

Policy and Implementation on Water Environment in Thailand

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Abstract

Based on geographical characteristics, Thailand can be divided into 25 river basins. From the monitoring programs of major rivers in 25 river basins, surface water quality varies widely in the different regions in Thailand. The results showed that the water quality at about 19 % of sampling stations were in good while most of them were in fair and worst condition (53 % and 28 %, respectively) compared to the water quality standards. Highest contaminants were high total solids (23 %), fecal coliform bacteria (22 %), Ammonia-nitrogen (21%), total coliform bacteria (18%) followed by dissolved oxygen (DO) depletion (9 %), and high biochemical oxygen demand, BOD (7 %). There are two major sources of pollution; point and non-point sources of pollution. For the whole country, the main source of pollution comes from domestic wastewater. Wastewater pollution management is mainly based on command and control approach under the Enhancement and Conservation of National Environmental Quality Act, 1992. Under the act, the effluent standards from major point sources of pollution were established and enforced. Besides, ambient water quality was set up as a goal for water quality management based on various beneficial uses. Existing water environment policy is addressed under the National Economic and Social Development Plan for 2007-2011 and the National Environmental Quality Plan for 2007-2011 which aims at the rehabilitation of water quality and increasing local and community participation. However, there is still a lack of integration of water resources management. The Thai government has launched many projects to resolve these problems, few of these attempted to take a basin-wide approach. Most actions to date have been local in nature, with the result that water quality of the river continues to deteriorate. The agencies responsible for water environment and water quantity are different. Currently, basin management approach is being implemented in some river basins in the country such as Bang Pakong and Thachin River Basins in the central part of the country. This approach incorporates water quality and quantity, aquatic resources and land development

Keywords: water quality, basin management approach, water environment

Introduction

The Kingdom of Thailand covers a land area of 513,115 square kilometers. As reported in 2004, the estimated population was about 63 million with a growth rate of 0.7 percent. The urban population was approximately 15 million with high density in the capital and the regional centers. Based on geographical characteristics, Thailand can be divided into 25 river basins. The average of annual rainfall for the country is about 1,700 mm. The total annual rainfall of all river basins is about 800,000 million m³ of which 75 % of the amount is lost through evaporation, evatranspiration and the remaining 25 % (200,000 million m³) is in streams, rivers, lakes and reservoirs. Thus, the available water quantity was about 3,300 m³/capita/year.

Like many countries in Asia, increasing population, economical, agricultural and industrial expansion, inefficient enforcement of laws and regulations, and insufficient management of institutions established for the handling of waste and wastewater in Thailand are the major causes of water quality deterioration in various water sources, including surface and coastal waters. High loading of pollutants from human activities beyond the water resource carrying capacity can contribute to the degradation of water quality in the country. Despite a worldwide trend of declining water pollution, Thailand witnessed an increase of more than 60 percent of organic water pollution between 1980 and 2000. While quality varies throughout the country, the central region faces the poorest conditions because of dense populations and intense economic activity. Water pollution causes damage to human health, fisheries, and agriculture, and results in huge health and economic costs.

In general, the water quality of water resources in Thailand is in fair condition with a slight trend of improvement. However, the surface water quality of major rivers, lower Chao Praya, Thachin, Lam Takhong and Songkhla Lake, particularly in the areas where receiving pollutants discharged from industrial, agricultural or populated areas are highly deteriorated. Similarly, the coastal water in the Inner Gulf and certain highly populated areas of the Outer Gulf of Thailand are in poor quality, particularly in the areas into which four main rivers flowing (Mae Klong, Thachin, Chao Phraya and Bang Pakong Rivers). Thus, mitigation measures such as construction of wastewater treatment plants, hazardous waste treatment, agricultural waste management, industrial waste control, and management of other pollution sources are required.

In the past, wastewater problems were managed within political boundaries. New approaches, such as basin management and maintaining the carrying capacity of the receiving waters, has been adopted for controlling both point and non-point sources pollution in some areas. Future water quality policies and implementation should not solely focus on managing domestic wastewater but should also include measures for controlling other urban and rural sources of pollution. Nutrient and sediment loads from agricultural activities should also be considered as integral to future planning strategies.

State Of Water Quality

Surface water quality varies widely in the different regions in Thailand. In 2004, Pollution Control Department (PCD, 2005) monitored the quality of 49 rivers and 4 lakes in Thailand. Finding revealed that 68% water bodies surveyed were suitable for agriculture and general consumption ("good" and "moderate" quality). Only less than 40% of Thailand's surface waters were in poor or very poor quality. According to the survey of major rivers and lakes by PCD, no surface water was categorized as "very good" quality (extra clean water which is suitable for aquatic animals and human consumption after normal treatment), and the surface water quality appeared to be slightly worse than that of last year in terms of dissolved oxygen (DO) and total coliform bacteria (TCB) indicators. The results showed that the water quality at about 19 % of sampling stations were in good condition while most of them were in fair and worst conditions (53 % and 28 %, respectively) compared to the water quality standards. Highest contaminants were high total solids (23 %), fecal coliform bacteria (22 %), Ammonia-nitrogen (21%), total coliform bacteria (18%) following by dissolved oxygen (DO) depletion (9 %), and high biochemical oxygen demand, BOD (7 %). This varies region by region. The results of water quality monitoring revealed that surface water monitored in the Northern, Central and Southern regions appear to have poor quality; while the water quality in

the Eastern region was fair. Compared to the other regions, the rivers and lakes monitored in the Northeastern region had good quality surface water. In terms of DO, surface water in the Northern regions rank the best, approximately 6 mg/L, followed by the Northeastern region with DO concentration around 4 mg/L. The Central, Eastern and Central regions rank the lowest, about 2 mg/L. The highest concentration of TCB, among surface waters monitored, is found in the Central region with concentration of TCB higher than 4000 MPN/100ml, while the surface water in the other regions have relatively lower TCB levels.

Water Environment Policy

The National Economic and Social Development Plan for 2007-2011 and the National Environmental Quality Plan for 2007-2011 continue to emphasize the rehabilitation of natural resources and the environment by strengthening environmental management and increasing local and community participation. Under the plans, policies for water environment aim to accelerate the rehabilitation of water quality in major water resources, to reduce and control water pollution originating from domestic, industrial, and agricultural activities, to apply the polluter pays principle, and to promote and support private sector investment in solving water pollution problem. The goal for water quality of the water bodies in the country was set up to comply with the ambient water quality standards within fair and good condition of not less than 85 % of water bodies in the country. Under those plans, area approach for water resources management is concerned. This should integrate water quantity, water quality and relate resources as a whole basin or a boundary of geographical area. The best practices of water quality management in developed countries are implemented under basin approach. The approach includes the following step: (1) identifying basin uses, (2) setting appropriate water use and water quality targets, (3) determining the current “state of the basin”, (4) identifying specific issues and management options, and (5) developing a process for public consultation (Heathcote, 1998). In Thailand, there is no such integrated approach applied to water environment management since 2000. The management has been separated between the quantity and quality of water due to agency responsibilities and their respective regulations. For major rivers in the country, observed water quality problems were dissolved oxygen depletion, fish kills, high ammonia nitrogen, high coliform bacteria, and eutrophication phenomena. Generally speaking, these problems were perceived to be most serious during summer low flow periods when there is minimal dilution capability available and first flush of high flow periods. Thus, once water quality problems have been identified, it is necessary to develop targets for restoration to undertake the planning exercise on a basin-wide basis (Wijarn, 2000). The strategy and plan should identify key areas for water quality improvements as well as a framework of actions for interested stakeholders, including: (i) ensuring better environmental governance through institutional restructuring, compliance, and decentralization; (2) introducing a sustainable financing mechanism, i.e Polluter Pays Principle; (3) promoting more active community participation in water resource management ; (4) improving waste and wastewater management in large cities in the country; and (5) improving water environment of the major river basins (World Bank, 2002).

Management Approaches and Implementation on Water Environment

Command and Control

Command and control is usually the normal approach to control waste discharges from point sources of pollution which is based on European and American pollution control models. In

Thailand, this model has been implemented with the establishment of effluent standards and their subsequently enforcement. The lists of parameters and values of each parameter of effluent standards can be found at <http://www.pcd.go.th/>. Effluent standards from point sources of pollution have been established such as factory, industrial estate, building, pig farm, gas station, and shrimp pond. The size of point source pollution has also been classified. From the results of monitoring the discharges by PCD, some point sources have not been in compliance with the effluent standards especially from agricultural activities. Thus, PCD is currently developing a compliance assistance centre to assist the polluters. The pilot program has been established for pig farm.

Wastewater Treatment and Disposal

The Government of Thailand has made some progress in the collection and treatment of urban wastewater over the past decade compared to other countries in the region. Wastewater management services are currently provided by the local government authorities, although agencies of the central government play the dominant role in sector planning and funding. Under investment in environmental infrastructure is clearly evident in the municipal wastewater management sector. Only a small proportion of total urban wastewater generation presently receives any treatment. At present, Thailand has 95 central wastewater treatment plants installed in large communities and major tourist areas. The 70 treatment plants, with a total capacity of about 1.13 million m³/d, are in operation, and a total capacity about 1.87 million m³/d, are now under rehabilitation and construction. These facilities will finish within the year 2008. As a result, the estimated total capacity of about 3 million m³/d of wastewater or approximately 21% of total generated domestic wastewater in Thailand (14 million m³/d by 2003) will be treated properly before discharging into receiving water. However, there are still a large amount of untreated wastewater drained into the environment causing many vital water sources to gradually deteriorate. (Wijarn, 2003a).

For industrial source, there are more than 120,000 factories and about 30 industrial estates in Thailand. Industrial wastewater management services are mainly undertaken and funded by individual industries. From monitoring program by PCD, some treatment facilities are not functional and the discharges are not in compliance with the effluent standards.

Voluntary Approach

The Cleaner Production (CP) is the most popular of voluntary approach where it initially starts as a tool for industrial sector to prevent pollution from its sources. Currently, the concept has been expanded into various sectors which include processes, products and services. CP is also the backbone in “Sustainable Consumption and Production” which is the umbrella method supporting sustainable development. The Thai Government has developed the National Cleaner production Plan for the year 2001-2009. The vision of the plan states that “Principle of cleaner production will be applied to all activities with efficiency for the achievement of production, reduction and control of pollution, natural resources and environmental management, quality of life with benefits from the country development”. Since then, CP has been widely applied to reduce waste discharge from industries in pilot areas such as factory in the Thachin and Songkla Lake basins. Ministry of industry has also promoted cleaner production for small and medium enterprises (SMEs). The government is currently developing the green procurement to support waste minimization.

Basin Management

The basin management approach can support the concept of protection of the water environment by keeping pollutant loads to the environment within carrying capacity of the natural purification process. This approach incorporates water quality and quantity, aquatic resources and land development. Human activities as well as natural events that occur in a basin or watershed can effect water quality throughout the entire system. The basin approach is a coordinated and integrated method to link science, waste discharges under permit system, and other water pollution control and prevention activities to meet the goals of water quality standards. The Pollution Control Department (PCD) has developed master plans for water-quality management for all 25 river basins in Thailand. In the water quality management plans, major river basins were undertaken which mainly include wastewater management in the plans. Priority to construct wastewater treatment facilities in municipalities was principally recommended as well as the controlling of wastewater from industrial and agricultural sources. Water quality modeling and the geographic information systems (GISs) have also been continually developed and used as tools to help decision-makers in water quality management processes.

Up to now, integrated water resources management such as basin management, has not yet been put into practice in Thailand. PCD has been taken a leading role by firstly developing a water quality improvement master plan at the Thachin River Basin as a whole basin in 1996 and then initiating implementation of the action plan since 2000. Since then, there is not much progress due to the lack of cooperation and budget availability especially for construction treatment facility at the lower part of the basin.

Public Participation

Public participation in water quality management in Thailand is becoming more progressive especially in the water quality monitoring activities. The volunteer or civil society groups were formulated. The volunteer groups monitor the conditions of streams, river and lakes. They want to help protect the water resources for beneficial uses. Many projects aim at raising awareness of basic water management issues, human and nature links and the importance of water quality to aquatic life, plus integrating local environmental studies into the school's curriculum in line with national educational policy such as in the Songkram River in the northeastern and the Thachin River in the central parts of the country. Development of water curriculum is also a challenges in encouraging schools to teach their children about the environmental problems and its situation. When they know about the situation, they will participate to solve the problems. In Thailand, the public has participated as volunteers in various activities such as litter cleanup, water quality monitoring, macroinvertebrate sampling, tree planting, stream inventory, and educational exhibits. The civil society or non government organizations (NGOs) have been established in some areas to implement some activities related to water issues.

Partnership Formulation

In 2002, the Director General of the PCD, and the four Governors from provinces in the Thachin River Basin agreed to cooperate for restoration of the basin by signing the Partnership Agreement of the Thachin River Basin. The Partnership aims to cooperate in order to of reduce waste loads from various sources of pollution in their political boundaries, to monitor water quality, to establish the center of Thachin database, to promote and support public participation, and to support implementation of the Thacin Rehabilitation Plan. The meeting of the Partnership was set once a year to evaluate and review the implementation plan.

However, the Partnership Agreement was not maintained and the governors were transferred from the basin. Other than this, partnerships between government agencies and private sector should also be established especially with major polluters in the basin while public can participate and monitor the progress of the action plan implementation (Wijarn, 2003b).

Conclusions and Recommendations

Conclusion

Currently, surface water quality in most part of Thailand can be considered to be in fair condition, while some rivers flowing through large communities are in poor condition. Water quality problems are affected by domestic and industrial wastewater discharges, agricultural point and non-point source discharges, deforestation, and development projects. In many parts of the country, surface water is severely polluted which has affected aquatic resources, water uses for various purposes as well as human health. Enforcement of relating regulations has to be seriously practiced. To manage water quality in the whole watershed, integrated approaches should be taken into account in future such as the ecosystem approach. Public participation should also be promoted.

Thai government has launched many projects to resolve these problems, few of these attempted to take a basin-wide approach. Most actions to date have been local in nature, with the result that water quality continues to deteriorate in the river. Currently, the most urgent water quality problems relate to dissolved oxygen depletion or excessive organic loads and high loadings of ammonia and bacteria, primarily from agricultural and domestic sources. The government has put in place policies, plans and water quality standards in an effort to combat the problem and has embarked on an ambitious program for the management of water pollution generated from various sources especially municipal sources. But a lack of an integrated approach combined with laws that are not enforced, weak capacity, insufficient investment, and poor operations and maintenance systems have exacerbated the problem. Limited community participation and low involvement of the private sector has further pushed the onus on the government.

Recommendations

To maintain and improve water quality in major rivers in Thailand, the following recommendations should be considered:

- Since many pollution problems occurred as a result of improper land use in the basin. Regional water quality planning at the basin level is required because it provides logical areas for water quality management. The basin is a natural system with readily identified boundary. The basin approach for water quality management should be applied because it highlights the connection between land, water, and people. Water quality is impacted by population growth, industrial development, agricultural production, and urbanization and development. This approach incorporates on both point and non-point sources of pollution control. Thus, the implementation of basin-wide total pollutant loads controls should be considered.
- Waste load allocation should be applied to management wastewater discharges from various sources of pollution. This depends on the assimilative capacity of the receiving water body and guidelines to attaining receiving water quality standards.

- Economic instrument for water pollution control should be applied. These instruments can provide incentives that will result in a changed behavior of water users and polluters such as pricing, tax etc.
- The government should promote public participation on water quality management. Partnership program between government agencies and public or private sector should also be developed. This will help government agencies to implement the water quality action plan.
- To address water pollution, Thailand should develop an integrated approach for water resources management. This will involve:
 - fostering local community participation in water resources management;
 - harmonizing functions and regulations by addressing overlaps in institutions and jurisdiction,
 - improving the efficiency of budget allocation and rationalize investments for the wastewater and water resources management sectors; and
 - promoting opportunities for private sector participation and public awareness about the state of water environment.

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