Sihwa Tidal Power Plant: a success of environment and energy policy in Korea

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Energy Situations in Korea

- Korea started its industrial development in the 1970s, focusing on energy-intensive heavy and chemical industries such as steel, chemicals, shipbuilding and cement.
- Korea is the world's fourth largest oil importer and is trying to diversify energy sources to increase security, meet rising energy demand and meet greenhouse gas emission reduction targets.

Energy Situations in Korea

- Korea plans to increase spending on alternative energy sources and wants to increase the share of alternative energy in its fuel mix from 1.4 per cent to 5 per cent by 2011.
  - It is mainly targeting solar and wind projects in order to increase the share of renewables.
  - It has also been closely examining the potential for tidal power projects around its shores.

Tidal Power Stations

- The tides are generated by the rotation of the earth within the gravitational fields of the moon and sun.
  - The relative motions of these planets cause the surface of the oceans to be raised and lowered periodically.
- On most shorelines the tides go in and out twice a day, and energy can be captured from this movement with tidal power stations.

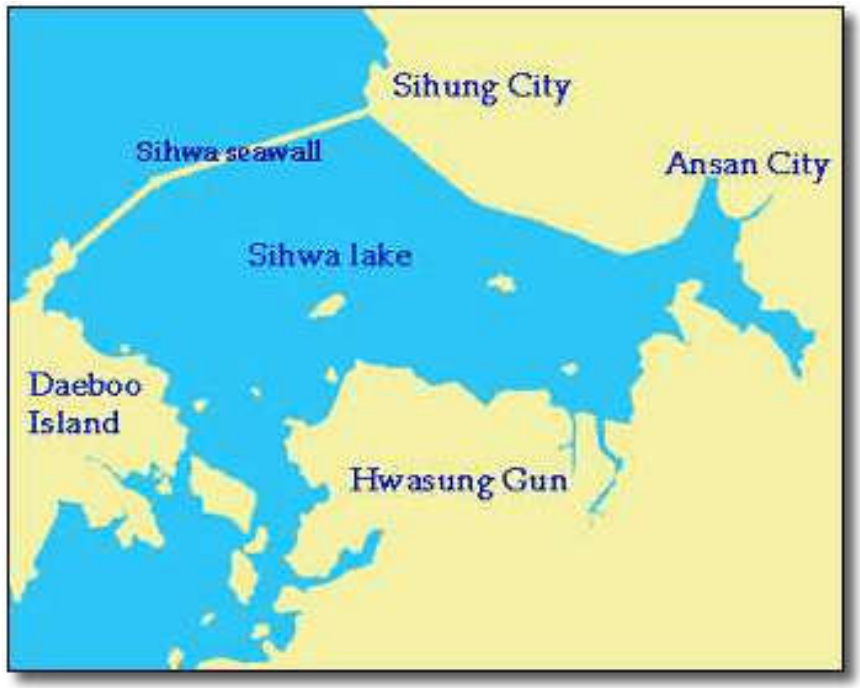
Tidal Power Stations

- **Although the initial cost of a tidal power plant is relatively high compared with other types of power plants, the benefits include low operating and maintenance costs, since no fuel is needed.**
- **The most noticeable benefit of tidal power plants is that they do not generate emissions.**
  - **Like most renewable sources of energy, tidal energy displaces fossil fuels and reduces CO2 in the atmosphere.**
  - **Korea ratified the Kyoto Protocol in 2002.**

Lake Sihwa

- Lake Sihwa is located in the mid-west of the Korean Peninsula in Gyeonggi province, bordering the West Sea at the Lake Sihwa Dam around 4 km from the city of Siheung.
- It was created by constructing a dam in 1994 to secure agricultural water for the region, to develop industrial/agricultural lands near the metropolitan area and to secure irrigation water.
  - Besides the 56.5 km2 freshwater lake (one of the largest tidal lakes in Korea), reclaimed land of 173 km2 was also created.

Lake Sihwa



Lake Sihwa

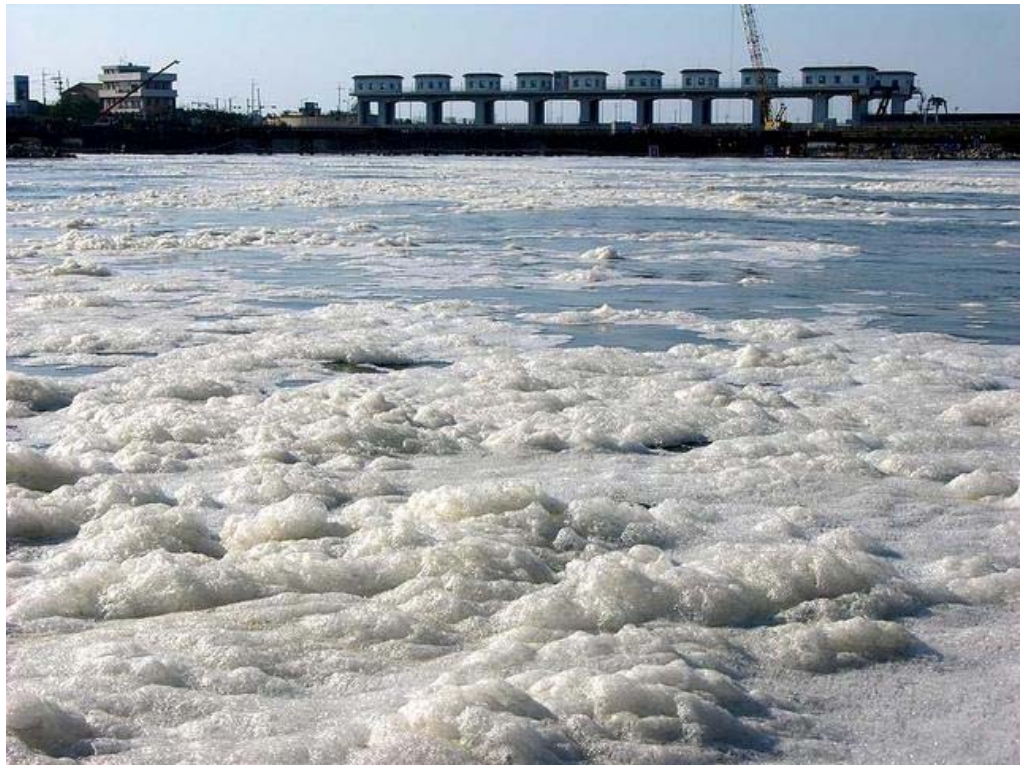
Lake Sihwa

Lake Sihwa Dam

Lake Sihwa

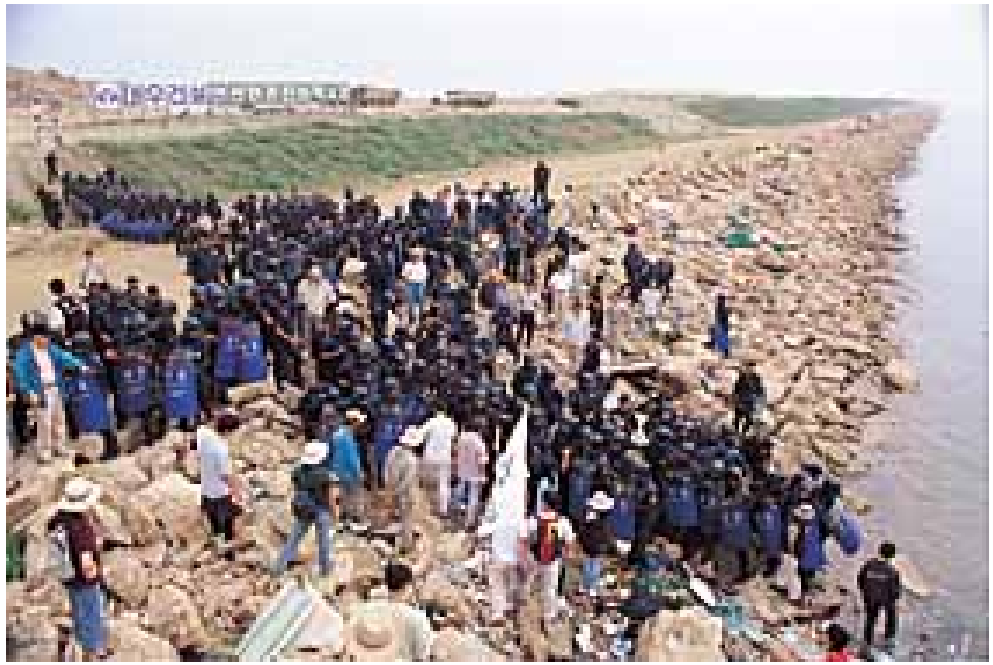
- **Due to the cut-off of tidal currents and the rapid increase of population and industrial waste loads from factories in the neighbourhood, the water quality of Lake Sihwa deteriorated over the years after the construction of the dam.**
  - **The water pollution is largely due to the lack of fresh water and disposal of sewage from nearby factories.**
  - **The pollution was considered to be severe and a solution was urgently required.**
  - **it was decided to open the lake to sea water.**

Lake Sihwa



‘Dead’ sea

Lake Sihwa



Conflicts with environmentalists

Sihwa Tidal Power Plant

- **The Sihwa tidal power plant is being constructed on Sihwa Lake in Korea.**
  - **It is designed as a flood generating system, taking advantage of the differing tide water levels between the sea and the artificial lake.**

Sihwa Tidal Power Plant

Sihwa Tidal Power Plant in 2009

Sihwa Tidal Power Plant

Sihwa Tidal Power Plant in 2009

Sihwa Tidal Power Plant

- **It opens up a new chapter in the renewable energy development in Korea.**
  - **This 260 MW, $250 million project is the first of its kind in the country and the world's largest (just after La Rance plant in France).**
    - **Another new world's largest one with 812MW for 2014 was proposed in Korea on 3 May 2007.**
  - **It will reduce oil imports by approximately 860, 000 barrels ($43 million).**

Sihwa Tidal Power Plant

- **It is also expected to play a big role in restoring the Lake Sihwa ecosystem and water quality through the continuing circulation of sea water.**
  - **The plant is to open the existing dam to allow the circulation and exchange of water between the Lake Sihwa and the sea.**
  - **The tidal plant will improve the lake by circulating 60 billion tonnes of seawater annually.**

Lake Sihwa

Dams are open for the inflow of seawater to the lake

Lake Sihwa

White Stork seen in a better environment

Lake Sihwa

Trout Leaping in a better environment

Catching two pigeons with one bean (一擧兩得)

- One bean
  - Sihwa Tidal Power Plant
- Two pigeons
  - Clean energy: renewable energy
  - Clean environment: better water quality

Thank you.

Lake Sihwa

- **Because of rapid socio-environmental changes and the lowering of water quality in Lake Sihwa, it was decided that there was no choice but to open the lake to sea water.**
- **The dam will be opened up allowing tidal flow into the lake, while the Sihwa tidal power plant will be built to harness the energy of the tides.**

Sihwa Tidal Power Plant's Mechanism

- **The Sihwa tidal power plant is designed as a flood generating system, taking advantage of the differing tide water levels between the sea and the artificial lake.**
  - **Flood generating systems generate power from the incoming tide i.e. from the sea to a basin.**
  - **When the high tide comes in, water flows through the turbines to create electricity.**
  - **Separate gates beside the turbines are designed to open during the ebb phase.**
  - **When low tide comes, the gates are raised and the water flows out.**
  - **The turbines operate in sluicing mode during the ebb phase and no energy is produced.**