

Shandong Yellow River Delta National Nature Reserve

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THE CONTEXT

Ecological profile

Shandong Yellow River Delta National Nature Reserve (118°33'-119°20'E, 37°35'-38°12'N) is situated in the northeast of Dongying City, Shandong Province, the People's Republic of China, which faces the Bohai Sea in the North and borders Laizhou Bay in the East (see appended map). It has a warm-temperate continental monsoon climate, with dry and windy spring, hot and rainy summer, cool and clear autumn, cold, dry and snowless winter. This area has an average annual temperature of 11.9°C, a frost-free period of about 210 days, an average annual precipitation of 592 mm, mean annual evaporation of 1962 mm and average annual relative humidity of 68%.

The Yellow River plays a dominant role in forming and maintaining the regional hydrology. The river has its lowest discharge from late March to June. With increasing water consumption upstream, especially the rapid development of water diversion works for irrigation, the river flow dries out frequently. The main flood season is from July to October, when there is heavy rainfall in the middle and lower reaches. From October to mid December, the river flow is steady. Then it will be ice bound season from the end December to March, during which the water level often rises drastically owing to poor drainage from ice blocking down the river channel. According to the observation data of Lijin hydrological station in the Yellow River Mouth from 1950 to 1985, the mean discharge is 41.9 billion m³, with an range from the maximum of 79.31 billion m³ to the minimum of 9.15 billion m³. The average flow rate is 1,330 m³ per second with a maximum at flood peak of 10,400 m³ per second and minimum of zero. Water of the Yellow River has pH of 8.0-8.3, total hardness of 2.16-5.56 and mineral intensity of 0.2-0.6 g/L.

The underground water includes saline water and slightly saline water. Due to the high mineral intensity, it is not very suitable for industrial and agricultural production.

There are 131 km of coastline in the Nature Reserve, with irregular and semi-diurnal tide. The mean spring range is 1.06-1.78 meters and neap range is 0.46-0.78 meters. Sea ice usually begins to occur by the end of December and thaws in early March.

The total area of the reserve is 153,000 ha, where the current Yellow River mouth is included however most parts of the delta are excluded. Due to the large quantity of siltation carried out by the Yellow River, the delta extends into the sea at a rate of 2.2 km/year with a land accretion of 3,240 ha per year which is all located within the reserve. The Yellow River has the highest silt content in the world with an average annual sediment load of 1.049 billion tons and a mean silt concentration of 25.5 kg/ m³.

The Reserve is mainly marine and coastal wetlands, including 31,314 ha marine waters, 38,534 ha intertidal mudflat and 32,772 ha intertidal reed marshes. However 7,966 ha inland or man-made wetlands, including permanent rivers and streams, fresh water ponds and reservoirs, is dispersed in the terrestrial area.

Major environmental value

With its vast area, abundant wetland vegetation and aquatic organisms, as well as sparse human population, the Nature Reserve provides habitat for breeding, migration and wintering birds. In light of the species and numbers of birds living in different types of vegetation, six kinds of habitats can be identified in the Reserve, including farmland and reed ditches, forest, reed and meadow wetlands, salt bush marshes, water areas and Seepweed *Suaeda Forsk* mudflat.

Since it is a newly-developed wetland ecosystem, the 393 plant species of the Yellow River Delta Nature Reserve is of great scientific and conservation significance, among which Wild Groundnut (*Glycine Soja sieb.et Zucc*) is a threatened species.

There exist vast even mudflat areas in the Yellow River Nature Reserve, which provide an excellent habitat for waterfowl. Populations of 10,000 geese and ducks, plovers and gulls can be observed frequently during the migration seasons. Among the waterfowl that occur, there are 48 species of shorebirds with annual numbers of around 500,000 to 1 million, 10 species of cranes including 2,000 individuals of Common Crane *Grus grus*, 200 individuals of Red-crowned Crane *Grus japonensis* wintering here, 30 species of Anatidae with a wintering Whooper Swan population of 2,000 individuals from mid-November to mid-April and 30 species of other waterbirds have been recorded.

There are seven bird species of the Reserve which have been listed as national class 1 priority, including Red-crowned Crane (*Grus japonensis*), Great Bustard (*Otis tarda dybowskii*), White-tailed Eagle (*Haliaeetus albicilla*), Golden Eagle (*Aquila chrysaetos daphanea*), White Stork (*Ciconia ciconia boyciana*), Hooded Crane (*Grus monacha*) and Chinese Merganser (*Mergus squamatus*), and 33 bird species which have been listed as national class 2 priority. Seven species have been listed into Appendix 1 of CITES, including White Stork (*Ciconia ciconia boyciana*), White-tailed Eagle (*Haliaeetus albicilla*), Red-crowned Crane (*Grus japonensis*), Hooded Crane (*Grus monacha*), White-naped Crane (*Grus vipio*), Little Curlew (*Numenius minutus*) and Spotted Greenshank (*Tringa guttifer*), while 26 and 7 bird species have been listed into Appendix 2 and 3 respectively. In the Sino-Japanese Agreement on the Protection of Migratory Birds and Their Habitats, the Yellow River Delta Nature Reserve has 152 species, constituting 67% of the total (227 species). For the Sino-Australia Agreement on the Protection of Migratory Birds and Their Habitats, 51 species have been found in the Reserve, accounting for 63% of the total 81 species. In addition to birds, several species of marine mammals, reptiles and fishes have also been listed into CITES appendices or national priorities.

History of land ownership and management practices

The Yellow River entered into the Huanghai Sea in the north part of Jiangsu Province before 1855, yet in the flood season of 1855 it was breached in Tongwaxiang, Henan Province, taking the way of Daqing River and through Jinan City (capital of Shandong Province) going into the Bohai Sea in Lijin County, Shandong Province. The tail channels of the Yellow River had changed its course over 50 times from 1855 to 1976, resulting in the creation and accretion of the Yellow River delta.

During this period, the coast line expanded into the sea for 52.56 kilometers, forming 1,890 square kilometers new land in total, average 15.89 square kilometers each year. From 1976 to 1992, the new land created by the Yellow River reached to 550 square kilometers in total, 32.4 square kilometers annually. There were no residents in the Delta until 1898. A real migration occurred in 1934 from west Shandong Province and only since then the virgin soil of the Delta began to be cultivated and developed.

From 1949 to 1958, in the early years of the People's Republic of China, the local governments of the Yellow River Delta had established several State Forest Farms such as Huanghe Gudao, Guojuzi, Qingtuozi, Yiqianer, with an total area of 67,000 ha. Up to now, the wood and shrub land has reached 85,000 ha with forest coverage of 20%. In 1959, Bohai State Farm Bureau was set up, which was mainly responsible for the large scale cultivation. However, uncontrolled cultivation has caused destruction of natural vegetation and serious secondary salinization which resulted in the deterioration of regional ecosystem.

On October 1, 1983, a new petroleum industry city-Dongying City was officially established, endowed with the jurisdiction of the whole Yellow River Delta, including Dongying District, Hekou District, Guangrao County, Kenli County and Lijing County. In addition, several units under the jurisdiction of central or provincial government such as Shengli Oil Field, Jinan Military Command Yellow River Delta Production Base and Yellow River Mouth Administration Bureau are also situated in its territory.

The newly established Dongying Municipality paid great attention to nature conservation. On the basis of sufficient survey and demonstration, the Yellow River Delta Municipal Nature Reserve was set up in December 1990, then in November 1991, it was promoted into Dongying Yellow River Delta Provincial Nature Reserve, and in October 1992, it was further promoted into Shandong Yellow River Delta National Nature Reserve. The Administrative Bureau of the Reserve was set up in the December of 1992, with three management stations Huanghekou, Yiqianer and Dawenliu.

The territory under the management of the Reserve mainly includes the whole land of state-owned Yiqianer Forest Farm in Lijing County, local Gudao Forest Farm and Dawenliu Grassland Farm in Kenli County with a total area of 64,000 ha, constituting 41.8% of the whole reserve. In addition, 31,314 ha shallow sea and part land of Huanghe State Farm, Jianlin Township and Hekou District in Kenli County and Jinan Military Command Yellow River Delta Production Base. The Reserve is mainly to protect newly-formed coastal wetland ecosystem and rare, endangered birds, with 79.2 thousand ha core area, 10.6 thousand ha buffer zone and 63.2 ha experimental zone. The core area should be strictly protected, only opened for scientific observation and research. The experimental zone can be used for scientific experiment, practice teaching and tourism etc.. There are still many human activities in the buffer zone due to historic reasons.

Shandong Yellow River Delta National Nature Reserve Administrative Bureau exercises total managing authority over the reserve. The local communities can continue to conduct their traditional activities (e.g. agricultural activities, fishing, apiculture, fuel wood collection and oil extraction) under agreement with the reserve Administrative Bureau. In most cases when there is a sharp conflict, the government will decide the outcome.

The main duties of the Reserve Administrative Bureau include the following: to enforce the national laws and regulations concerning the nature reserve; to formulate management regulations and work out countermeasures; to assume responsibility for the conservation, management, research

and awareness activities in the reserve; and to protect important habitats and prevent wetland ecosystem from pollution and irrational use.

The Reserve Administrative Bureau has taken effective conservation measures since it was established. The Bureau has exerted different kinds of management in line with the zoning of core area, experimental area and tourism zone, which achieved good results. Improvement of public awareness is an important focus of the reserve. Through various kinds of training courses the reserve technical and administrative staffs have been improved and this is especially necessary for the research management. In addition, the reserve also constructed necessary infrastructure observation tower, several checkpoints, fire lanes and boundary signs.

Socio-economic profile

Dongying City has a population of 1.64 million by the end of 1995 with a density of 205 persons/km², among which the urban population is 490 thousand constituting 31% of the total. Therefore, the wetland area is a mixture of rural and urban districts, although the reserve is predominately rural. The natural population growth rate has been controlled below 0.9%. The major determinant to the birth rate is the national birth control policy.

The social and economic undertakings of Dongying City have gained great achievements since its establishment. Currently Dongying City has a high-developed highway network, with a total length of 3,786 km. Railway and water transportation are also convenient for the regional development. Besides these, Dongying City has also constructed six oil-gas pipe lines with a transport capacity of 50 million tons per year. Almost all the children of school age can have chances to accomplish their 9-year compulsory education in 28 middle schools and 584 primary schools. A total of 81 hospitals in 1995 provide good health security for the local population. There are still some differences between urban and rural people in view of the income, education and health, yet it is not serious and is gradually being reduced.

Human-environment relationship

The Yellow River Delta has a relatively plentiful land resources with an average per capita land of 0.48 ha, which is 5.33 times that in Changjiang (Yangtze) River Delta. Aquatic production is another important economic value for Dongying City with an average annual per capita aquatic production of 46.3 kilograms, which is 2.59 times the national level.

Oil and natural gas are the major mineral resources of Dongying City, which is the origin of regional prosperity. A total of 65 oil fields were developed by the end of 1994, with a total oil reserve of 7.5 billion tons and natural gas reserve of 500 billion m³.

Due to the lack of correct understanding of the ecology of newly-developed coastal areas, large scale and irrational reclamation has been carried out since the end of the 1950s, e.g., the Bohai State Farm Bureau, established in 1959, cultivated a large area of "waste land" which resulted in the thorough clearing out of natural willows. Although reclamation may increase farmland area temporarily, secondary salinization sharply reduces productivity and often results in land abandonment. Kenli County possessed 59,000 ha farmland in the mid-1950s, yet it had been reduced to 37,000 ha by 1980. This irrational cultivation has caused serious ecological deterioration in the Yellow River delta.

The oil industry is the main source of pollution in this region. It accounts for 40% of the total waste gas, 40% of the total waste water and 43.9% of the total industrial residues of Dongying City. The main stream of the Yellow River and its large- and medium-sized reservoirs have fairly good water quality which meet the Class 3 National Surface Water Standard. However the water quality of independent small rivers exceed Class 5 of the same Standard due to the agricultural runoff and industrial sewage. Eutrophication and red tides have begun to occur in the river mouth which are harmful to the aquatic ecosystem and decrease food production for waterfowls. In addition, poisonous pollutants affect the birds throughout food chain. With the rapid development of the local economy, pollution will inevitably be a main threat to this coastal ecosystem.

The Yellow River Delta Nature Reserve is adjacent to large number of local villages. Due to the remote location and saline-alkaline soil, the local people surrounding the reserve remain in difficult circumstances. Thus, illegal reclamation, grazing and hunting activities frequently take place. In recent years with increased economic development and livelihood improvement, the market demand for seafood has increased and more and more people go to the reserve to catch fish, shrimps, crabs and mollusks - all of which exert high pressure on the reserve management.

Political/governance context

The political mechanisms within Dongying City provide good opportunity for the local community to express their opinions and concerns. At the city and county levels, there are people's congresses and people's political consultative conferences. At the village level there are village people's commissions. These bodies ensure democracy for citizen participation. Of course the local residents enjoy a fair degree of autonomy from the national government; they can make decisions on industrial, agricultural and most other activities.

The national government has emphasized the need for people's participation in nature reserve management for some time. However, due to the region's high population density, many local people still live within the reserve and many more people in the surrounding areas regard the resources in the reserve as their main livelihood. Because of this situation, the reserve management bureau cannot successfully manage the reserve without local community participation.

The local government also pays great attention to this issue and has done much work to facilitate and promote such involvement. Dongying Municipality issued the "Shandong Yellow River Delta National Nature Reserve Management Temporary Provisions" and "Shandong Yellow River Delta National Nature Reserve Management Levying Provisions and Standards" under the approval of the provincial and municipal Price Administrations, which provided the basis for the reserve administrative bureau to handle relationships with the local people.

As the government authority charged with wetland conservation and management, Shandong Yellow River Delta National Nature Reserve Administration Bureau has provided much support for the local community involvement in wetland management. The Bureau often holds joint meetings with local stakeholders to reach consensus on wetland management issues and achieve understanding and assistance from local people.

INVOLVEMENT OF STAKEHOLDERS

Stakeholders in the management of the wetlands

There are numbers of stakeholders around the Yellow River Delta Nature Reserve, yet the following 11 communities especially have direct relationship with the area's wetland management.

a. Huanghe State Farm is located to the south of Dawenliu Management Station, with an total area of 16,900 ha, population of 3,668, farmland of 1,400 ha and other land types, four branch farms are adjacent to the reserve. It produced 2,359 ton grain, 53 ton cotton, 33 ton soybean and 35 ton marine or freshwater products. This farm has its own school, hospital, post office and other facilities.

b. Jianlin Township, situated to the west of Dawenliu Management Station with an total area of 12,900 ha, population of 16,608, farmland of 4,333 ha, woodland of 333 ha and orchard of 200 ha, six villages of which borders the reserve. The main crops are wheat, soybean, rice and cotton with the total grain output of 17,141 tons, cotton output of 59 tons, oil crop products of 315 tons and aquatic products of 25 tons. Part of the villagers conduct agricultural activities within the experimental zone of the nature reserve. There are one hospital, one post office and one middle school.

c. Xinan township is located to the south of Dawenliu Management Station with one village adjacent to the nature reserve, the total area of which is 4,533 ha, population 8556, farmland 2,083 ha, woodland 182 ha and orchard 63 ha. The output of grain is 9,171 tons, cotton 55 tons, oil crop products 81 tons and aquatic products 906 tons. Xinan Township has leased some land in the Nature Reserve experimental zone to conduct agricultural and fishery activities. The township has a good infrastructure including bus station, post office, middle school and sealed road access to the inner reserve. The town where the Xinan Government is situated is also the place where the Huanghe Farm Headquarters is located.

d. Xiazheng Township, situated to the west of Dawenliu Management Station, has one village bordering the reserve. It has a total area of 17,300 ha, total population of 9,098 and farmland of 7,666 ha. The main crops are wheat, soybean and cotton, with grain output of 11,004 tons, cotton output of 7 tons and aquatic products of 3,500 tons. This agricultural lands within the township has suffered from serious salinization, therefore the local people are relatively poor. There is one hospital, one middle school and one post office in the township.

e. Xianhe is a new modern oil industry town situated 15 km north of the Yellow River mouth, which is adjacent to Huanghekou Management Station and Yiqianer Management Station. The total population is 25 thousands and the total area is 78,000 ha, among which natural grassland is 104,700 ha, reed area is 13,300 ha and farmland is 11,000 ha. Xianhe Town owns plentiful underground oil and natural gas resources which is an important production base of Shengli Oil Field. There is only one village under the jurisdiction of Xianhe Town and the differences between urban and rural area are gradually disappearing.

f. Diaokou Township is located to the northwest of Yiqianer Management Station, with a total area of 54,860 ha and total population of 39,864 among which oil field population is 30,000. Since it borders the sea coast, the township has a developed fishery, aquaculture and salt industry but an undeveloped agriculture sector.

g. Gudao Town was set up in November 1992 on the basis of the former Gudao Oil Extraction Factory, which is also a modern oil industry town. It is situated to the west of nature reserve with a jurisdiction of 17,000ha, where the nationally famous Gudao Extraction Factory of Shengli Oil Field Administrative Bureau and Yellow River Delta Production Base of Jinan Military Command

are located. The Gudao Town has a population of 35,000 including 12,000 oil field staff and 11,000 production based staff. Due to the rapidly developing oil industry, Gudao Town has a good infrastructure, including a first class highway, well-equipped schools, hospital, post offices, hotels and parks.

h. Dongying City Livestock and Domestic Fowl Breeding Farm is adjacent to the south Dawenliu Management Station with a total area of 3,400 ha, among which 667 ha is farmland, 2,933 ha is grassland, 667 ha is mudflat and 73 ha is woodland. This farm can produce over 100 ton prawns, 300 ton eggs and 40 thousand chickens per year.

i. As the second largest oil field of China, Shengli Petroleum Administration Bureau has many production units and facilities distributed in and around the nature reserve, thus it has a close relationship with wetland management.

j. Yellow River Delta Production Base of Jinan Military Command has a total population of 11,000 and total area of 46,000 ha including 4,000 ha woodlands, 19,000 ha farmland, 20 ha fish ponds and an annual wheat output of 5,000 tons and soybean of 1,500 tons. Part of the Farm land is located within the reserve. The farm owns several factories and good infrastructure.

k. Yellow River Mouth Administration Bureau is under the direct supervision of National Yellow River Water Conservancy Commission which is responsible for harnessing the Yellow River. Since the reserve is situated in the mouth of Yellow River, river harnessing has a close connection with reserve management.

Active roles in wetland management

a. Shandong Yellow River Delta National Nature Reserve Administration Bureau

This is a government authority of Dongying Municipality which was set up in December 1992 under the supervision of Shandong Provincial Department and the Ministry of Forestry. According to the Shandong Yellow River Delta National Nature Reserve Administrative Provisional Regulations and Shandong Yellow River Delta Nature Reserve Management Provisions and Standards, the reserve bureau is responsible for the co-ordination of wetland management. For example, to counter the over harvesting of marine products and illegal agricultural activities, it has taken the following measures: 1) Close-season management was adopted to achieve the sustainable use of biodiversity resources. That is to say, during the catching seasons, several routes into the reserve were opened to the local people, which should restrain and focus their activities in selected areas. 2) Resource compensation fee was charged to the local people who went to the reserve to harvest reeds, catch shellfish and conduct other production activities, which not only gave consideration to the benefits of local people, but also improved the effectiveness of resource use. In the mean time, the charges can be used for the enhancement of wetland management, which is very important for conservation undertakings in developing countries such as China. 3) Checkposts were established in several main roads and warders kept patrolling day and night. Due to these practicable administrative measures, illegal phenomena obviously reduced with the local awareness improved greatly.

The Nature Reserve Bureau have been confronted with a particular situation. First of all, the Bureau should take corresponding measures in line with so many kinds of habitat including shallow sea, rivers, mudflat, grassland, woodland and farmland; secondly, it should deal with the disturbances and threats from Shengli Oil Field; Thirdly it should be careful to prevent fire due to the dense

vegetation in the reserve and at last, the large number of local people who go to the seashore to catch fish, crabs and shrimps in the spring and autumn also challenge the wetland management. However, the Administration Bureau has done a large amount of effective work in the wetland management since its establishment. Up until now, the reserve has been listed as a priority site of China Biodiversity Conservation Action Plan and the project "Yellow River Delta Resources Development and Environmental Protection" has been listed as the priority of China's Agenda 21.

b. Shengli Petroleum Administration Bureau

There would no Dongying City without Shengli Oil Field, which has provided local people with convenient infrastructure such as roads, communications and so on. Since it was launched in January 1964, a total of 65 oil and gas fields of different types had been discovered and 60 of which had been developed with 610 million ton accumulative volume of oil and 30 billion cubic meter natural gas by the end of 1996. Since the beginning of the 1990s, Shengli Oil Field has extended its exploration area to the offshore area and has discovered in Bohai Sea an oilfield with 300-400 million tons of prospective reserve-Chengdao Oilfield, which is so far the biggest shallow sea oilfield in China. While developing the main industry of oil and gas, Shengli Oil Field has built up a rapidly diversified economy including chemical industry, machine building industry, electronic industry, light industry and so on.

However, the production processes of the oil field have also caused different influences on the wetland ecosystems. The most obvious influence is the habitat fragmentation by the erected derricks and densely crossing roads. Another threat is the variety of pollutants produced in the oil production process which will inevitably affect the wetland ecosystem. Therefore, the Shengli Oil Field Administration Bureau has the obligation to decrease their influences on the wetland as far as possible. In fact, the Shengli Oil Field has laid great stress on environmental protection and carried out strictly the principle of simultaneous design, construction and putting into operation of all the production and environmental protection items for every key project construction.

Currently the most important issue for the oil field is how to co-ordinate their production activities with wetland management. Due to some misunderstandings and fairly low conservation awareness, there frequently occur some conflicts between the oil field and reserve administrative bureau.

Up to now, there are over 1,000 oil field staff on duty within the nature reserve with 515 oil wells, among which 94 in the core area, 35 in the buffer zone and 396 in the experimental zone, with an oil output of around 1.5 million tons, accounting for 4.5% of the total Shengli Oil Field production.

The oil production facilities only occupied 701 ha of land in the reserve because at the beginning of the reserve establishment, the reserve demarcation was defined on the full consideration of conservation needs, local economic development and local people's livelihood thus the oil field production area has been excluded from the reserve as far as possible. Yet a part of oil field staff have low awareness of wetland conservation importance and put undue emphasis on oil production, which have caused some disturbances to wetland management, e.g. in early 1994, Gudong Oil Extraction Factory carried out production activities within the 100 ha reserve land without prior approval of reserve administrative bureau, which has resulted in serious pollution and resource destruction in the reserve.

c. Local Townships

They are responsible for arranging the agricultural and fishery activities of local people through necessary negotiation with the reserve management bureau. With the increasing prices of marine products, the local people have set up several markets for the purchasing and wholesale of aquatic

products in different scales. Only in Haibao of Dawenliu Management Station, about 150 boats were moored everyday with the mobile population of 3,000 in the spring and autumn. According to a preliminary estimation, more than 8,000 persons go to the 131 kilometer shoreline of the reserve to catch molluscs with an annual production of over 10,000 tons, and the marine products of the reserve constitute over 20% of the whole Dongying market. These activities are very important for local livelihood improvement yet have also caused some ecological and administrative problems.

The municipal, county and township governments have effectively facilitated such local community involvement. However, this involvement has been carried out through variety of informal or official ways. As a government authority, Shandong Yellow River Delta National Nature Reserve Administration Bureau is fully responsible for the development, implementation and monitoring of wetland management plan e.g. "Shandong Yellow River Delta National Nature Reserve Management Temporary Provisions" and "Shandong Yellow River Delta National Nature Reserve Management Levying Provisions and Standards", on the basis of close consultation with local communities. Ecological monitoring, scientific research and public education are also the main duties of the reserve bureau. In co-operation with Wetlands International-Asia Pacific, Qingdao University of Oceanography, Northeast China Forestry University, Peking Forestry University, Shandong University, Shandong Normal University, Forestry Academy of China and other agencies, the reserve bureau has finished many research and monitoring projects such as shorebird survey, observation of crane ecological features, investigation on Saunder's Gull, integrated wetland ecosystem investigation and so on. Hundreds of articles, news and reports about the reserve have been published or broadcast in different newspapers, periodicals and radio stations. Televised documentaries "Beautiful Yellow River Mouth" and "Young Wetlands, Paradise of Rare Birds" have been transmitted through central, provincial and municipal television stations.

d. Citizens

In addition to the involvement through official representatives, ordinary local citizens can also directly put forward their ideas and suggestions to the Reserve Administrative Bureau and local governments. In fact, no participatory involvement can be carried out successfully without the contributions and collaboration from individuals.

Organization of Stakeholders

Several joint meetings have been held since the establishment of reserve administrative bureau, on which the representatives of local communities and local people could put forward their suggestions on how to improve the wetland management and maintain their interests. This kind of joint meeting which was organized by the reserve and sponsored by municipal government have proved very useful for the involvement of local communities. Most of the suggestions by the local communities were taken seriously and were implemented to different extents.

In order to co-ordinate the important conservation issues and encourage the participation of stakeholders in wetland management, Dongying Municipal Government decided to set up Shandong Yellow River Delta National Nature Reserve United Conservation Committee on 17 June 1997. A vice mayor is the chairman of the committee, the members of which include directors of relevant authorities of the municipal government, director of Yellow River Mouth Administration Bureau, deputy director of Jinan Military Command Production Base, governors of Kenli County, Lijing County and Hekou District. The committee has its office in Shandong Yellow River Delta National Nature Reserve Administration Bureau. Although it looks very official, the representatives of this Committee can reflect the public opinions to a great extent.

The first meeting of the United Conservation Committee was held on 23 July 1997, which indicated the formal inception of the committee function. The meeting clearly defined the relationship between economic development and wetland conservation, which should be addressed as equal priorities. The rights and obligations of some key stakeholders were also discussed in the meeting.

Analysis on Crucial Factors for the Community Involvement

a. Statutes and Regulations

National and local statutes and regulations are the foundation of community participation in wetland management, without which such involvement would become a disorderly process. The primary national statutes include the "Nature Reserve Regulations of the People's Republic of China" issued on September 2, 1994, the "Forest and Wildlife Nature Reserve Management Rules" issued on July 6, 1985 and the "Environmental Protection Law of the People's Republic of China" issued on December 26, 1989. The local regulations include "Shandong Yellow River Delta National Nature Reserve Management Temporary Provisions" and "Shandong Yellow River Delta National Nature Reserve Management Levying Provisions and Standards". These regulations have provided the legal basis for community involvement particularly when conflicts arise.

b. Government Support

There is a complete and effective administrative system in China from central government to township governments. The governments of different levels play very important roles in a wide range of social, economic and environmental issues, thus their attitude sometimes can control the whole process of wetland conservation and community involvement.

c. Public Awareness

Public awareness will undoubtedly exert a tremendous influences on the effectiveness and ways of local community participation in wetland management.

RESULTS

Ecological Results

Current wetland management is very successful in maintaining the natural ecosystem and protecting biodiversity. As a result of extensive community involvement, local awareness has been much improved. The reserve administrative bureau received 18 injured or sick birds of national class 1 or 2 priority from the local people from the winter of 1994 to the end spring of 1995, most of which have been sent back to the wild. This figure is much increased compared with previous years.

The bird populations have been greatly increased because their habitats were protected effectively these years especially after the establishment of the nature reserve. It has been investigated that from 1990 up to now, bird species number has been increased from 187 to 265, the population of Common Crane has also increased from around 2,000 to over 5,000 and Whooper Swans from around 800 to more than 2,000. Besides this, Red-crowned Cranes and Great Bustards can be observed more frequently than before, in the mean time the Saunder's Gulls begin to have breeding groups with over 300 individuals.

Social Results

Wise use principles of Ramsar convention are important guidelines for such community involvement in Yellow River Delta. Current wetland management does not aim at a strict protection of wetland resources since it is impossible in China under a heavy pressure of dense population and enormous demand for resources. Therefore, from the beginning the reserve administrative bureau has paid great attention on the effective wetland management based on the sustainable use of resources. In fact, very good results have been achieved that not only the wetland biodiversity can be protected but also the local people can maintain or improve their livelihood and thus further promote their involvement in wetland management.

The only stakeholder which think itself to be affected by the present management system is Shengli Petroleum Administrative Bureau. As a giant enterprise under the direct jurisdiction of China Petroleum General Corporation, all the exploitation activities of Shengli Oil Field should require the prior approval of wetland management authority. Due to the wide scope of United Conservation Commission, all the relevant government authority can more easily co-ordinate the issues occurred in the wetland management. Of course, as the Ramsar contracting party, Chinese government is satisfied with the involvement experiences of Yellow River Delta National Nature Reserve.

Shandong Yellow River Delta National Nature Reserve Administrative Bureau has worked out a comprehensive and detailed wetland management plan, including management guidelines, management division, engineering designing, tourism development, scientific research and institutional framework. This plan is being implemented step by step supported by the co-ordination between relevant agencies although the plan contains a wide range of activities. Actually all the management activities have been carried out on the basis of the management plan.

Proposed Steps

Although the Yellow River Delta has a very successful wetland management system, some elements still need to be strengthened. First of all the further improvement of local awareness including government officials is still necessary for effective management, which can be achieved through different training courses and public awareness campaigns. Secondly the reserve administrative bureau should be enhanced as the government authority which is responsible for the wetland management and relevant co-ordination between different agencies. This enhancement should comprise the capacity building of nature reserve itself and more power from municipal government. Thirdly current management system should strengthen its abilities to solve some specific conflicts, e.g. between Shengli Oil Field and reserve bureau, which is a difficult thing needing more co-ordination and high awareness.

For so many different stakeholders from local level to national level and their successful participation in wetland management, the experiences of the Yellow River Delta are very typical and useful for other wetland areas e.g. the Liaohe River Delta also confronted a similar situation. Therefore such wetland management structure should be replicated to other areas and can only be accomplished through higher level authorities.

CONCLUSIONS

On the basis of the case study experience, it is necessary and beneficial for the local and indigenous communities to be involved in the wetland management. Three important indicators can help to identify the cases in which the active involvement of local and indigenous communities is actually crucial to the successful management: the first is the sustainable use of wetland resources and

corresponding improvement of local livelihood, the second is the effective maintenance of wetland biodiversity and the third is the good coordination between different stakeholders. Local involvement should be regarded as crucial if the above three results can be achieved.

Community participation is a very complicated process requiring repeated negotiations between stakeholders and sometimes final judgement from higher authorities. There should be a leading stakeholder to coordinate the involvement which can be usually held by the government authority. However, practicable regulations, strong support from the government and effective governance is most important for such involvement because the negotiation can not always be successful.

RECOMMENDATIONS

1. Based on the experiences of this case study, local and indigenous communities should indeed be involved in wetlands management. Two criteria apply. The first is whether it is beneficial to the conservation of the ecosystem and the second is whether it is good for the maintenance and improvement of local livelihood. These criteria can help evaluate whether the local involvement is crucial to the successful management of the area. Only if both of these objectives are achieved will this local participation be successful.
2. In general, positive support from local governments and high awareness of local people are the most important factors needed to involve local resident communities.
3. The key to obtaining local involvement in wetland management is how to summarize different opinions and convert them into real actions. This also requires comprehensive regulations and strong authorities.
4. Negotiation should involve as many as participants as possible yet the most important is how the negotiation conclusion can be realized.
5. The different kinds of agreements among stakeholders can facilitate local involvement; however complete regulations remain extremely important.
6. Competent management institutions are essential for wetland conservation. A leading agency which can be responsible for the implementation of different opinions should be decided by local government. Inter-agency coordination is essential.
7. A regular review meeting should be held where all stakeholders concerned can advance their opinions and evaluate their involvement and progress.
8. Based on the experiences of this case study, local and indigenous communities should indeed be involved in wetlands management. Two criteria apply. The first is whether it is beneficial to the conservation of the ecosystem and the second is whether it is good for the maintenance and improvement of local livelihood. These criteria can help evaluate whether the local involvement is crucial to the successful management of the area. Only if both of these objectives are achieved will this local participation be successful.
9. In general, positive support from local government and high awareness of local people are the most important factors needed to involve local resident communities.
10. The key to obtaining local involvement in wetland management is how to summarize different opinions and convert them into real actions. This also requires comprehensive regulations and strong authorities.
11. Negotiation should involve as many as participants as possible yet the most important is how the negotiation conclusion can be realized.
12. The different kinds of agreements among stakeholders can facilitate local involvement; however complete regulations remain extremely important.
13. Competent management institutions are essential for wetland conservation. A leading agency which can be responsible for the implementation of different opinions should be decided by local government. Inter-agency coordination is essential.

14. A regular review meeting should be held where all stakeholders concerned can advance their opinions and evaluate their involvement and progress.