Pre-feasibility Study on Artificial Fish Reefs Demo Project in Water of Changxing Island in Bohai Sea
Atifical Fish Reefs Demo Project in Water of Changxing Island
Project Brief

• In the first stage over 500,000 m$^3$ of artificial fish reefs and sea cucumber reefs will be placed in the area for enhancement of species and quantity of sea foods

• Two breeding plants will be reconstructed with water volume of 7000 m$^3$ for each

• The recreational fishing demo site related to fish reefs will be established

• A comprehensive touring demo site will be established in relation to underwater sight-seeing, recreation on the sea and sight-seeing on the island

• The capacity of eco-environmental monitoring and management will be built
Background and Capacity in Project Site

• Natural Background and Socio-economic Status

• Sea Area, Marine Fishery and Function Zonation

• Needs from the Stakeholders

• Policy Analysis and Capacity Evaluation
• Natural Background and Socio-economic Status
advantageous geographical location
Changxing Island

- Located on the east coast of Bohai Sea
- Recovery of environment and biodiversity
- Resolving disused boats and ships
- Promoting eco-tourism and local economy
- Demonstrates Bohai Sea restoration
Rapid Socio-economic Development

a、土地面积为252.5 km²
b、常住人口为41,000

c、成为中央政府批准的全面深化改革实验镇


d、辽宁省经济发展区

区于2002年1月由辽宁省人民政府批准。
Good Resources and Environment

a、The hills are located in southeast with an average elevation of 60m and high ridges and peaks are in the south with average elevation of 100m. In the west there is a 3000ha of primeval forest and in the middle and the north an artificial park is in construction with area of 500ha.

b、The wind-energy resource is rich and a wind-energy power station has been established
c. The wind-energy resource is rich and a wind-energy power station has been established.
d. The freshwater resource is also sufficient with supply capacity of 20000 tons per day.
e. The abundant touring resources such as natural beaches, primeval forest, historical relics and landscapes provide a base for rapid development of tourism.
f. The climate on the island is mild, neither cold in winter nor hot in summer with a significant 4 seasons.
Perfect Infrastructure

a. The roads on the island have been well constructed.
b. The freshwater resource can ensure the supply to the domestic, the industry and the agriculture.
c. The capacity of electric transformer increases to 9,450KV.
d. The communication facilities are well established.
e. A modern hospital and 12 clinics provide well medical treatment.
• Sea Area, Marine Fishery and Function Zonation

Sea Area

a、 coastline of 91.6km
b、 sea area of 100 square kilometers
c、 total beach area of 500ha
d、 average water temperature for each month is given in Table.1
e、 There are abundant species in the sea of interest, which include 40 species of phytoplankton, 30 species of zooplankton, 50 species of benthic organisms and 60 species of fishes
<table>
<thead>
<tr>
<th>Month</th>
<th>Average Water Temperature</th>
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<tbody>
<tr>
<td>JAN</td>
<td>-0.62</td>
</tr>
<tr>
<td>FEB</td>
<td>-1.05</td>
</tr>
<tr>
<td>MAR</td>
<td>1.36</td>
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<tr>
<td>APR</td>
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<tr>
<td>MAY</td>
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<td>JUN</td>
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<td>JUL</td>
<td>23.28</td>
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<tr>
<td>AUG</td>
<td>23.69</td>
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<td>SEP</td>
<td>21.57</td>
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<td>OCT</td>
<td>16.04</td>
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<td>NOV</td>
<td>9.12</td>
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<td>DEC</td>
<td>2.69</td>
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</table>
Marine Fishery

a. There are 400 fishing boats with fishing capacity of 40,000 tons and output of $12 millions (in 2001).

b. The area for bottom culturing is up to 2,350 ha with annual output of sea cucumber to 300 tons. The area for pooled culturing amounts up to 1,400 ha with annual output of Chinese prawns to 250 tons and sea cucumber to 180 tons.

c. There are 7 breeding bases for sea cucumber and valuable fishes with total water volume of 30,000 m³. The total breeding capacity can be up to 300 million prawn larvae, 1.5 billion shellfish larvae and 120 million sea cucumber larvae.
Marine Function Zoning

a、seaport zone

b、touring and recreational zones

c、coastal holiday zone

d、mariculture zone

e、natural reserve zone
Policy Analysis

• Taking tourism as driving force, industry as leading factor, and fishery and aquaculture as mainstay;
• To continuously improve environment and ecosystem;
• To rapidly construct the sea-cucumber culturing bases while developing marine fishery on a basis of marine resources;
• To greatly develop the third industries, especially eco-tourism and touring destinations and to build Changxing Island into an eco-tourism island and a tourist resort in northeast of China.
Investment policy

The income tax from the invested projects will be determined depending on the national policy and regulations and the local capacity. In general, the invested project with dealing duration of over 10 years will be exempted from taxation in the first two years from the year getting benefit.
Capacity evaluation

Local tax revenue and financial capacity
In 2001, the island realized the local tax revenue of 50,100,000 CNY, the financial income of 80,100,000 CNY and per capita income of 4,038 CNY.

Infrastructure
2km of main water pipelines and 12km of branch pipelines; 70km of road has been newly paved; 200,000m2 of buildings have been newly increased.

Monitoring and management capacity
• The areas for placement of artificial reefs are designated in the waters in north of Changxing Island.

The basic features of reef placement areas are:

• **Coastal geomorphology:** The coastal areas belong to the erosion rock type. In the west the 10m isobath is close to the coastline and the slope is steep. In the east the tidal beach is smooth in silt-mud bottom.

• **Hydrologic conditions:** The coastal current is in northeast direction in spring tide and in southwest direction in neap tide.
Pre-designing of Reefs

Reef and Construction and Placement

The disused boats and other cement materials are used for construction of reefs.

The construction and placement of reefs are consist of four part:

- the treatment and repackage of disused boats
- the construction of concrete fish reefs
- the construction of sea-cucumber reefs
- the placement on the sea.
• **Reconstruction of Breeding Bases**
  Two breeding bases are reconstructed for fish and sea cucumber, designing according the standards of modern breeding plants.

• **Equipment of Facilityies for Recreational Fishing and Underwater Sight-seeing**
  It is planned to invest on 3 sets of facilities, of which each includes a 150-ton fishing boat, a semi-submarine boat, 100 light-diving facilities, 2 sets of heavy-diving facilities, and a floating wharf.
Monitoring and Management

• A monitoring station will be established with equipment of a set of water-quality detector, a set of underwater camera and other necessary analytical instruments.

• The management tools need to be provided for management on reef placement areas, such as software of management information system, computers and office facilities.

• The training courses for managers, office staffs and enforcement team should be involved in the project. After trained the monitoring and management will be enforced to ensure their safety of reef areas.
Investment and Total Budget

• Investment Way
  The project would be invested by investors and implemented by Changxing Island Township

• Cost Estimation
  The total budget would be $51,780,000
<table>
<thead>
<tr>
<th>Code</th>
<th>Main items</th>
<th>Basic price</th>
<th>Total cost (US$)</th>
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<tr>
<td>1</td>
<td>Supplementary investigation</td>
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<td>80,000</td>
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<tr>
<td>2</td>
<td>Repackage of disused boats</td>
<td>1,200/one boat</td>
<td>600,000</td>
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<td>3</td>
<td>Construction of all reefs</td>
<td>60/m³x500,000 m³</td>
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<td>4</td>
<td>Reconstruction of breeding bases</td>
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<td>Facilities for recreation fishing and underwater sightseeing</td>
<td>2,000,000/set x3</td>
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<td>6</td>
<td>Establishment of monitoring station</td>
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<td>7</td>
<td>Equipment of management tools</td>
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<td>8</td>
<td>Placement engineering</td>
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<td>800,000</td>
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<tr>
<td>9</td>
<td>Breeding activities</td>
<td>1,200,000/year-base x2 x3years</td>
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<td>10</td>
<td>Training and management</td>
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<td>300,000</td>
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<td>11</td>
<td>Reconstruction of tourist facilities</td>
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<tr>
<td>12</td>
<td>Advertisement and promoting selling</td>
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<td>60,000</td>
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<tr>
<td></td>
<td>Total</td>
<td></td>
<td>51,780,000</td>
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</table>
• Cost-benefit Analysis

• Feasibility and Measures from Local Governments and Sectors

• Risk Analysis and Risk Management Strategies
Thank you!