing and social preparation from the inception through the different stages and processes of implementation. People, leadership, mandates or authority, political will and commitment constitute the social foundation of the system. Likewise, technical factors must be available. A missing or weak element can make the system either falter or cease operations.

While no pre-determined set of factors can guarantee successful implementation, Chart 1 below summarizes the social, technical, and management factors that necessarily must be integrated at the input, process, and outcome stages. The input stage refers to all the necessary activities to launch the system; the process stage to the flow of operations; and the outcome stage to the direct and immediate results.

In the cited cases, eco-waste interventions were launched prior to the passage of RA 9003. Their elements were covered in the provisions of the law, indicating the success of the pioneering NGOs' advocacy and influence in legislation.

Explicitly, it is necessary to know how the system works to plan and implement it in compliance with the law. At present, majority of local government units are unfamiliar with the operations of the system and even with the provisions of the law, as pointed out by key informants from the implementing agencies. The shift to the ecological approach demands transformation of individual and collective behavior at the various points where wastes are generated.

In conclusion, other experiences should be documented to verify the elements of a functional and effective system and to understand the dynamics of implementation. The recent laws and policies at national and local levels are indispensable for mandatory and legitimate action. But in the operations, the driving forces – local government, the people, and participating organizations must deal with the complexities of the elements constituting the system. Although it will take time for the

Input Stage	Process Stage	Outcome Stage
Social Factors		
Community diagnosis: practices, values and attitudes, awareness levels, resources, groups and power structures; environment and health problems, physical setting, etc.	Continued information dissemination; awareness building, scientific and technical literacy promotion; values formation, training of all participants	Participation and commitment of community and other participants
		Increased level of awareness
Social preparation – values, attitudes, skills; information dissemination; community consultative processes – problem identification and problem solving, planning, community commitment and ownership of project	Community consultations, problem solving, consensus seeking	Behavior change
Collaboration, networking and integration of interested groups		
Technical Factors		
Waste characterization to benchmark waste reduction	Composting processes; site maintenance	Waste reduction based on waste characterization and analysis; volume of recyclables, volume of compost
Site preparation for storage of recyclables; for compost site	Recycling Processes and operations at the site	
Legal matters – authorization to operate	Maintenance of Equipment and materials	Equipment and resources inventory
Operational scheme: collection, transport, recycling and composting system		Site conditions – environmental, health, physical
Linkages to waste buyers and system of operations		
Equipment and materials		

Table 1. Integrated Eco-Waste System (cont.)

Input Stage	Process Stage	Outcome Stage
Management		
Project structures and functions	Supervision of sorting, segregation, recycling, composting processes	Enforcement of policies
Management Policies		Higher benefits over costs
Human Resources – staff, implementers – tasks and responsibilities	Supervision of collaboration and networking	Funds accountability
		Problem solving
Funds generation and management – accountability	Accounting and auditing of funds	System maintenance
	Monitoring and reporting	Measurement of waste reduction; volume of wastes recycled and composted
Monitoring Scheme	Enforcement of policies	

processes to be set up and bring out expected results, starting now is still worth the effort. Deterioration of the urban environment, caused by urban wastes, must be stopped to ensure the environment's favorable support to human life and natural resources. ❁

Endnotes

1 Asian Development Bank 2001:1-6; World Health Organization 1997.
2 Rebullida, 2000.
3 Rebullida, 2000; Viloria and Rebullida 1996.
4 JICA, 1998:2-2.
5 JICA, 1998:2-10.
6 MMDA reports, 1995.
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