A City-Wide Ecosan Concept for Cagayan de Oro, Philippines

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1 Abstract

The ecological sanitation concept has been successfully introduced to Cagayan de Oro City, Philippines, through establishment of urine-diverting dehydration toilets in several allotment and school gardens of the city. It is part of a holistic approach concerning public health, nutrition, food security and urban environmental planning as a joint effort of the academe, the local government, the urban poor communities as well as the German Government through CIM, GTZ and the German Embassy. Based on the positive impact of the pilot activities on the communities, the city government in cooperation with Xavier University and its partners from Germany are in the process of integrating this approach into the overall city planning in order to localize the Millennium Development Goals.
Key words: ecological sanitation, food security, allotment gardens, public health

2 Background

According to the Worldbank (2003), the Philippines are classified among the world's fastest urbanizing countries. Urban areas grew by five percent annually between 1980 and 2000. If this trend continues, an estimated 65 percent of the total population will be living in urban areas by the year 2020. Important factors that propel urban-ward migration are poverty and an unstable peace and order situation in the rural areas. Cagayan de Oro, the capital city of Northern Mindanao in the Southern Philippines, has at present a population of about 600,000 which grows annually by 4.4 % compared to 2.3 % nationwide. It is considered Mindanao's gateway to the Central and Northern Philippines and serves as the regional trade and commercial center to the eight cities and five provinces of the region. Northern Mindanao's economy grew from 5.1% in 2003 to 6.0% in 2004 contributing 27.2% to Mindanao's total production with the highest share of the island's gross domestic product. Besides having the highest gross regional domestic product (GRDP) in Mindanao, its per capita GRDP is the third highest in the country, indicating a growing middle class and a general improvement in the standard of living (Baños, 2006). De Vera (2000) cites Cagayan de Oro as the best positioned for future growth and investments among 23 leading urban regional cities of the Philippines.

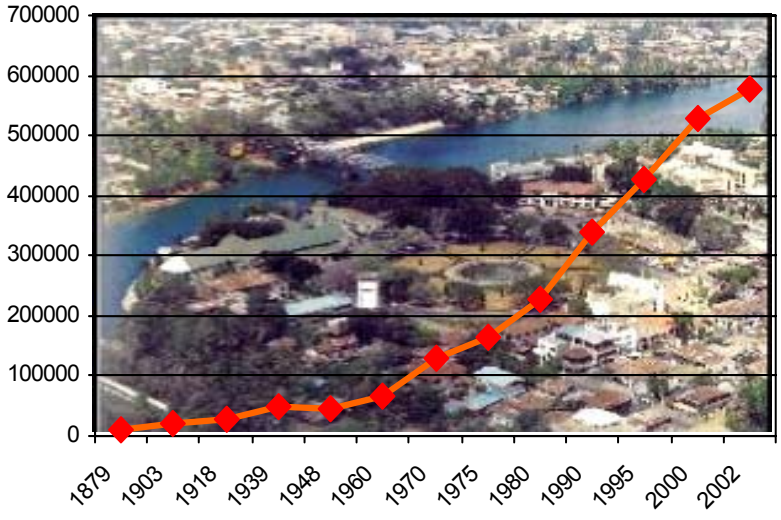

Figure 1: Population Growth of Cagayan de Oro (1879 to 2000)

3 Challenges

Although cities strongly contribute to the country's economic growth, such growth is being achieved at a high social and environmental cost. Slum and squatter settlements, traffic congestion, water and air pollution, sanitation problems, and proper disposal of an abundance of solid waste are urban specific issues. The sheer volumes of solid and liquid wastes produced in the fast growing urban agglomerations, their hazards to the environment and human health, as well as the costs associated with appropriate disposal and treatment systems make innovative, participatory and more cost effective strategies an increasingly pressing concern. Food security is defined by FAO as year-round availability, accessibility and affordability to safe and nutritious food. The Philippine Association of Nutrition (1997) estimates that the poorest sector of the Philippines, which comprises almost 40 % of all households, spends about 60 % of its available income on food alone. Newer data described by Dulle (2005), citing survey data furnished by Gladys De Veyra, AC Nielsen Executive Director for Retail Measurement Services, are in a similar range. The urban poor are especially vulnerable to food price increases as encountered in the later part of 2005 with an increasing number of Filipinos experiencing hunger) as recently reported in newspapers and TV news. The Health Report of the Department of Education 2002 revealed that 25 % of elementary school children are underweight, 30% are suffering from iron deficiency anemia and 38% have deficient and low vitamin A levels. Further, more than half of the public school children suffer from parasitism such as lice and intestinal worms, and more than 40% suffer from skin diseases such as infected mosquito bites and scabies. All these diseases are known as "poverty related diseases". Crowed living conditions in the families, overcrowded classrooms, lack of water and appropriate sanitation facilities at home as well as in the schools, lack of awareness concerning the importance of hygiene as well as unhealthy and insufficient food intake are the root causes. Public health resources cannot cope with the huge treatment need since treatment is cost intensive.

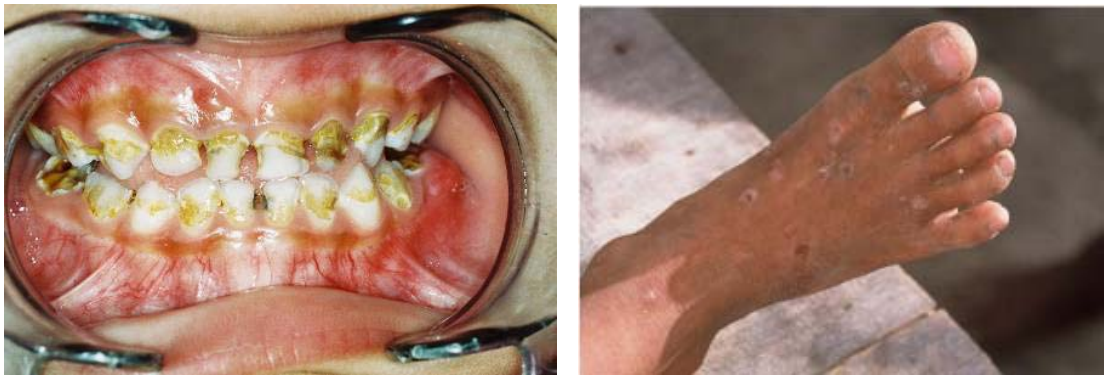

Figure 2: Symptoms of hygiene-deficiency related diseases in the Philippines. Dental caries has the highest level world wide.

4 Strategies implemented

New strategies based on prevention and health promotion within the WHO frameworks "Healthy Cities" and "Health Promoting Schools" have been introduced to five urban poor communities and two elementary schools in Cagayan de Oro to address these challenges in an appropriate way. This approach is based on the principle that the community and the schools have to become healthy places where healthy lifestyle is not just taught, but practiced under active participation of non-health professionals such as teachers, parents, local government officials and community members. The strategies which are implemented in the pilot projects are addressing the Millennium Development Goals as follows:

Figure 3: Allotment gardens have increased available income and vegetable consumption in Cagayan de Oro (CDO)

- **Eradicate extreme poverty and hunger**, by implementing urban agricultural activities in schools and urban poor communities through allotment gardens.
- **Achieve universal primary education**, by focusing on the fact that children need to be healthy to attend school and benefit from education.
- **Promote gender equality and empower women**, by focusing on traditional women centered fields of activities such as nutrition, health, and waste recycling.
- **Reduce child mortality,** by taking actions to reduce the main risks to health, namely insufficient hygiene and nutrition.
- **Improve maternal health,** by taking actions based on forming healthy habits.
- **Combat HIV/AIDS, malaria and other major diseases**, by addressing the actions towards diseases most prevalent in the Philippines, such as malnutrition and all hygiene deficiency related diseases (diarrhea, tuberculosis, internal and external parasitism, colds, lymphadenopathy, acute respiratory tract infections, skin diseases and dental caries, which has the highest level worldwide).
- **Ensure environmental sustainability,** by actions based on proven concepts of integrated solid waste management and ecological sanitation.
- **Develop a global partnership for development** by enabling exchange and dialogue between governmental, academic, private and civil society organizations in Germany, Philippines, and other Southeast Asian countries.

4.1 Figure 4: Oral hygiene is taught and practiced in CDO in the framework of the WHO "Health promoting schools" progarmme

5 The Allotment Gardens of Cagayan de Oro and their link with Ecological Sanitation

In 2003, the first allotment garden of the Philippines was established in Cagayan de Oro as part of a European Union funded project (Holmer et al., 2003). Meanwhile, with the assistance of the German Embassy in Manila and several private donors from Germany, this number has grown to five self-sustaining gardens located in different urban areas of the city, enabling a total of 55 urban poor families the legal access to land for food production (Holmer & Drescher, 2005). Further three allotment gardens, two of them within the premises of public elementary schools are presently being set up for additional 44 families.

Some of the gardeners belong to the socially most disadvantaged group in the city, the garbage pickers of the city's controlled landfill site (Gerold et al., 2005). Aside of different vegetables, the gardeners grow also herbs and tropical fruits. In some gardens, small animals are kept and fish ponds are maintained to avail the gardeners of additional protein sources for the daily dietary needs. Each allotment garden has a compost heap where biodegradable wastes from the garden as well as from the neighbouring households are converted into organic fertilizer, thus contributing to the integrated solid waste management program of the city.

Further, all gardens are equipped with so-called urine-diverting ecological sanitation toilets similar to practices in Danish allotment gardens described by Bregnhøj et al. (2003). According to the GTZ Water and Sanitation Program, more than 90% of the sewage in the Philippines is not disposed or treated in an environmental friendly manner. Prior to the establishment of the ecosan toilets in the allotment gardens, a survey was conducted among gardeners and their non-gardening neighbours as regards their perception towards this new technology. 92% of the gardeners responded that they would not have a problem consuming vegetables fertilized with treated urine or faeces since they considered them as an organic manure similar to chicken or cow manure. However, only about 60 % of the non-gardeners were of the same opinion (Urbina, 2005). In order not to lessen the market opportunities of the gardeners and to minimize possible health risks, human faeces is not used for vegetable production but for (fruit) tree production only. Urine is used as fertilizer for vegetables that are not consumed raw (such as sweet corn, okra, etc.) and is applied diluted with water (5:1) the latest one month before harvest. Foliar fertilization of urine is not recommended. This follows the guidelines for use of urine and faeces in crop production published by the Stockholm Environment Institute.

Figure 5: In the Philippines allotment gardens have been linked with the ecosan approach

6 The Asset-Based Community Development Approach

The allotment gardens and ecosan toilets were established following the so-called Asset-Based Community Development (ABCD) approach. This methodology seeks to uncover and highlight the strengths within communities as a means for sustainable development. The basic tenet is that, although there are both capacities and deficiencies in every community, a capacities-focused approach is more likely to empower the community and therefore mobilize citizens to create positive and meaningful change from within (Kretzmann & McKnight, 1993). In short, the ABCD approach does not focus primarily on the problems, but on the assets of the community.
The internal and external resources of the pilot communities in Cagayan de Oro were defined as follows: (1) the skills of the people, which however could not be fully harnessed due to lack of access to resources such as land, appropriate technologies and initial capital requirements necessary for allotment gardening; (2) privately owned vacant lots within the community; (3) knowledge on integrated crop management practices, composting and ecological sanitation; (4) organic matter from household and human wastes, however presently misplaced resources causing environmental and health hazards; (5) existing networks between the academe, local government units and urban poor communities. The local government facilitated the community organizing while Xavier University in cooperation with the GTZ Water & Sanitation Program transferred the knowledge on integrated crop management, composting and ecological sanitation through a series of workshops and hands-on trainings. The production practices for vegetables in allotment gardens were generated in earlier research projects (Holmer, 2000) and are similar to those in rural areas. However, they differ in the choice of cultivars which are adapted to the climate of the tropical lowland as well as in the reduced application of agrochemicals due to the proximity to populated areas (Guanzon et al., 2003).

7 The Contribution of Allotment Gardens to Food Security

Two years after the implementation of the allotment gardens (and one year after the outside funding had ended and the gardeners were able to sustain their activities without financial support), a survey was conducted to assess the socioeconomic effects of the project (Urbina et al., 2005). The perceived benefits of the allotment gardens in Cagayan de Oro are multiple. 25 % of the vegetables produced are consumed by the family, 7 % are given away to friends and relatives while 68 % are sold to walk-in clients, who come mostly from the direct neighborhood. They appreciate the freshness of the produce, the convenience of proximity as well as the lower price compared to the public markets. The gardening activities, a secondary occupation for all the association members, have augmented the available income by about 20 % while the vegetable consumption has doubled for 75 % of its members. This is especially notable since the average vegetable consumption in Cagayan de Oro is only 36 kg per capita and year, which is one half of the recommended minimum intake as suggested by FAO (Agbayani et al., 2001). When asked how their vegetable consumption level would be affected if the allotment garden will stop its operation, only 19 % of the respondents said that they would consume the same amount, while 81 % replied that they would consume less.

Aside of the monetary benefits, the respondents particularly appreciate that the allotment gardens have strengthened their community values since it is a place where they can meet, discuss issues and enjoy spending quality time with their families and friends in a clean and silent natural environment which they are deprived of in the densely populated areas where they live.

8 Vision and next steps for a city-wide ecosan application

The city government of Cagayan de Oro is presently mainstreaming the concept into its overall city planning and development, which will also use participatory GIS-based approaches to identify suitable areas for further allotment garden sites (Guanzon, 2006). This will be supported by a city ordinance that will give tax holidays and other incentives to landowners who make their areas

available for allotment gardens The PUDSEA[1] Network and the RUAF "Cities Farming for the Future"[2] program are major vehicles to promote allotment gardening cum ecological sanitation to other urban areas in South and Southeast Asia[3].

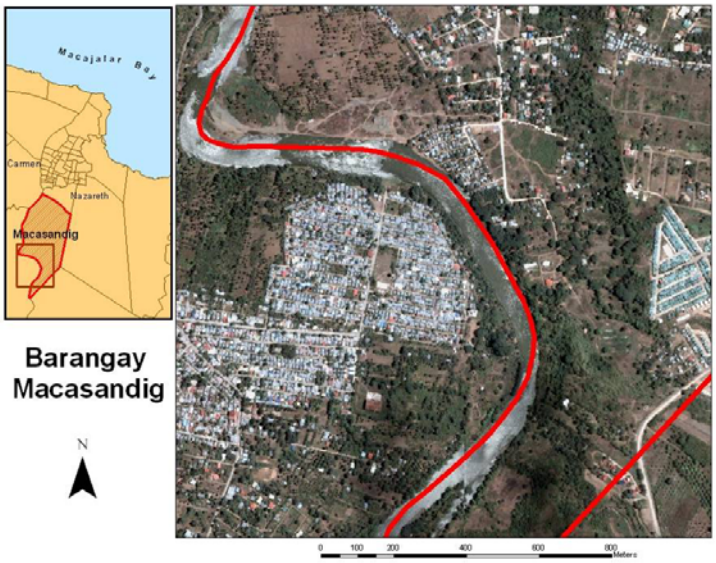

Figure 6: Map (left); GIS-photo of Macasandig (right)

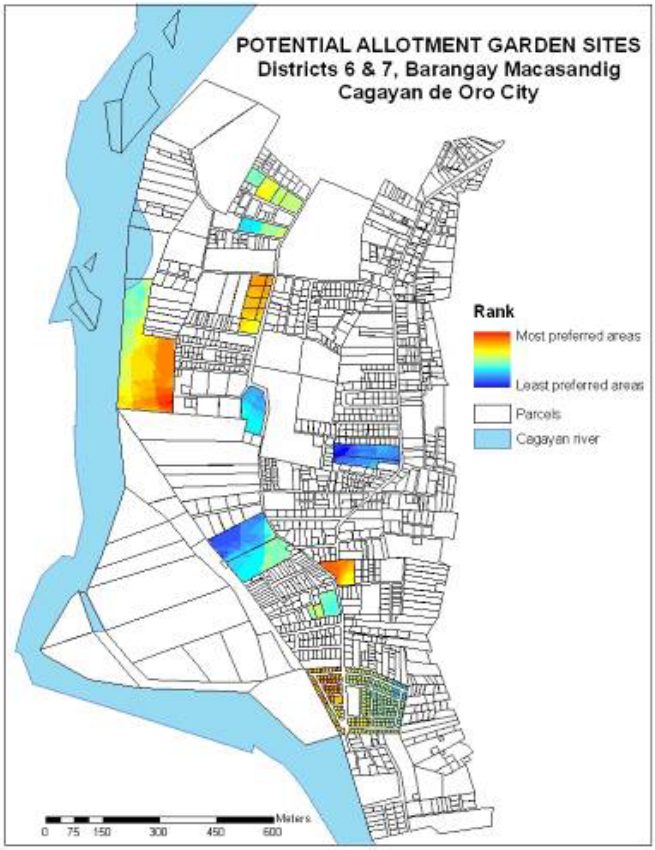

Figure 7: Result of the GIS-bases analysis of potential new allotment garden sites in Macasandig

[1] Periurban Development in Southeast Asia (www.pudsea.net)
[2] See http://www.iwmi.cgiar.org/southasia/ruaf/ruafsouth.html for details

Representatives from Cambodia, India, Indonesia, Sri Lanka, Thailand and other Philippine cities have already expressed their interest to replicate this model. Xavier University through its international training center SEARSOLIN[3] also offers a corresponding one-month module within its social leadership development course.

Following activities are being scheduled to be implemented in the near future:

- UN-HABITAT has approved a project proposal of the city government to expand the allotment garden integrated with ecosan and appropriate solid waste management to further five city districts[4]. Through networking with the Department of Interior and Local Government (DILG) and the League of Cities of the Philippines (LCP), these best practices will be further channeled to other cities in the Philippines.
- The allotment garden concept was already replicated by the city of Valencia and the municipality in Kitaotao, Bukidnon, with pending requests for ecological sanitation toilets. Additional cities in Central and Southern Mindanao expressed their interest in the project and asked for a corresponding training in November 2006.
- The city government in cooperation with the tourism industry and Xavier University has already submitted a project proposal to establish ecosan toilets for different eco-tourism projects, particularly at the entry and exit points of the Cagayan de Oro White Water Rafting as well as the Macahambus Adventure Park, both major tourism destinations of the city.
- Further, the establishment of 50 to 100 ecosan toilets for informal settlers along the banks of the Cagayan de Oro River is being conceptualized. The city government of Cagayan de Oro recognizes the huge eco-tourism potential of the river, which finds its expression in different activities such as white water rafting, kayaking, river boat restaurants, river taxis and fluvial parades during the city fiesta. However, due to the rapid urbanization of the city, migrants from the rural hinterlands tend to establish shanty houses without proper sanitation along the river, thus contributing to the increasing pollution of the river.
- The neighboring municipalities of Opol (coastal area) and Manolo Fortich (rural – mountainous) already underwent training in ecological sanitation in order to establish 20 ecosan toilets in 2007
- Xavier University College of Agriculture is presently conducting the following researches:
    - Use of diluted urine for food and non-food crops (October 06 to January 07)
    - The effect of vermicomposting on presence of helminth ova in human faeces (November 06 to February 07)

Figure 8: Actual vermicomposting of organic wastes in Manresa (XU Farm)

The German Government through CIM, GTZ and its Embassy in Manila has signaled further support for up scaling the activities in future. Following German “Best Practices” are envisioned to be replicated in Cagayan de Oro:

a) Constructed Wetland for subdivisions, housing and resettlement areas

For the upgrade of existing subdivisions but also for newly planned settlements a decentralized wastewater treatment system, i.e. a constructred wetland, is a suitable option. This concept has been successfully implemented in Bayawan City, Central Philippines. The domestic wastewater

[3] See http://searsolin.xu.edu.ph for details

[4] Good Practices in Local Governance: Facility for Adaptation and Replication - Local Environment Protection Management (GOFAR-LEPM Project)

from 'GK Fishermen's Village, a newly constructed resettlement area for 715 households, is treated in a constructed wetland system. The system is composed of clustered septic tanks for solid removal and a vertical and horizontal reed bed that cover about 2 500 m^2. For the reed beds a locally available plant called 'Tambo' (*Phragmitis karka*) was used. The effluent of the wetland is used for construction and for irrigating public greens and the sludge from the septic tanks will be treated in a central biodigester at the sanitary landfill to generate biogas. The constructed wetland technology was chosen because of its low construction cost and because it is easy to operate and maintain. Operation and maintenance are done by the city government but will be transferred to the GK Village association after the start-up phase. The system was planned and implemented with technical support of the GTZ Water & Sanitation Program in the Philippines. The GTZ program has continued its support throughout the start up phase.

Figure 9: Constructed wetland for resettlement area, Bayawan City, Philippines (GTZ)

b) Decentralized waste water treatment plant for a slaughterhouse

Wastewater from slaughterhouses has a high organic load, sufficient organic biological nutrients, adequate alkalinity and a relatively high temperature. These characteristics make it suitable for anaerobic treatment with biogas generation. In the Philippines, such an anaerobic treatment system has been set up for the slaughterhouse of the Animal Products Development Center—Bureau of Animal Industry (APDC—BAI) in Valenzuela City, Northern Philippines. The treatment system is designed for 10 cbm/day and is composed of a fixed dome digester, an Anaerobic Baffle Reactor with 6 chambers, an Anaerobic filter, a Planted Gravel Filter and an Indicator Pond. The biogas from the digester is used for heating water and the treated waste water is partially used for watering plants. Operation and maintenance of the treatment system are fairly simple and are carried out by technical staff of the APDC-BAI. The system was designed by the Bremen Overseas Development and Research Agency (BORDA) and its Philippine partner Basic Needs Services Philippines, Inc. (BNS). BORDA-BNS also supervised the construction and carry out the performance and effluent monitoring. The project was financially supported by the GTZ Water and Sanitation Program in the Philippines.

View of anaerobic treatment; digester, anaerobic baffled reactor (ABR), and anaerobic filter (AF). Gas produced from digester is piped to offal room.

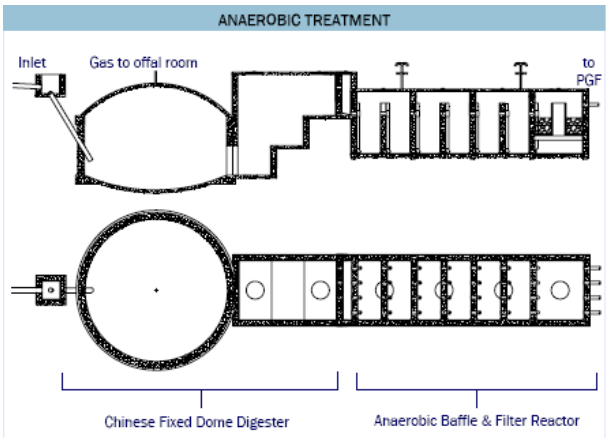

Figure 10: Biogas producing Dewats System for a Slaughterhouse,Valenzuela City (Philippines)

c) Decentralized waste water treatment plant for a hospital

Waste water from hospitals is similar to domestic waste water and should be treated accordingly. A

good example of a decentralized treatment facility for hospital waste water is the Kasih Ibu Hospital in Surakarta, Indonesia. The hospital has 200 beds and the treatment system is designed for 110 cbm waste water/day. The waste water originates from the bathrooms, toilets, laundry, kitchen and laboratory. The system is composed of a Grease Trap, Sedimentation Tank, Anaerobic Filter, Horizontal Gravel Filter and Aerobic Indicator Ponds. The treated waste water meets the national effluent standards and is discharged into a nearby river. The treatment system is operated by the technical staff of the hospital. Desludging of the Sedimentation Tank and the anaerobic filter are done by a desludging company. Design and construction supervision were provided by BORDA who also financed the system, together with the Kasih Ibu Foundation.

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