Research into the Coastal Zone Protection Plans of Dalian

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2008年9月

DUT
Research Content

- Natural conditions of the coastal zone
- Situation and problems of development
- Marine industrial distribution
- Research into the direction of development and utilization of the coastal zone
- Study of the control index of sea filling coastline
BoHai Sea

Yellow Sea
Natural conditions of the coastal zone

- Coast, submarine geomorphology, submarine sediment
- Hydrodynamic tidal force, coastal erosion, seawater encroachment, coastal storms, earthquake
- Resources, natural characteristics, environmental conditions
There are Tidal flats, Erosion-Accumulation underwater slope, Erosion-Accumulation plain from the coast of the Yellow Sea to the sea in turn; There are Beach or Tidal flats, Erosion-Accumulation underwater slope, Ancient Limnetic Depression from the coast of the BoHai sea to the sea in turn.
Submarine Geomorphology

The type of submarine geomorphology are
Erosion – Accumulation Underwater Slope,
Scour Plain, Modern Submarine delta
Submarine Sediment

fine sand, silty sand, sand -silt-clay, clayey silt, sand -silt-clay, fine sand, Silty Sand

sand -silt-clay

Silty Sand

silty clay

Clayey silt

Fine sand

sand -silt-clay

Fine sand

Silty Sand

Fine sand
Type of tide

irregular semidiurnal tide

regular semidiurnal tide
earthquake epicenter and earthquake peak motion

Belong to liaodong geofracture zone. There were all together 49 earthquakes over 4.7 scales of magnitude in Dalian in recent century.
Seawater Encroachment
Risk assessment of coastal zone geological disasters
situation and problems of development

<table>
<thead>
<tr>
<th>Coast type</th>
<th>Length (km)</th>
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</thead>
<tbody>
<tr>
<td>continental coast</td>
<td>1288</td>
</tr>
<tr>
<td>Island coast</td>
<td>618</td>
</tr>
<tr>
<td>Total</td>
<td>1906</td>
</tr>
</tbody>
</table>
Area of land reclamation

- Before 1986: 225.25 km$^2$
- 1986-1996: 23.01 km$^2$
- 1996-2007: 76.72 km$^2$
Area of land reclamation

Pu LanDian

- Before 1986: 117.35km²
- 1986-1996: 7.6km²
- 1996-2007: 3.3km²
Area of land reclamation

- JinZhou
- JinGang

Before 1986: 54.31 km²
1986-1996: 9.8 km²
1996-2007: 4.63 km²
Area of land reclamation

Lu ShunKou

- Before 1986: 11.09km²
- 1986-1996: 0.6km²
- 1996-2007: 3.99km²
Central area of DaLian

Area of land reclamation

- Before 1986: 5.72 km²
- 1986-1996: 8.11 km²
- 1996-2007: 15.09 km²
Area of land reclamation

JinGang

- Before 1986: 8.45km²
- 1986-1996: 8.87km²
- 1996-2007: 16.33km²
Area of land reclamation

ZhuangHe

Before 1986: 127.64km²
1986-1996: 16.53km²
1996-2007: 1.06km²
### Area of land reclamation in DaLian

<table>
<thead>
<tr>
<th>county (city/district)</th>
<th>1986-1996</th>
<th>1996-2006</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>Zhuanghe city (km(^2))</td>
<td>16.53</td>
<td>1.06</td>
<td>17.59</td>
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<td>Jinzhou district (km(^2))</td>
<td>9.8</td>
<td>4.63</td>
<td>14.43</td>
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<td>Central area of Dalian (km(^2))</td>
<td>8.11</td>
<td>15.09</td>
<td>23.2</td>
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<tr>
<td>Lv shunkou district (km(^2))</td>
<td>0.6</td>
<td>3.99</td>
<td>4.59</td>
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<tr>
<td>Wa fangdian city (km(^2))</td>
<td>23.01</td>
<td>76.72</td>
<td>99.73</td>
</tr>
<tr>
<td>Pu landian city (km(^2))</td>
<td>7.6</td>
<td>3.3</td>
<td>10.9</td>
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<td>Jingan district (km(^2))</td>
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<td>16.33</td>
<td>25.2</td>
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<tr>
<td>Total (km(^2))</td>
<td>74.52</td>
<td>121.12</td>
<td>195.64</td>
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<tr>
<td>County /city</td>
<td>Yellow sea</td>
<td>Bohai</td>
<td>Total</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>continental coast (km)</td>
<td>continental coast (km)</td>
<td>continental coast (km)</td>
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<tr>
<td></td>
<td>occupancy rate (%)</td>
<td>occupancy rate (%)</td>
<td>occupancy rate (%)</td>
</tr>
<tr>
<td>Total</td>
<td>607.10</td>
<td>680.40</td>
<td>1287.50</td>
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<tr>
<td>Zhuanhe city</td>
<td>215.00</td>
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<td>215.00</td>
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<tr>
<td>Wafangdian city</td>
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<td>423.10</td>
<td>423.10</td>
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<tr>
<td>Pulantian city</td>
<td>52.00</td>
<td>10.00</td>
<td>62.00</td>
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<tr>
<td>Jinzhou district</td>
<td>100.00</td>
<td>91.00</td>
<td>191.00</td>
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<tr>
<td>Jingang district</td>
<td>67.00</td>
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<td>67.00</td>
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<tr>
<td>Lushunkou district</td>
<td>54.90</td>
<td>92.70</td>
<td>147.60</td>
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<tr>
<td>Central area of Dalian</td>
<td>118.20</td>
<td>63.60</td>
<td>181.80</td>
</tr>
</tbody>
</table>
Marine industrial distribution

Fig.1 Structural drawing of major marine industries output value of Dalian in 2005
Distribution of coastal tourism Resources
Distribution of maritime transport Resources
Distribution of sea salt industry Resources
Research into the direction of development and utilization of the coastal zone

- The principle of coastal zone protection and utilization as follows:
Research into the direction of development and utilization of the coastal zone

1. Resource protection.

   Strictly controlling the utilization of the coastal zone, protecting the important ecosystem of the natural coast.
   Saving ecologically sensitive resources such as beaches, everglades etc.
   Forbidding land reclamation and the exploiting of the natural coastline.
   Strengthening management and protection for state-level and local-level oceanic nature protection areas.
   Prohibiting using non-renewable coastal zone resources, destroying unrecoverable natural coastal environment.
2. The coastal zone environmental quality regulation.

- It is important to reinforce pollution prevention in coastal waters, such as Dalian Bay; to combine pollution prevention in sea areas with comprehensive rehabilitation in urban environments; to develop local pollution prevention and handling measures.

- To minimize the amount of contaminant discharges entering the sea; to restore environmental functions and ecological indicators in polluted sea areas.
3. Coastal Zone Development Regulations

- Coastal zone utilization should give priority to the following projects:
  - Major military installations related to national security;
  - Energy, transportation, communications and water supply infrastructure construction projects;
  - Villages, towns and public service facilities construction projects;
  - Projects in keeping with the advantage of resources and development directions
  - Significant bank protection projects;
3. Coastal Zone Development Regulations

- Projects that promote ecosystem balance;
- The introduction of advanced technology and scientific research
- The use of aquaculture, proliferation projects;
- The island development project;
- Wastewater, exhaust gas, solid waste utilization and environmental governance projects;
- With regards to the development and utilization projects, cross-site selection, contradictions, eco-efficiency, economic and social benefits of the best projects should be taken into consideration.
4. Coastal land control.
The shore sections with the following conditions should be retained:

- 1) Suitable for harbor construction,
- 2) Suitable for leisure beaches and tourist areas
- 3) Suitable for the establishment of coastal defense and military installations
- 4) Areas with functional disputes and resources utilization potential.
5. Coastal traffic policies.

- Construct the cross-border roads and highways, which are parallel to the coastline, with reasonable distance between the coastline and hinterland.
- Construct a mini branch road perpendicular to the coastline, in order to reduce any negative impact to it.
- Do not construct cross-border roads or highways on beaches, lagoons, land not available for development or other ecologically sensitive areas.
- Construct a mini branch road connecting the cross-border roads, highways, and coastline in the least environmentally sensitive areas.
6. Coastal disaster prevention plan.

- Tightly control the groundwater yield to inhibit sea water intrusion.
- Implement coastal eco-environmental restoration engineering.
- The emphasis is to solve the problems of quarrying and dredging, coastal erosion caused by groundwater overexploitation, sea water intrusion etc, for the sake of promoting the coastal protection project, restoring and improving the coastal environment.
<table>
<thead>
<tr>
<th>target layer</th>
<th>item level</th>
<th>factor level</th>
<th>index layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control index of sea filling</td>
<td>A&lt;sub&gt;1&lt;/sub&gt;resource</td>
<td>B&lt;sub&gt;1&lt;/sub&gt;raw</td>
<td>C&lt;sub&gt;11&lt;/sub&gt;length of available coastal line</td>
</tr>
<tr>
<td>coastline</td>
<td>system</td>
<td>materials</td>
<td>C&lt;sub&gt;2&lt;/sub&gt;water area</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C&lt;sub&gt;3&lt;/sub&gt;bay connectivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B&lt;sub&gt;2&lt;/sub&gt;resource</td>
<td>C&lt;sub&gt;4&lt;/sub&gt;marine resources utilization ratio</td>
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<tr>
<td></td>
<td></td>
<td>utilization</td>
<td>C&lt;sub&gt;5&lt;/sub&gt;natural coastline preserving rate</td>
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<tr>
<td></td>
<td>A&lt;sub&gt;2&lt;/sub&gt;environment</td>
<td>B&lt;sub&gt;3&lt;/sub&gt;natural</td>
<td>C&lt;sub&gt;6&lt;/sub&gt;Coastal Erosion Rate</td>
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<td></td>
<td>system</td>
<td>disaster</td>
<td>C&lt;sub&gt;7&lt;/sub&gt;frequency of storm tide</td>
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<td>C&lt;sub&gt;8&lt;/sub&gt;rising rate of sea level</td>
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<td>C&lt;sub&gt;9&lt;/sub&gt;disastrous geological risk</td>
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<td></td>
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<td>B&lt;sub&gt;4&lt;/sub&gt;man-made</td>
<td>C&lt;sub&gt;10&lt;/sub&gt;area of seawater intrusion</td>
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<td></td>
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<td>disaster</td>
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</table>
# Study on the control index of sea filling coastline

<table>
<thead>
<tr>
<th>Target layer</th>
<th>Item level</th>
<th>Factor level</th>
<th>Index layer</th>
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</thead>
<tbody>
<tr>
<td>Control index of sea filling coastline</td>
<td>A₃ social system</td>
<td>B₅ development activity</td>
<td>C₁₁ the reclamation of land</td>
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<tr>
<td></td>
<td></td>
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<td>C₁₂ coherence of the using function of neighboring land</td>
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<tr>
<td></td>
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<td></td>
<td>C₁₃, C₁₂ coherence of the using function of neighboring tidal flat</td>
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<tr>
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<td></td>
<td>C₁₄, C₁₂ coherence of the using function of neighboring waters</td>
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<tr>
<td></td>
<td>B₆ urbanization level</td>
<td></td>
<td>C₁₅ the number of the population</td>
</tr>
<tr>
<td></td>
<td>A₄ economic system</td>
<td>B₇ coastal economy</td>
<td>C₁₆ marine aquatic products output value</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>C₁₇ coastal tourism output value</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>C₁₈ main port cargo throughput</td>
</tr>
<tr>
<td></td>
<td>B₈ basic economy</td>
<td></td>
<td>C₁₉ Per Capita GDP</td>
</tr>
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<td></td>
<td>C₂₀ proportion of the tertiary industry</td>
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</table>
Study on the control index of sea filling coastline

• These 21 indicators reflect the current conditions of coastal areas and the impact of human activity upon them

• We hope experts can give us some advice with regards to the indicators. All the indicators will be acted upon.
The End

Thanks