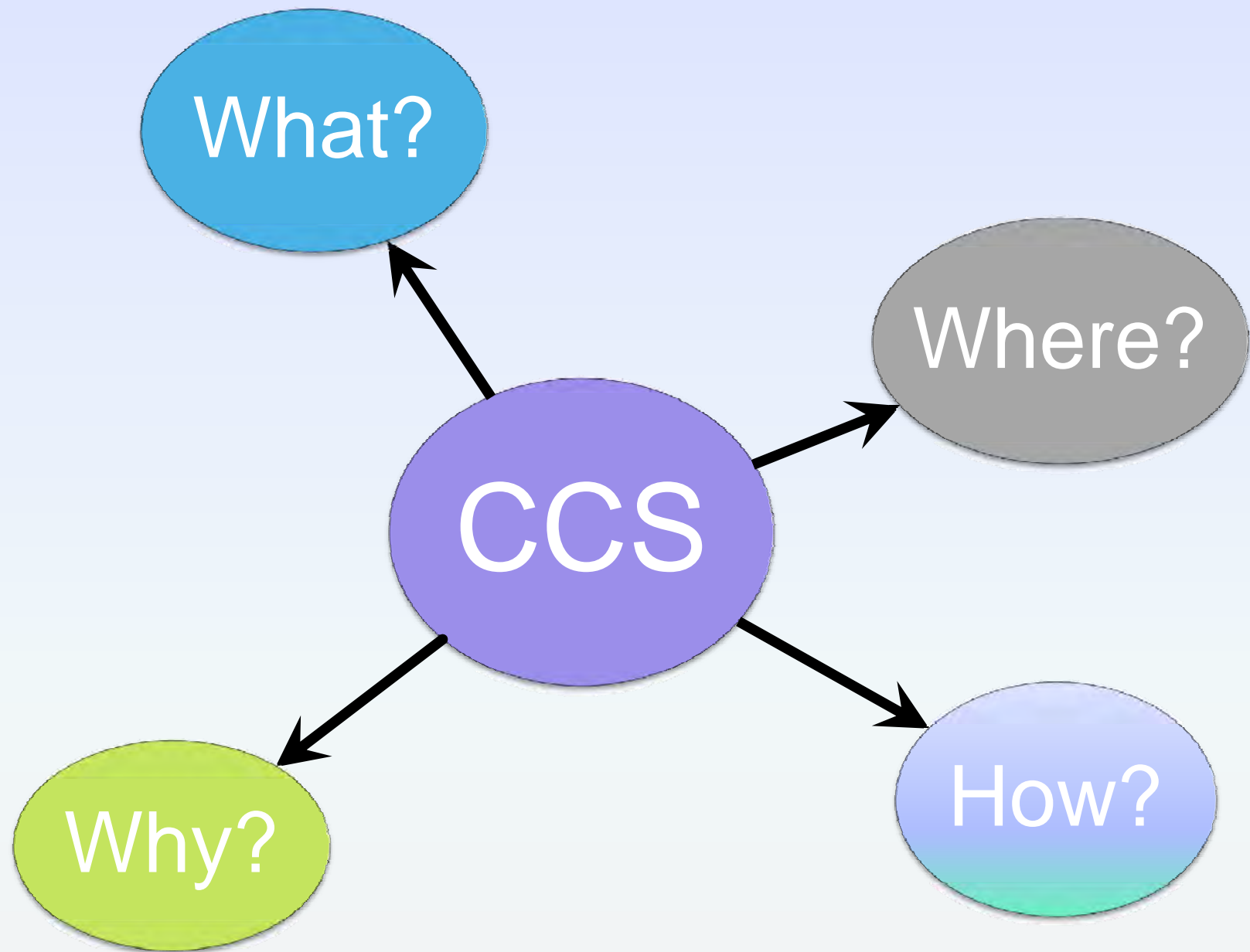


*An overview of technical and legal issues of
carbon dioxide storage and the progress in
China*

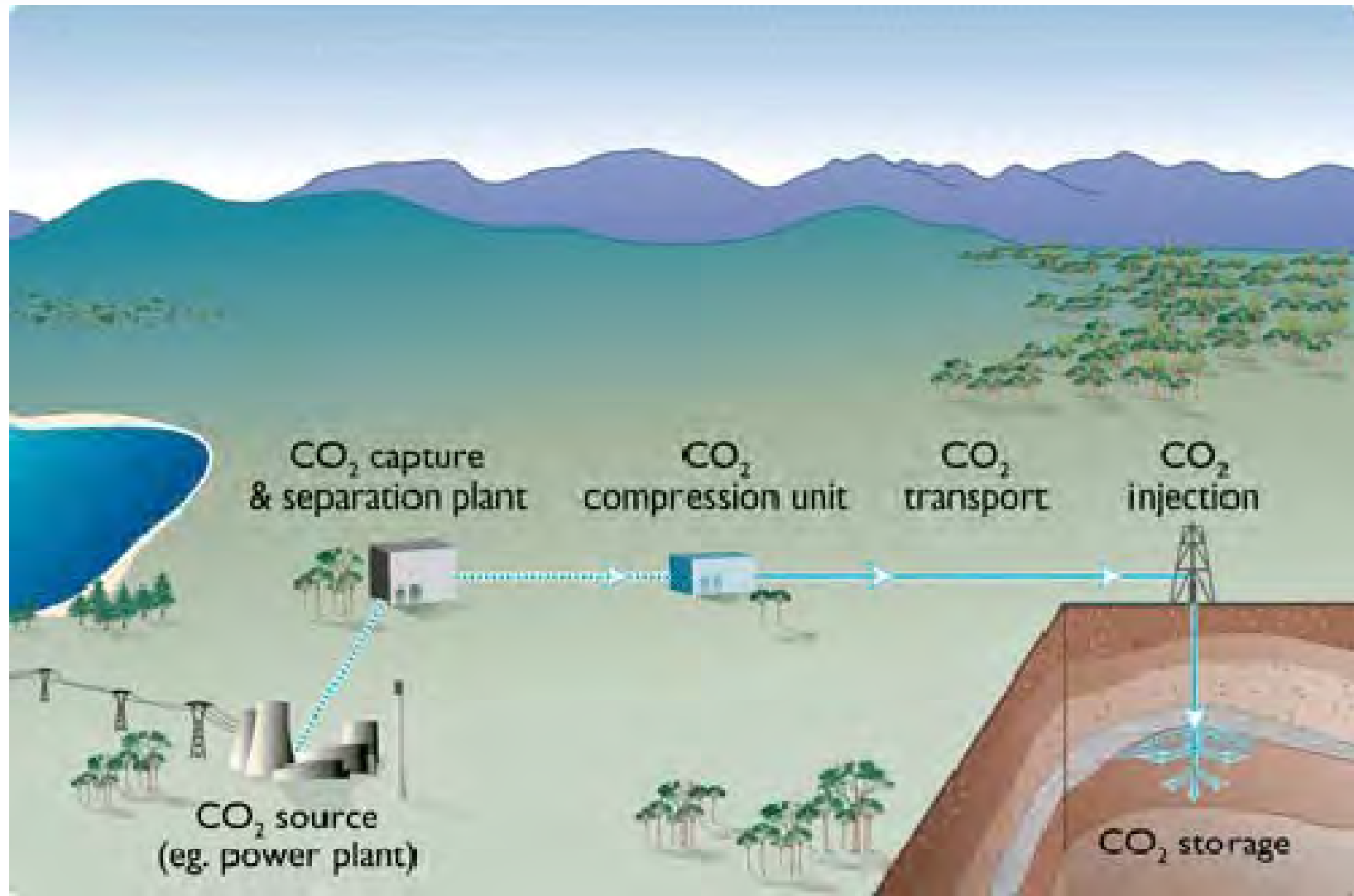
*Xiaomeng Wang
National Marine Environmental
Monitoring Center*

*PICES 2011 annual meeting
October 14~23, 2011 Khabarovs,Russia*

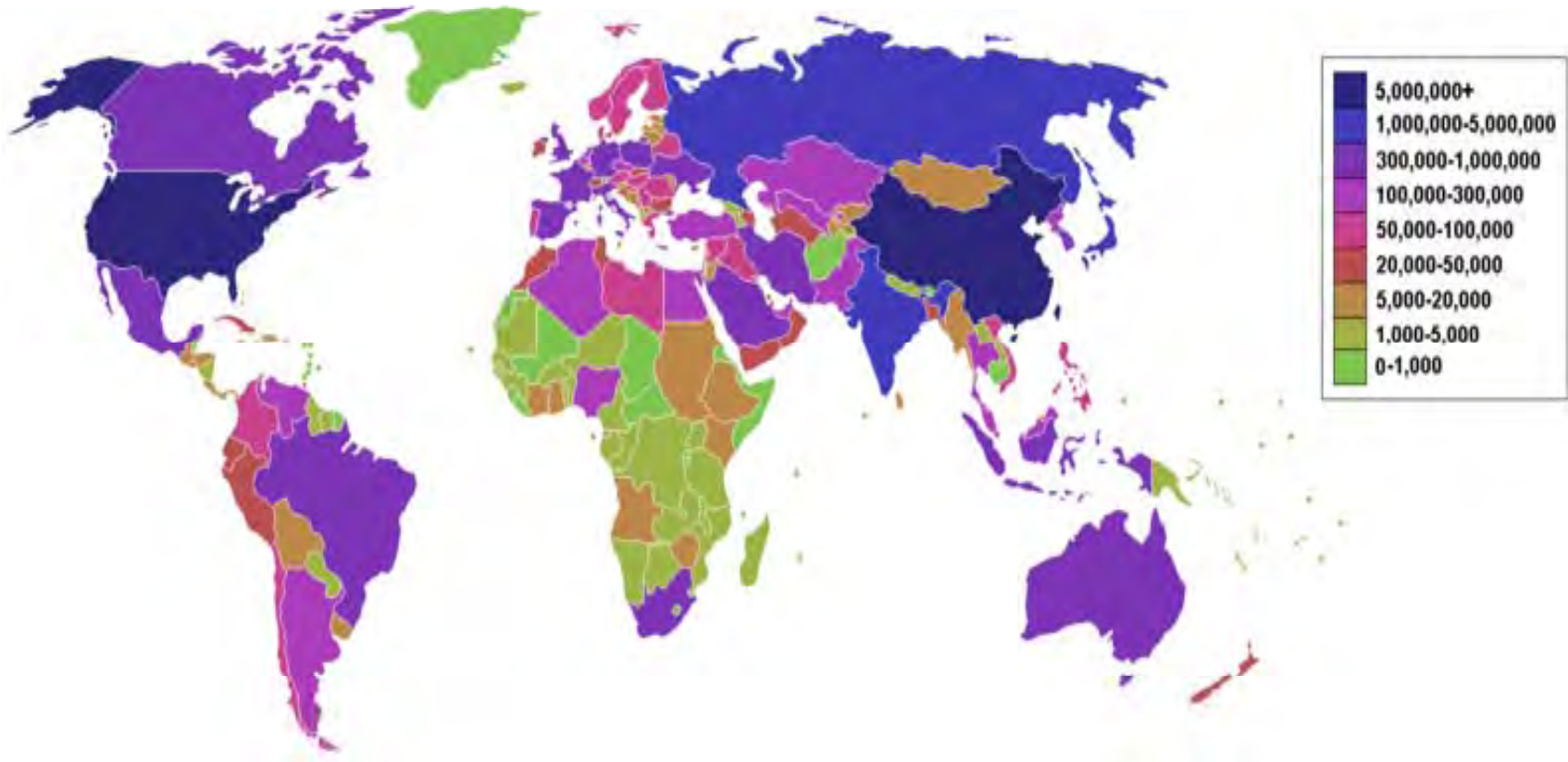




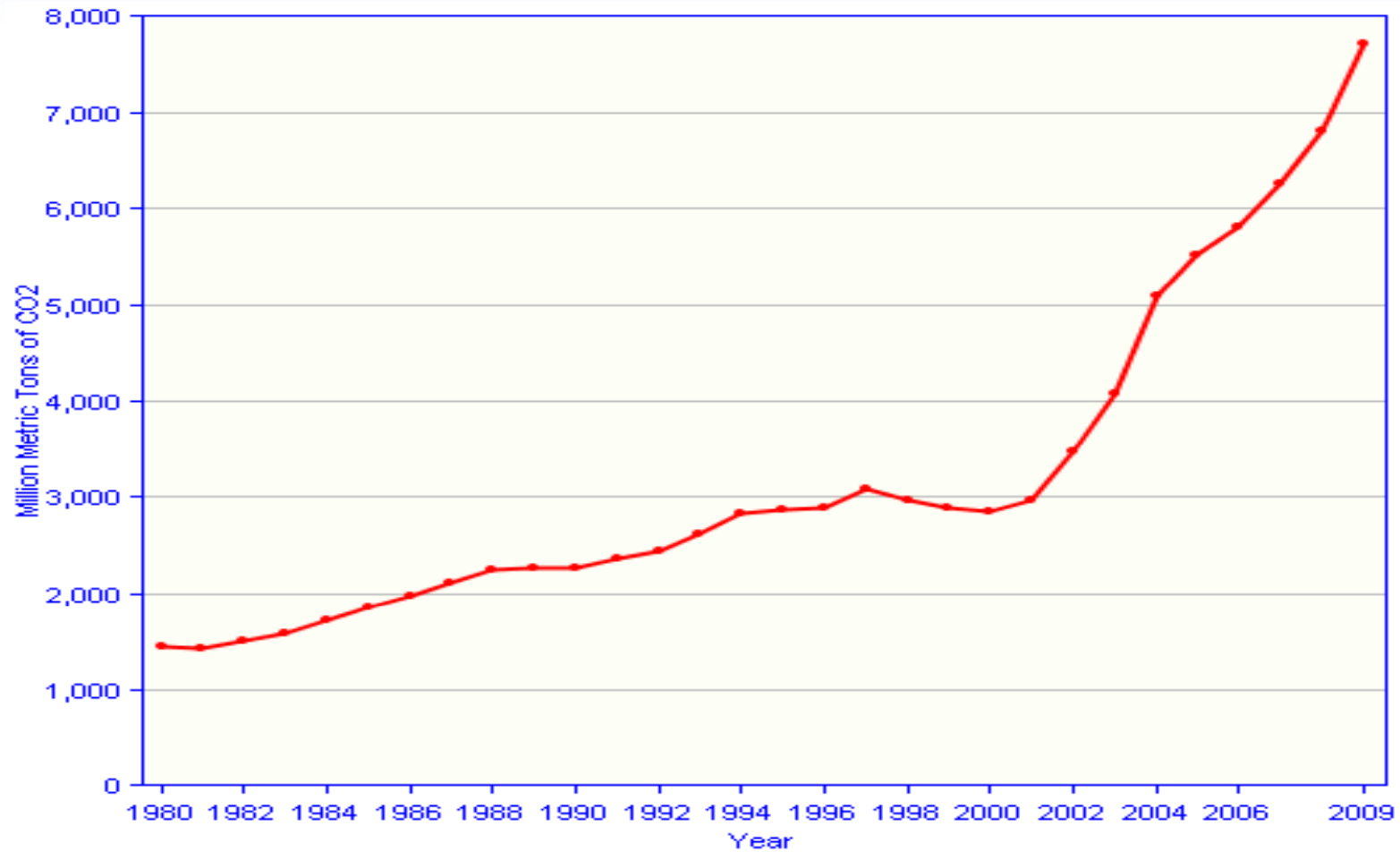
What?



Why?



Why?



■ Carbon Dioxide Emissions from Consumption



Why?

- ❖ In order to mitigate global warming, series actions have been carried out by the international communities to reduce the greenhouse gas emission, for example, improve the efficiency of the energy utilization, change the energy structure into low-carbon fuel, enhance the biological carbon sinks; CO₂ capture and storage; reduce the non- CO₂ greenhouse gas emissions.
- ❖ CCS has the potentiality to decrease the costs of reduction emissions and increase its flexibility, it may be an important part of achieving low-carbon economic in the future, so it is given great attention by developed countries and developing countries.



How?

❖ CCS is a process designed to:

Capture CO₂ emissions from large industrial facilities such as coal, oil and gas facilities and other industrial operations before the CO₂ is emitted to the atmosphere, transport the CO₂ through pipelines or ships, and permanently store the CO₂ in deep, secure underground formations.



How?

❖ There are three main techniques to capture CO₂ :

- Post-combustion

- Pre-combustion

- Oxyfuel

❖ Post-combustion process involves scrubbing the power plant's exhaust gas using chemicals.

❖ Pre-combustion CCS takes place before the fuel is placed in the furnace by first converting coal into a clean-burning gas and stripping out the CO₂ released by the process.

❖ Oxyfuel, burns the coal in an atmosphere with a higher concentration of pure oxygen, resulting in an exhaust gas that is almost pure CO₂.



How?

- ❖ **There are currently two methods used to transport large volumes of CO₂ by industry:**
 - **Pipeline Transport**
 - **Ship Transport**
- ❖ As transportation by ship does not allow a continuous flow of CO₂ from the industrial source to the storage sink some sort of interim storage facilities would be required (e.g. in harbours). Currently LPG is stored either in large steel tanks at pressure or in underground rock caverns, both of which could be used for intermediate CO₂ storage.
- ❖ All large scale pipelines are currently designed for supercritical/dense phase CO₂ transport. This avoids solidification of the CO₂ and allows it to be pumped as a liquid. Typically pressures are kept above 10 MPa by recompression stations at intervals along the pipelines.

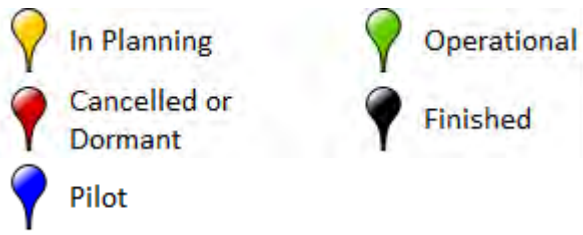


How?

- ❖ There are some methods to store CO₂ , generally, it can be classified into two categories:
 - Geological Storage ;
 - Ocean Storage.



Where?



Where?



Technical Issues

- ❖ Carbon capture efficiency;
- ❖ The technology of CO₂ transportation;
- ❖ The standard to select the storage sites;
- ❖ The effective methods of storage capacity estimation;
- ❖ The marine environmental effects;
- ❖ The safe and long-term storage of CO₂ ;
- ❖ The relevant monitoring and Emergency management program.



Legal Issues

- ❖ Lack of regulations for CCS have been a main obstacle for further development of CCS for a long time, but that is about to change.
- ❖ Before large CCS plants can be built all necessary regulations must be in place. We need international agreements on how and where to store CO₂ , as well as regulations to ensure that new fossil fuel power plants are built with CCS.
- ❖ Many international regulations were changed in recent years to allow CCS, and many countries and regions have established new regulations facilitating CCS.



International regulations

- ❖ **UNFCCC**
- ❖ **Tokyo protocol**
- ❖ **UNCLOS**
- ❖ **OSPAR convention**
- ❖ **LC/LP**



OSPAR Convention

- ❖ Initially, OSPAR did not allow CO₂ storage, but these regulations were amended in 2007 to permit CO₂ storage under the seabed.
- ❖ In June 2007, the OSPAR Commission issued a press statement entitled “*OSPAR takes action on climate change*”, the new OSPAR initiatives that legitimize CCS in sub-seabed geological structures.
- ❖ The statement was issued in conjunction with an OSPAR decision to amend the Convention to allow for environmentally safe storage of CO₂ in geological formations while banning the injection of CO₂ into the water column or its deposition on the seabed.



London Convention and related treaties

- ❖ The London Convention is one of the oldest global conventions to protect the marine environment from human activities. The relevance of the London Convention - or more particularly its London Protocol - to CO₂ storage is limited but important – it only applies to storage conducted from aircraft and vessels and platforms in the water column.



- ❖ In April 2006, Risk Assessment and Management Framework for CO₂ Sequestration in Sub-Seabed Geological Structures ;
- ❖ In November 2006, Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations ;
- ❖ In October 2006, the Parties amended the Protocol to allow CO₂ to be stored if
 - the disposal is into a sub-seabed geological formation;
 - stored streams consist overwhelmingly of carbon dioxide;
 - no waste is added for the purpose of disposal.
- ❖ This amendment provided a basis in international environmental law to regulate CO₂ sequestration in sub-seabed geological formations. This amendment entered into force in February 2007.



- ❖ In October 2009, Resolution on the Amendment of Article 6 of the London Protocol;
 - Contracting Parties shall not allow the export of wastes or other matter to other countries for dumping or incineration at sea except CO₂ streams.
- ❖ Contracting Parties also asked the Scientific Group under the London Protocol and London Convention to evaluate the need for an amendment to the 'Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations', in order to establish guidelines for export of CO₂ for disposal;
- ❖ In October 2010, a work plan was adopted for the review of the Specific Guidelines.



- ❖ Because of the hurriedly adoption of the resolution on the Amendment of Article 6 of the London Protocol, there are still many detail issues haven't been addressed, for example,
 - How to make sure the distinction between export and transboundary movement;
 - It is not clear who would be responsible for carrying out the monitoring and risk management arrangements;
 - It is also not clear how to undertake the relative legal obligations between the exporting country and importing country when the CO2 transboundary movement happen.



National or regional regulations

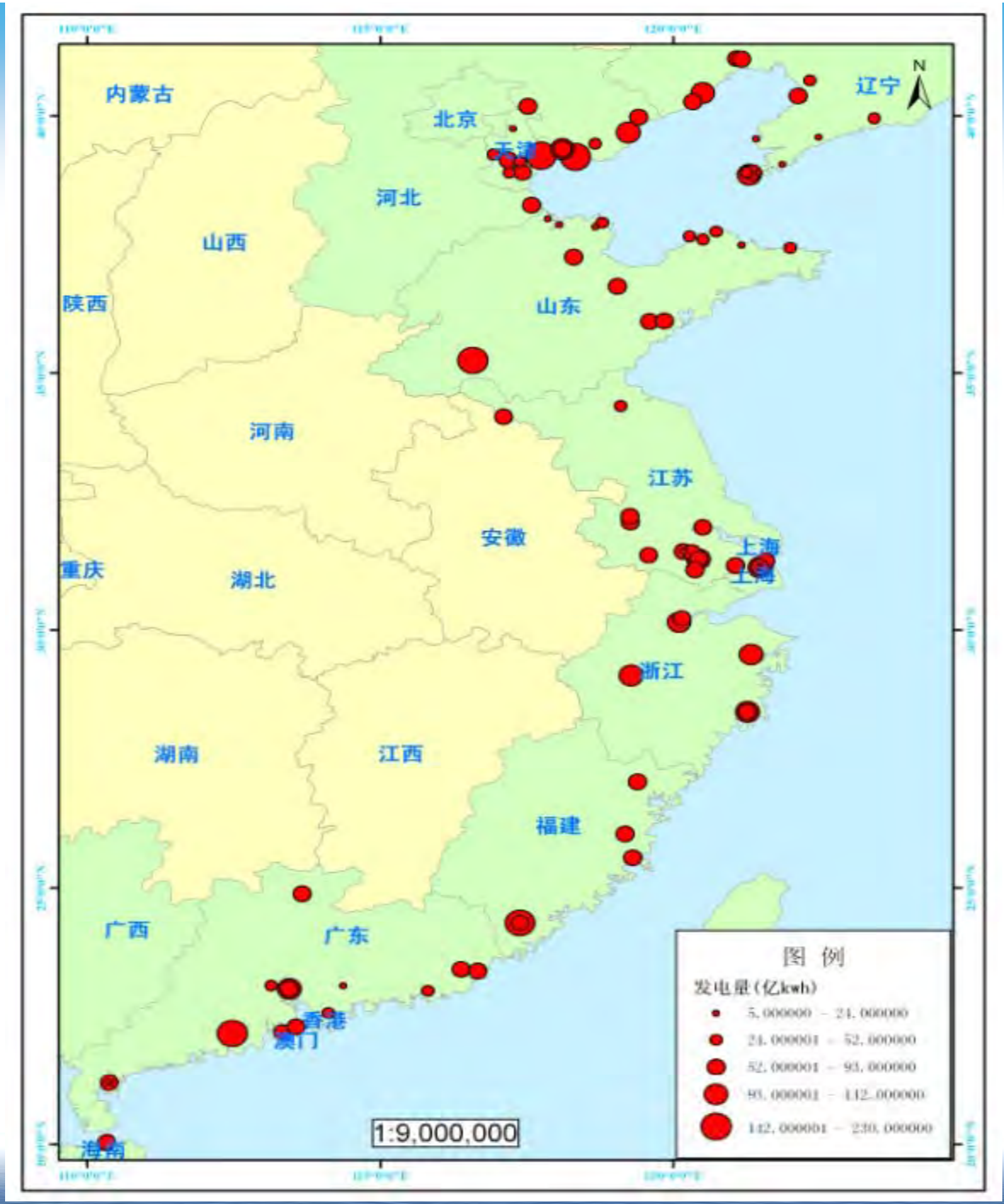
- ❖ **The Australian CCS legislation:** As the first country in the world Australia endorsed guiding principles for CO₂ storage in 2005.
- ❖ **The EU Directive for CO₂ Storage:** The EU established a new directive with guidelines for CO₂ storage in 2008.
- ❖ **The Californian Emission Performance Standard:** The Californian power production regulation has an upper limit for how much CO₂ a power plant can emit. Coal power plants are incapable of operating under this limit without CCS.



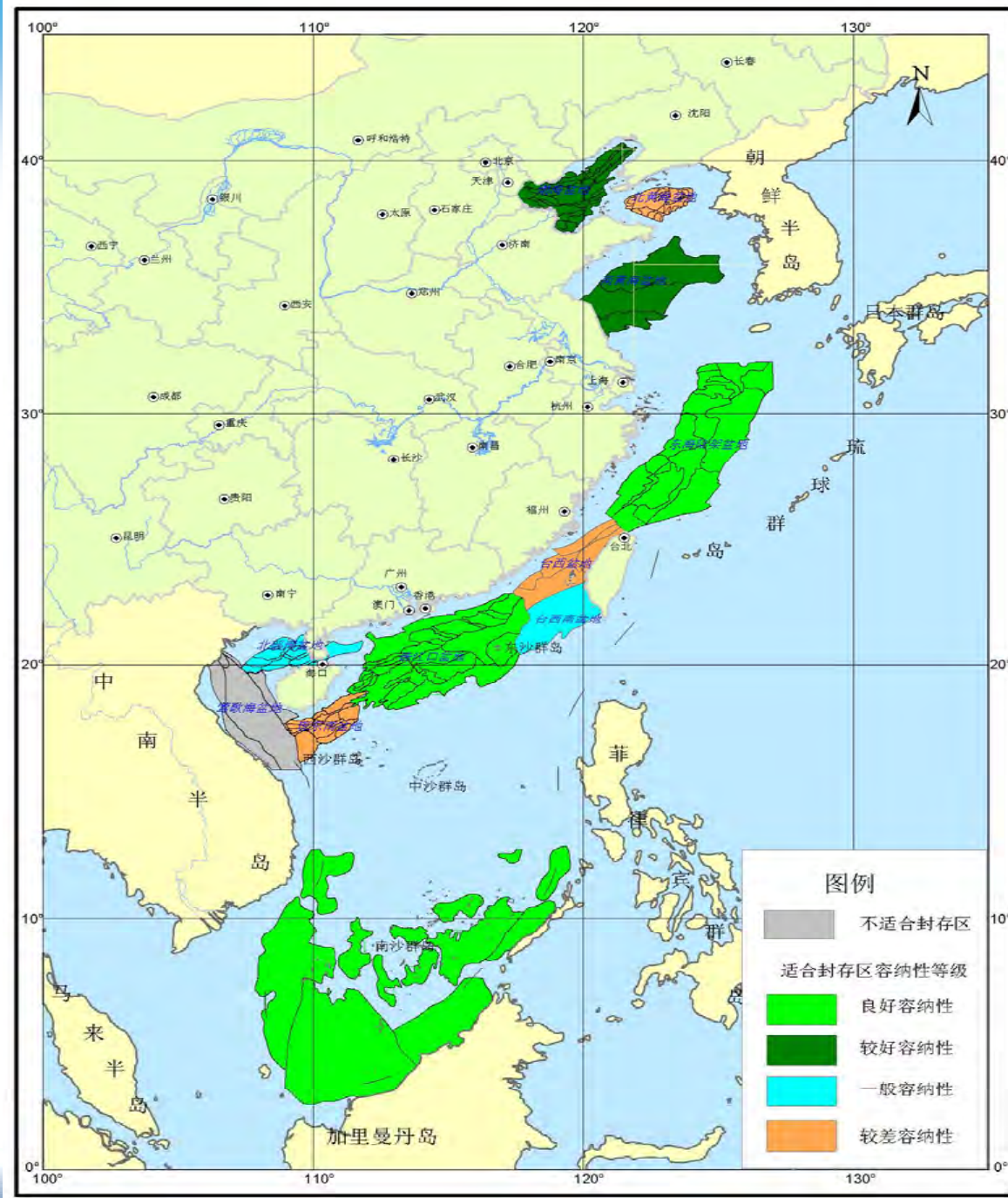
Progress in China

- ❖ There are good conditions to carry out geological storage of CO₂ in China. There are 11 offshore sediment basins in China.
- ❖ In recent years, CO₂ ocean storage has been actively researched in China, and initial progresses has been made, for instance,
 - The establishment of a method of estimating CO₂ storage capacity, and the calculation of the storage capacity of major sedimentary basins in China;
 - The simulation of CO₂ leakage from the deep sea in the laboratory, and the preparation of “Guidelines of survey and monitoring of CO₂ seabed geological storage (draft)”; and
 - The establishment of a database of coastal point sources of CO₂ emissions.









Thank you !!!

