Bogor, Indonesia

Using local initiative and knowledge for local water and soil conservation

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Limited water access and polluted rivers make it more difficult for Bogor municipality, a growing and dynamic city, to address the issue of water conservation. In 2004 Bogor municipality began to undertake a number of initiatives to strengthen its water and land conservation. Meanwhile the initiative has planted 200 trees, created 1,000 bio-pores, constructed 1,000 groundwater recharge wells, and protected 21 spring waters all together with local communities. Residents have better access to reasonably clean water.

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Abstract

Due to the strategic location of Bogor, it is one of the fastest growing urban municipalities in Indonesia. Large parts of land are quickly converted to residential, industrial and public areas. But the speed of this growth challenges the city's ability to provide for the increasing demand of water.

Bogor municipality's experience in managing water and soil conservation highlights that a balance between sustainable resource management and human demand for resources is needed. Innovative approaches needed to be identified, for example conservation of sufficient water supplies while also providing public access. To date, a thousand groundwater recharge wells have been constructed. In 2007, the government implemented a joint partnership with local communities to build 1,000 bio-pores and 21 spring water protectors. Though still in small scale, these undertakings contribute to the regeneration process of ecosystem services. In the long run, water and soil biodiversity will be better conserved to meet people's needs for generations to come.

Population / Land area
~ 942,000 (2008) / 118 km^2

Municipal budget
Approx. IDR 97.768 million (2008) (US$ 10.8 million)

Bogor joined ICLEI in September 2005

Importance of water conservation in urban growth

The city's tremendous growth for the last decades has required a great deal of resources. At least 80 percent of Bogor residents currently do not have access to water. Poor communities in particular must rely on polluted rivers as their main source of water. Those who live near rivers are considered fortunate, many do not have that luxury of choice and need to travel some distance to collect water for their daily needs from the nearest river or have to spend more of their limited income on water. Bogor experiences frequent rainfall, which, if properly managed, can provide a source of water to the public.

With further city expansion and higher demand for water the quality and quantity of primary water sources will deteriorate. Over-extraction of the already limited water will destabilize soil structure and damage soil biodiversity, which leads to environmental damage as a whole. Practical measures and supportive policy were not instituted until 2004.

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Case Study

City context

Bogor is one of the big cities in West Java Province. The city itself is divided into six sub-districts and 68 villages. Bogor is 56 kilometers away from Jakarta and is the next destination for workers to live and commute via train on weekdays. Bogor city is located at the feet of Salak and Gede mountains, between 190 to 330 meters above sea level. The average temperature is 26 degrees Celsius with approximately 70 percent humidity. The average rainfall can be up to 4,500 mm per year. Such climate conditions make Bogor a favorable place as a botanical and agriculture centre since Dutch colonial era.

Bogor 'angkot' is the main public transport mode (in green).

The frequent rainfall gave Bogor the nickname 'Rain City'. The two big rivers, Ciliwung and Cisadane, and four smaller ones, Cipakancilan, Cidepit, Ciparigi, and dan Cibalok, pass through the city. They are the main sources of water. The local state owned company (PDAM) is responsible for the provision of water and sanitation services to the local people.

Conserving and providing water for residents

Bogor's strategic location between the capital city of Indonesia and Puncak, a recreational city in West Java, has contributed much to its rapid growth. Open green space has been converted into residential, industrial and public building. Bogor city is now a modestly medium size city. The 'Rain City' still encounters flooding in certain sub-districts and at the same time is not able to provide clean water for all of its residents. It is estimated that currently 80 percent of Bogor residents have limited access to clean water. Basic needs for drinking, cooking, bathing, and sanitation among other is needed for the growing population.

Inevitably these people seek other water sources, such as neighboring rivers, which do not meet the basic standard requirements. Sewage, garbage, toxic pollutants from households and industry are dumped into the rivers or burnt. Lack of clean drinking water and poor sanitation pose various health problems such as diarrhea, dengue fever and malaria to disadvantaged communities.

These circumstances led the city of Bogor to implement a number of measures at the beginning of 2004. Headed by the Environment Unit of Bogor, the city began to implement a number of water and soil conservation efforts in several villages. Approaches and mechanisms were selected for their low cost, simple technology and easy implementation. Generally, the post-implementation phases were transferred to the community for maintenance and follow up activities. Acticities included the following.

Groundwater recharge wells serve to reduce the occurrence of flooding. They collect water runoff from the surface helping the surrounding soils to absorb rain water. This reduces the risk of land subsidence and replenishes groundwater. The

well parameters vary around 50cm diameter and five meters depth.

The 'bio-pores' in the ground, vertical holes (or called biopori in Indonesian term), idea was first introduced several years ago by Kamir R. Brata, a local scientist from IPB. Soil is a vital habitat for microbes (bacteria and fungi), micro and macro fauna such as earthworms, termites to recycle organic matters. Bio-pores provide ecosystem services in terms of a regulating service by allowing biological activity to take its natural process: renewing soil fertility and purifying sub-surface water quality. The average measurement is ten cm in diameter by one meter depth.

Spring water protection is an annual program where at least two resource locations in one village are implemented jointly with the local community, based on assessment results. Similar to the first program, this action supports the eco-system's provisioning services to increase production and conserve water. Mini reservoirs or detention ponds are built to increase the input to a sub-surface or groundwater source in the area. Tree planting within 200 meters radius of the water resource(s) point are undertaken to better preserve water capacity and quality while minimizing erosion possibility.

Results and impacts of the project

Construction of groundwater recharge wells and raising awareness. Since its inception in 2004, the city has constructed 1,000 groundwater recharge wells. Each well has the capacity to absorb six cubic meter per hour. These wells will serve to provide water for consumption. Based on the city's technical assessment however, the number is still far short of the 6,642 needed. There is also now greater community awareness on the importance of water conservation through a series of awareness raising programs undertaken by the local government.

Construction of bio-pores and encouraging recycling. An estimated 1,000 bio-pores have been made since 2007 with an absorption capacity of three liters per min per bio-pore. Each tunnel also has the capacity to collect up to eight liters of organic waste with a decomposition rate of around 30 days. Recycling practice of separating organic and non-organic wastes plays an important role to reduce pollution in the city's rivers. Though no exact data are yet available, it reduces garbage burning, a common waste treatment method in Indonesia, which produces CO_2 emissions and global climate change, and local air pollution.

Protection of springs and increasing water supply. Approximately 21 water springs have been protected over the last three years. As many as 200 trees have been planted around each location to further increase water supply, maintain its quality and minimize the possibility of erosion. With the local government's support, at least 21 mini reservoirs have been constructed to support communities' needs especially during dry seasons.

Bio-pores in Bogor.

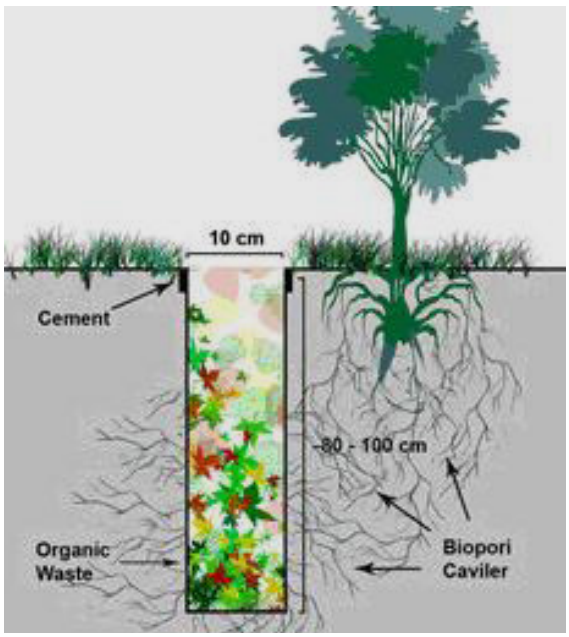
Cleaner water and greater understanding. To date, more Bogor residents have access to reasonably clean water, a better understanding of nature conservation and ways to manage these in more sustainable ways. The achieved target is currently far from the quantified target due to limited budgetary constraints. Nonetheless, these undertakings are worth the effort as they will have contributed to a cleaner and healthier environment for Bogor city in the long term.

Upcoming biodiversity program

At present, the city is preparing for a more comprehensive biodiversity program for the period 2011 - 2014. The two main programs are:

1. A series of conservation efforts in all villages. These include socialization and practical training to local communities about biodiversity concept by planting 10 to 20 different plant species in 68 villages.
2. Implement a similar program but specified to two to four plant species in local high schools. The latter program will provide good opportunities for both teachers and school children to learn about the importance of biodiversity, ecosystem services and the impact on human needs.

The city also aims to allocate one to two hectares and build a "small city's arboretum" in its five sub-districts. These arboretums will be additional to the Bogor Botanical Garden, which is currently managed by the national government. The development of these arboretums is expected to preserve Bogor native plants and further enrich the city's biodiversity program to be completed within the next 5 to 10 years.



Bio-pores concept.

Lessons learned

Participatory based planning, implementation and monitoring as part of government policy. Local communities are currently not engaged until the implementation phase, although the outcome suggests that people offer their full support and they even collectively co-share the costs. The commitment to follow up the post-implementation phase is formalized and signed by the Head of Village on behalf of the community. Community participatory approaches, where local residents partake from design over planning to monitoring, further empower them to manage and own these processes. Regular public awareness raising integrated in government policy may increase the effectiveness of such actions, emphasizing everyone's responsibility to preserve water resources. Other organizations such as Community Based Organizations (CBOs) and local universities can be engaged as well.

Due to budget limitation, current programs are undertaken on small scale basis. A very small financing figure allocated for clean water implies that such services are not yet a development priority for Bogor. Public private partnerships may be explored, as it can provide greater funding, where local government's budgets are restricted. Water being a public good makes access to clean water everyone's right. Post decentralization in 2001 mandated every local government (PDAM) to provide basic services including access to clean water and sanitation. Strong political will is a key driver to mobilize required resources and make it part of its development priorities. The Bogor Planning and Development Office 2005 data suggested that at least 51 percent (or 63 percent including rivers, lakes and so on) of its area is still 'untouched'. It implies that with sufficient funding, Bogor municipality is able to invest in water infrastructure. Economies of scale will be able to meet more needs. The excess of supply can afterwards be commercialized for drinking water exports or recreational purposes with reasonable user-fees for example.

Make an informed decision based on analytical data supported by relevant units within Bogor municipality. The inter-linkages of issues of water scarcity, river pollution, and high number of diarrhea cases will be best addressed through assessments. The undesirable effects of polluted rivers, for example, cause water borne diseases i.e. diarrhea, typhoid and cholera. A high percentage of such cases will call for the Health Unit to take necessary action. Databases and information analysis supported by strong political leadership and better coordination among relevant units attains more effective impact. The data should also be the basis for the Planning and Development Unit to design a comprehensive spatial plan ensuring conservation areas are intact and protected against further development.

Continuous public awareness and environmental focused advocacy to the general public. Having a proper understanding of natural resource thresholds and ecosystem services will enable local communities to use water and recycle their wastes more responsibly. Promoting behaviors such as improved sanitation and hygiene among various age groups should be a regular awareness raising exercise. Frequent exposure and early learning opportunities have been observed to result in a gradual transformation of behavior that better appreciates the value of ecosystems.

Replication

Consultation process with multi-stakeholders in designing the whole implementation concept is a key driver for successful replication. A sense of ownership and responsibility should be developed among all stakeholders from the very beginning onwards. Local communities especially must be given opportunities to voice their concern, share ideas and resources.

CBOs and NGOs can play dual roles, during awareness raising campaigns and also trainings to the local communities during implementation phase to ensure they are done in a sustainable manner without further damage to the environment.

Local university and/or research centers can be brought in for the development of a comprehensive land use plan, basing it on thorough data and analysis, and identifying potential conservation sites.

An effective tool for the local government in its decision-making process for concrete measures is cost-benefit analysis to highlight the potential savings attained from conservation efforts. These can provide thorough analysis for external resources and help justify these, if required. Policy should be supported by each respective unit(s), integrated within their planning and budget to arrive at a greater accomplishment.

Budget and finances

The expense of building a groundwater recharge well is estimated to be less than IDR four million (US$ 440) depending on the material type, sizes and labor cost. The least expensive is bio-pore construction. It costs not more than IDR 200,000 (US$ 20) for the equipment. Spring water protection requires about IDR 20 million (US$ 2200) per point of location, including mini pond construction and tree plantings within 200 meters of each location.

The financing of these programs are from the Environment Unit budget, although many are partially co-shared with the local communities. The total budget appropriated for these programs is estimated to be less than 200 million Rupiah per annum (or approx. US$ 22,000).

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Local Action for Biodiversity

The Local Action for Biodiversity (LAB) program is a global urban biodiversity program coordinated by ICLEI - Local Governments for Sustainability´s Global Biodiversity Centre, in partnership with the International Union for Conservation of Nature (IUCN). The LAB Pioneer program began in 2006 with a selected group of local and regional authorities from around the world, representing over 54 million citizens. The program provides an accessible and enabling platform for committed, leading local governments from around the world. This is achieved by profiling and promoting the importance of urban biodiversity and the role of local governments in its management, as well as by sharing the experiences, successes and challenges of urban biodiversity management in the participating cities and local authorities.
ICLEI provides guidance in assessment, planning and implementation; strategic networking opportunities; profiling opportunities for the participating local authorities at global and regional events; and creates a platform for local authorities to contribute to global advocacy on biodiversity issues.
http://www.iclei.org/biodiversity

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KOTA BOGOR

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