



中国地质调查局
CHINA GEOLOGICAL SURVEY

中澳二氧化碳地质封存国际合作
The China Australia Geological Storage of CO₂ Project

中国地质调查局二氧化碳地质储存研究进展与展望 CO₂ Geological Storage of China Geological Survey : Progress and prospecting

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China Geological Survey

April 17-18, 2012

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China Australia Geological Storage of CO₂
中澳二氧化碳地质封存



OUTLINE

1. 背景

BACKGROUND

2. 中国地质调查局二氧化碳地质储存工作进展

PROGRESS OF CO₂ GEOLOGICAL STORAGE OF CHINA GEOLOGICAL SURVEY

3. 中国地质调查局二氧化碳地质储存工作展望

PROSPECTING OF CO₂ GEOLOGICAL STORAGE OF CHINA GEOLOGICAL SURVEY



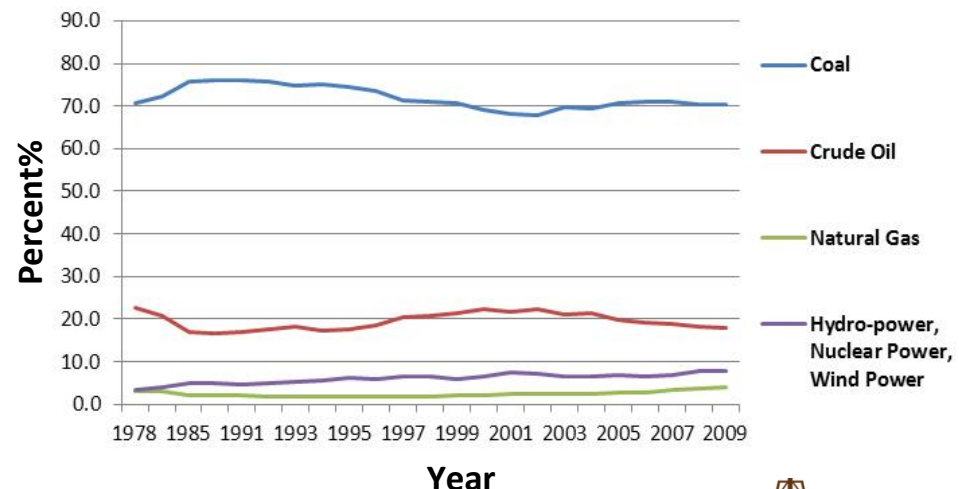
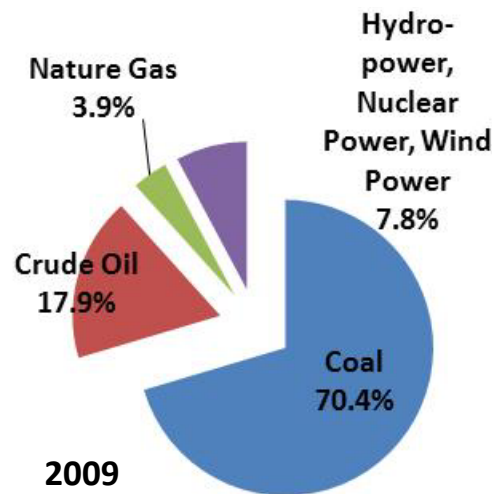
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中国能源消费结构特点

Energy Consumption Structure in China

- 中国能源消耗以煤炭、石油、天然气等化石燃料为主
Fossil fuels including coal, crude oil and natural gas are main energy consumption
- 据统计数据，煤炭在能源消耗中所占比例高于发达国家平均水平
Coal was in the proportion of 70.4% and higher than the average of developed countries in 2009
- 中国以煤炭为主的能源消耗趋势在未来一定时期内不会发生大的改变
Little change on trend of energy consumption structure in China



Sources: China Statistical Yearbook 2010

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二氧化碳地质储存是中国的碳减排选择之一

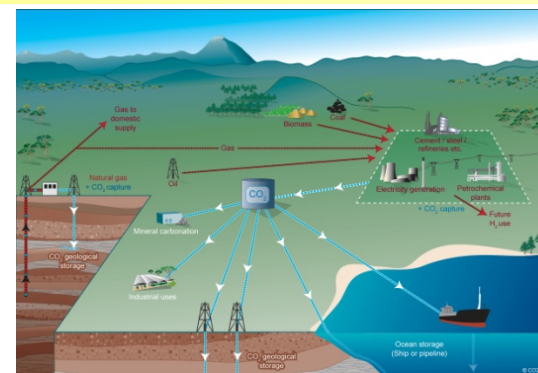
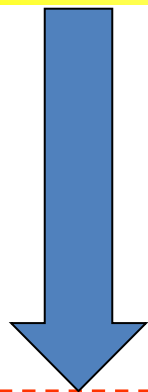
CO₂ Geological Storage is One of Choices to Reduce CO₂ for CHINA

中国政府承诺到2020年碳排放减排目标是：

到2020年中国单位国内生产总值CO₂排放比2005年下降40% - 45%

Emissions Cut Target Of China in 2020 :

Reducing the intensity of CO₂ emissions per unit of GDP in 2020 by 40 to 45 percent compared with the level of 2005



中国对化石燃料的依赖程度依然偏高，二氧化碳捕获与地质储存技术将受到越来越多的重视

China will continue to rely on fossil fuels into the 21st century , CCS has been receiving significant attention

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存在的问题

Existing Problems

➤ 以往CO₂地质储存潜力评价都是初步评价，未开展详细工作

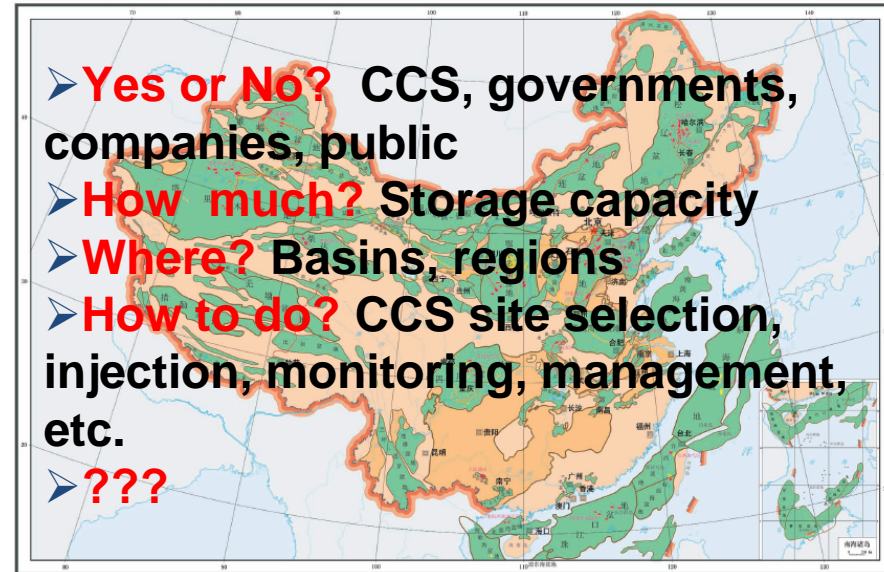
Primary assessment had carried out, but high level storage capacity assessment never been launched

➤ 以二氧化碳减排为目的的CO₂地质储存示范工程尚未建设

Demonstration projects for CO₂ emission never been developed

➤ 二氧化碳地质储存技术方法体系与关键技术尚未系统研究

A little researches on key technologies of CO₂ geological storage had been carried out



中国及毗邻海域面积大于200km²的盆地有417个，沉积面积约574.8万km²。

Sedimentary basins: 417 (>200km²)

Total areas: 5.748×10⁶km²



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国土资源部中国地质调查局重视应对全球气候变化工作

Pay More Attention on Climate Change

中国地质调查局从2009年起，正式启动了二氧化碳地质储存潜力评价与示范工程工作，主要工作内容包括：

- ◆中国二氧化碳地质储存潜力评价与适宜性编图
- ◆与神华集团合作，实施二氧化碳地质储存示范工程
- ◆二氧化碳地质储存潜力评价、数值模拟、监测等关键技术方法的研究
- ◆为中国二氧化碳地质储存提供地学技术支撑

From 2009 China Geological Storage Launched a serial of projects on CO₂ Geological Storage. Main tasks included :

- ◆Capacity assessment and suitable mapping of CO₂ geological storage in China
- ◆Cooperation with Shenghua Group to develop the demonstration project on CCS
- ◆To summary techniques and methods on capacity assessment, numerical simulation, monitoring, etc.
- ◆To supply geosciences supports for CO₂ geological storage in a long term

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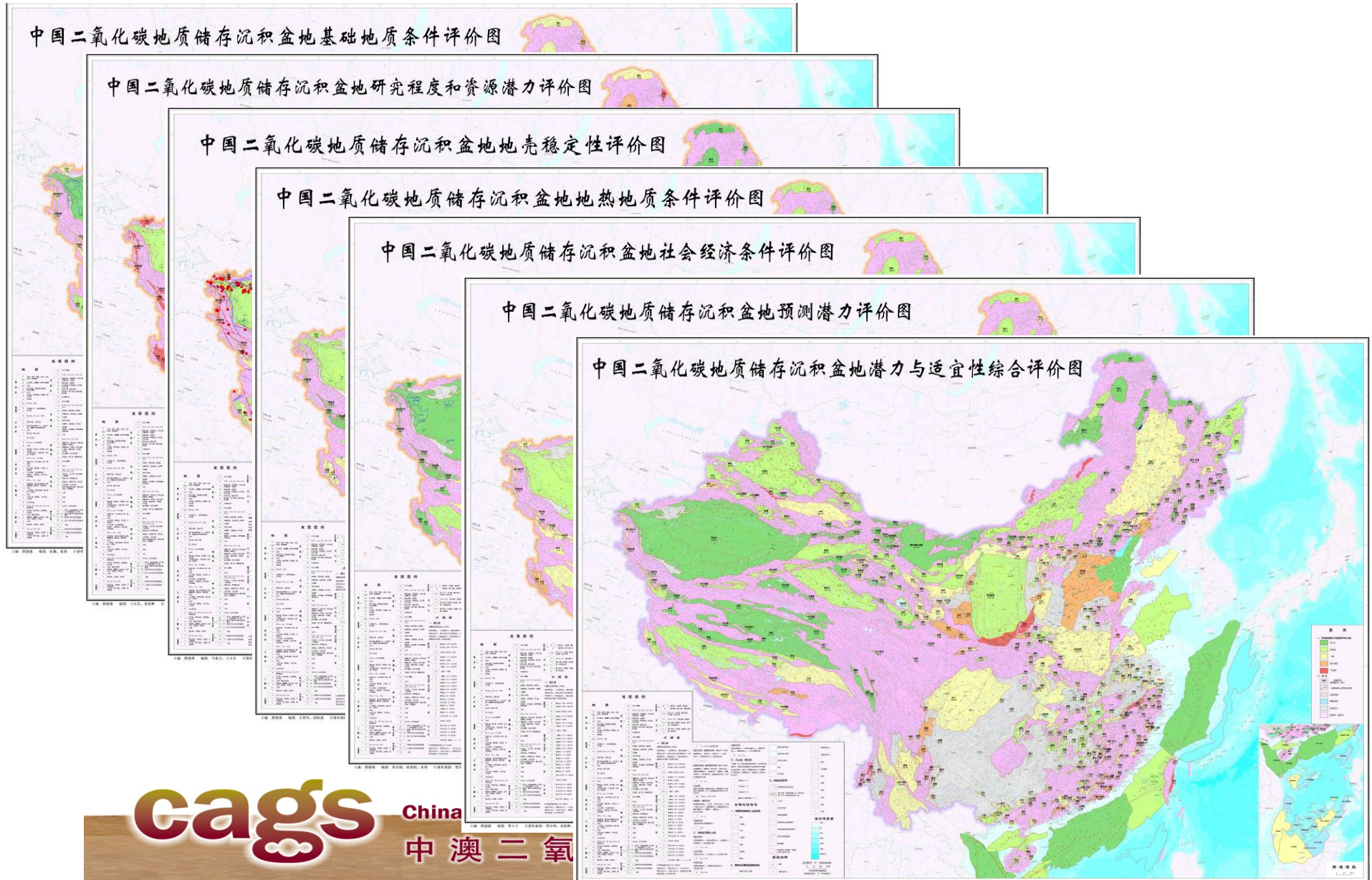
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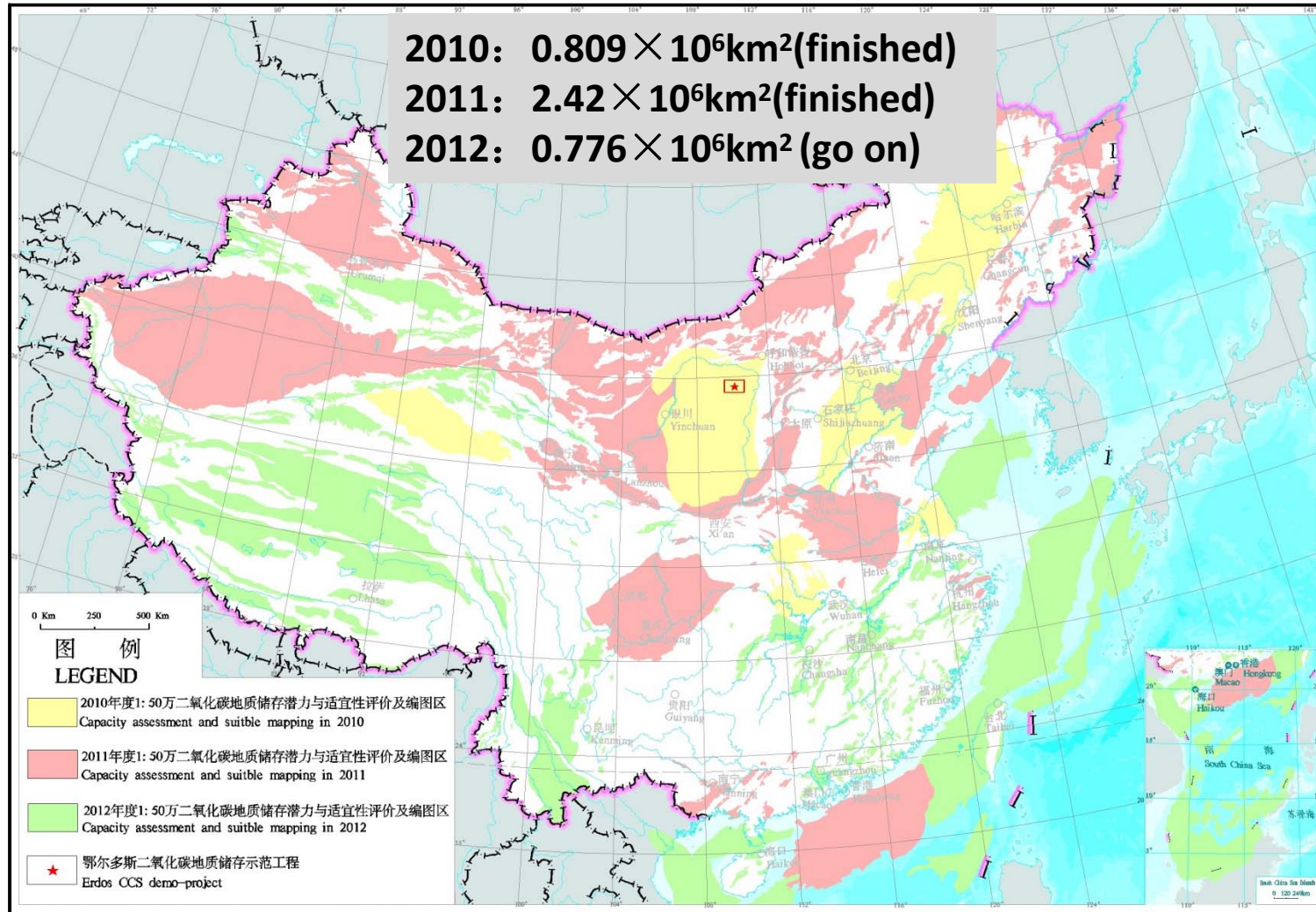
中国1:500 区域级潜力与适宜性成果图系

Basal Maps of CO₂ Geological Storage (National Scale, 1:5M)



潜力评价与适宜性编图

Capacity Assessment and Suitable Mapping



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中国主要沉积盆地CO₂地质储存潜力与适宜性评价图集

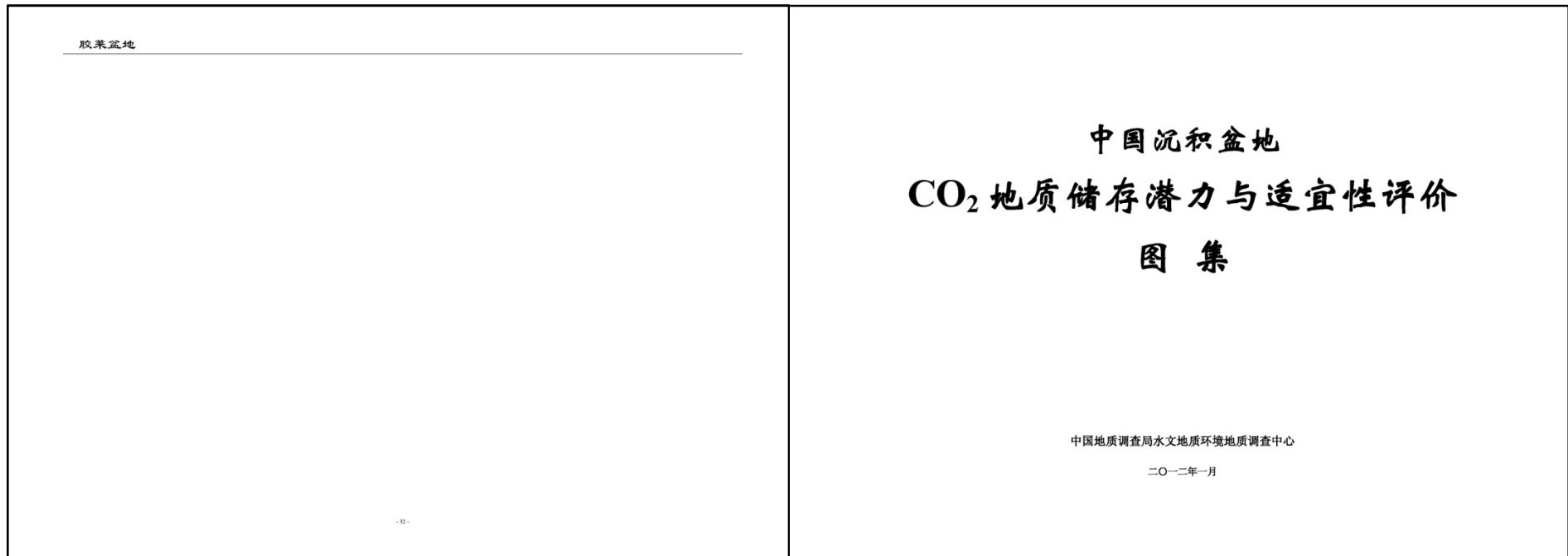
Atlas of CO₂ Geological Storage in China

图集由东部、中部、西部和南部四册图集组成.

4 atlases : Eastern China , Central China, Western China and Southern China.

展示松辽、渤海湾、胶莱和沁水盆地CO₂地质储存潜力与适宜性评价图册

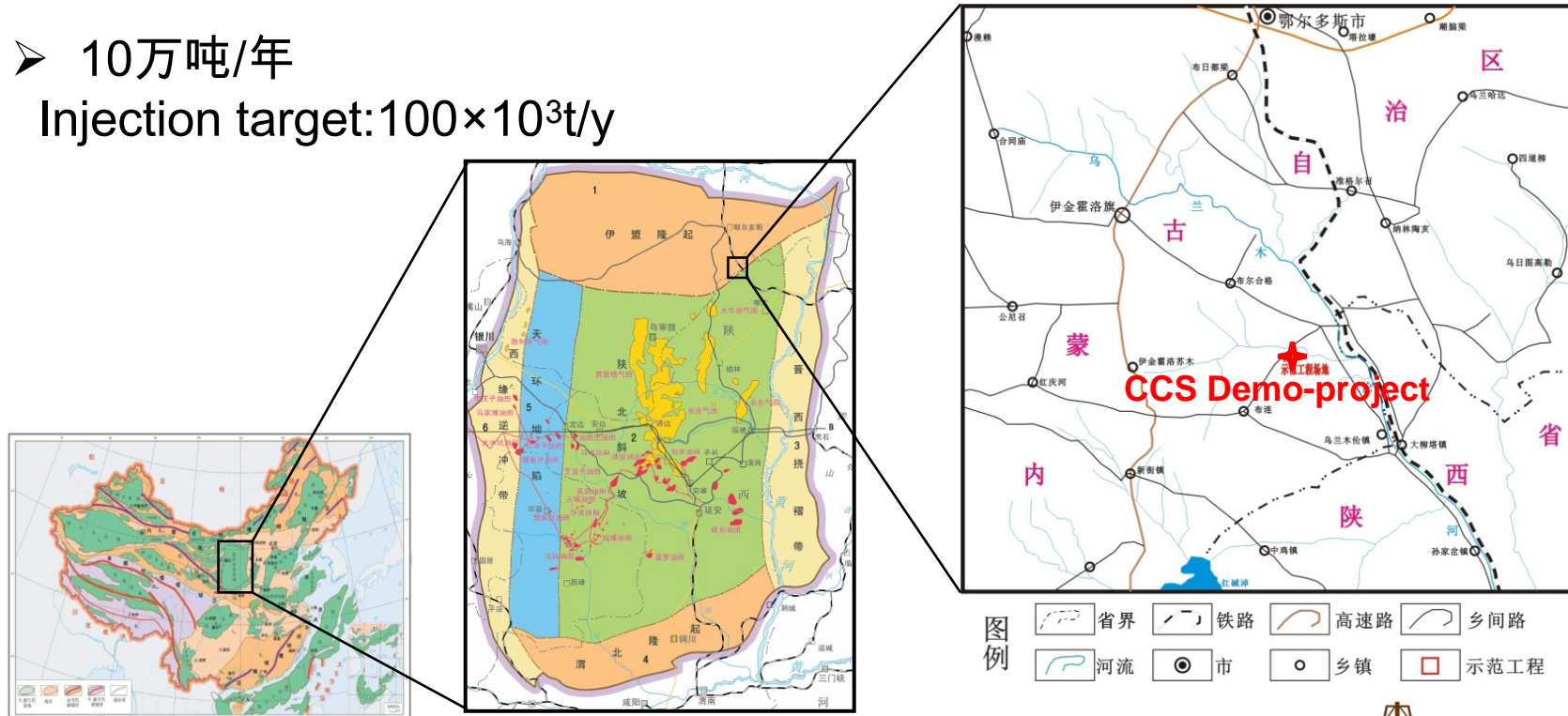
Examples show : songliao Basin, Bohaiwan Basin, Jiaolai Basin and Qinshui Basin



鄂尔多斯二氧化碳地质储存示范工程

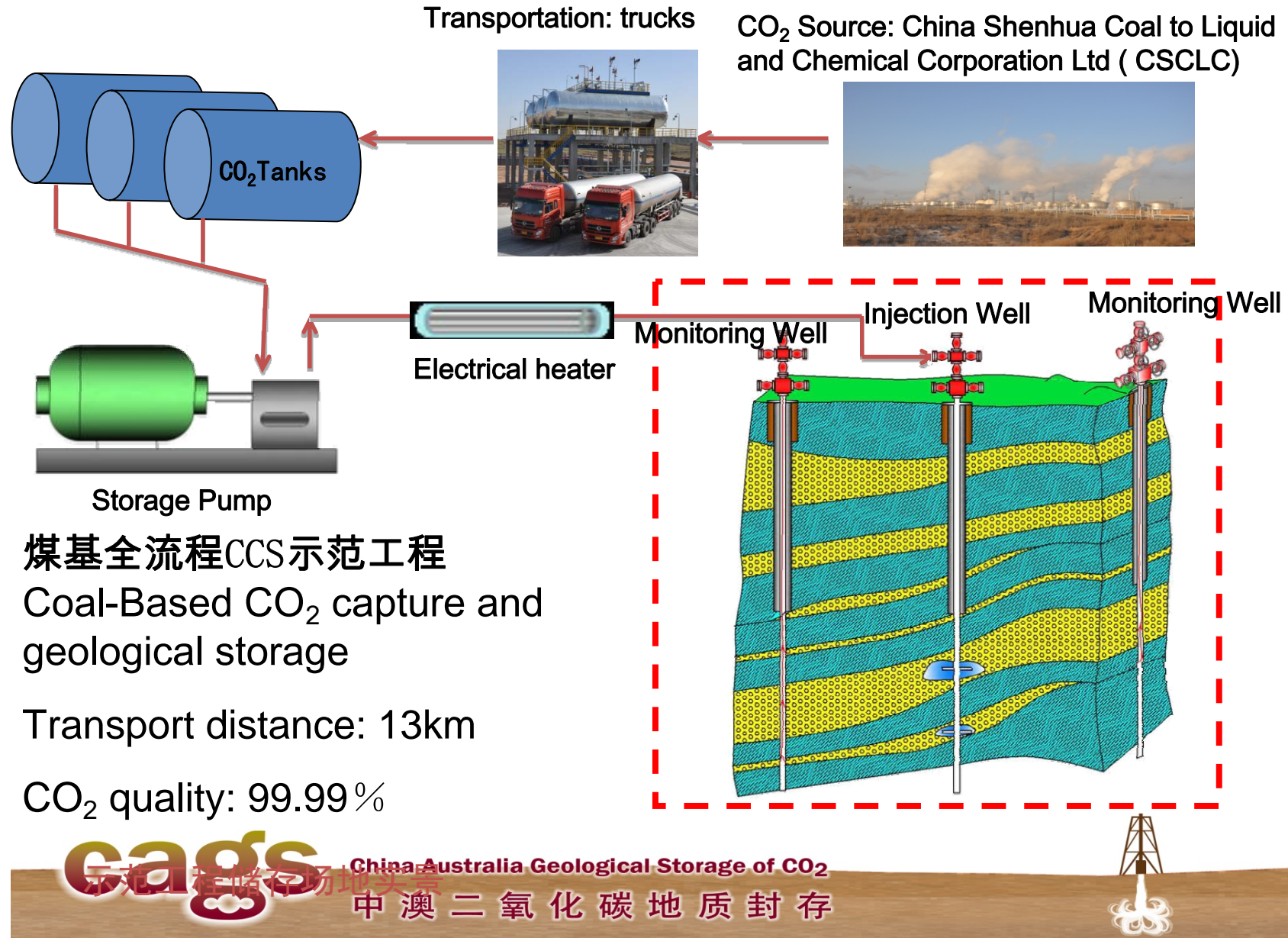
Ordos Demo-project of CO₂ Geological Storage

- 依托神华集团CCS项目，实施了鄂尔多斯二氧化碳地质储存示范工程
Cooperation with Shenghua Group to develop the CCS demo-project
- 中国首个深部咸水层CO₂地质储存示范项目
The first CCS demo-project in deep saline aquifers in China
- 10万吨/年
Injection target: 100×10³t/y



鄂尔多斯二氧化碳地质储存示范工程

Ordos Demo-project of CO₂ Geological Storage



鄂尔多斯二氧化碳地质储存示范工程

Ordos Demo-project of CO₂ Geological Storage

- 基本完成鄂尔多斯二氧化碳地质储存示范工程建设
Developed the CCS demo-project



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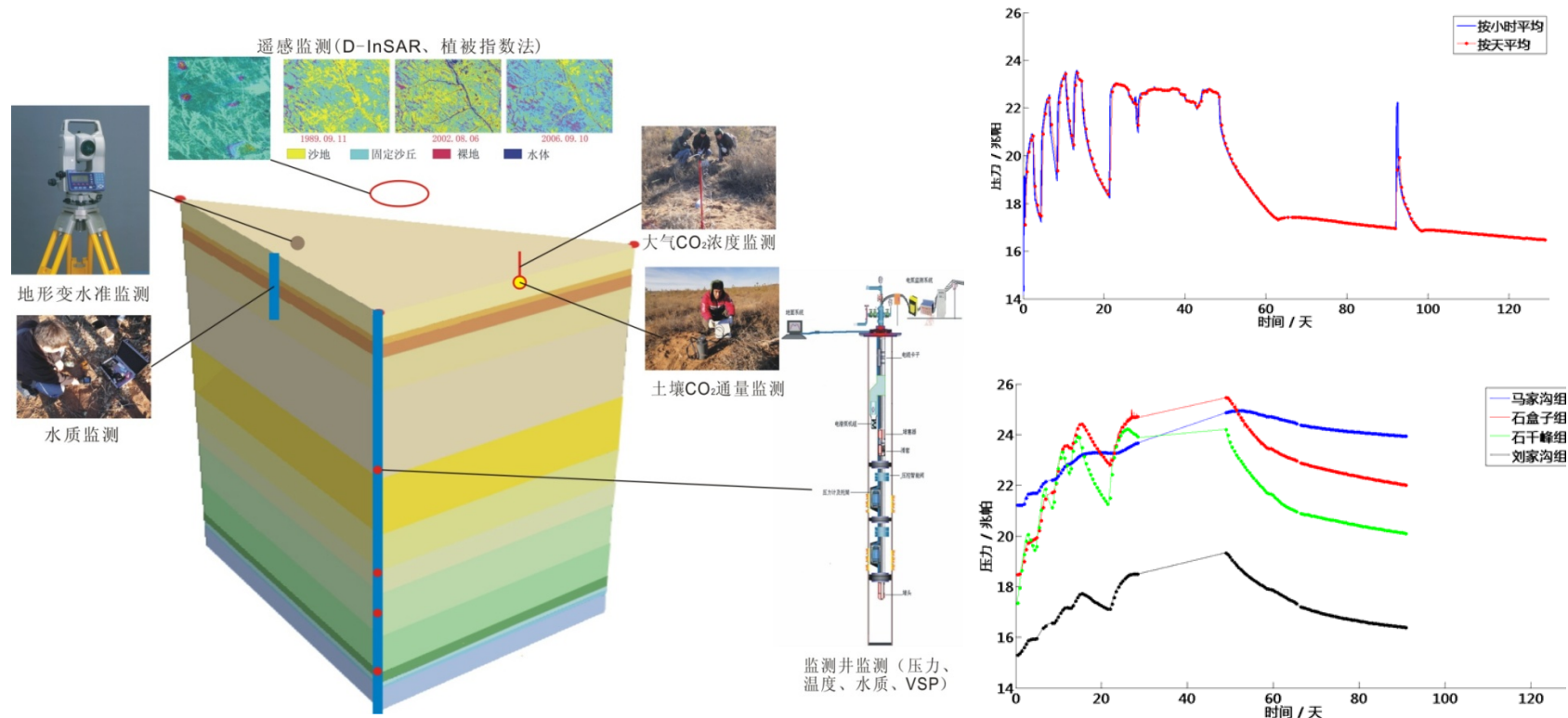
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鄂尔多斯二氧化碳地质储存示范工程

Ordos Demo-project of CO₂ Geological Storage

- 建立了较为完善的鄂尔多斯CO₂地质储存示范工程监测体系，获得一些监测背景值等数据
Developed the Monitoring system on CO₂ geological storage, and obtained CO₂ baseline data.



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鄂尔多斯二氧化碳地质储存示范工程

Ordos Demo-project of CO₂ Geological Storage

➤ 提出了二氧化碳地质储存示范工程实施技术流程, 明确了调查、勘查、选址、评价、钻探、灌注试验、灌注、监测等各技术方法的总体要求、工作程序、实施原则、技术与质量要求

Formed the process on CCS demo-project , and developed the techniques and methods on investigation, survey, site selection, evaluation, injection, monitoring, etc. .



二氧化碳地质储存机理研究

Mechanism of CO₂ Geological Storage

➤ 开展了深部咸水层二氧化碳地质储存机理研究，主要包括：

- 水-岩-CO₂相互作用微
- 生物对二氧化碳地质储存影响
- 天然CO₂气田类比
- 盖层力学变化和稳定性



➤ Researched the mechanism on CO₂ geological storage in deep saline aquifers, including:

- Water- rock-CO₂ reaction
- Microorganism effect on CO₂ geological storage
- Natural analogues of CO₂ field
- Mechanical stability of cap rocks



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二氧化碳地质储存数值模拟软件的改进

Software Improvement of CO₂ Geological Storage

TOUGHREACT软件改进研究

并行计算版开发

软件可视化界面研发

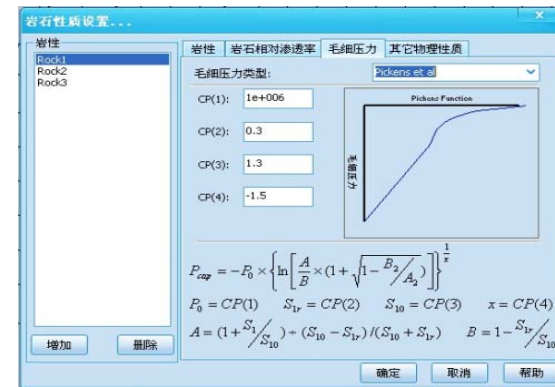
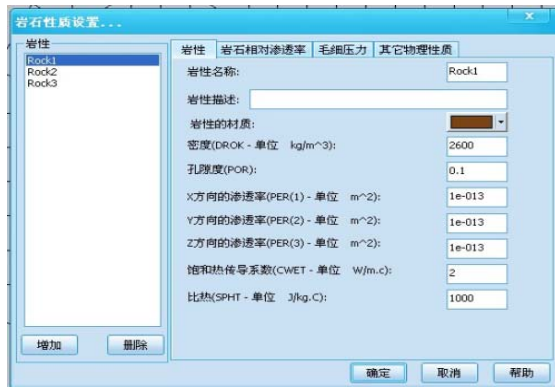
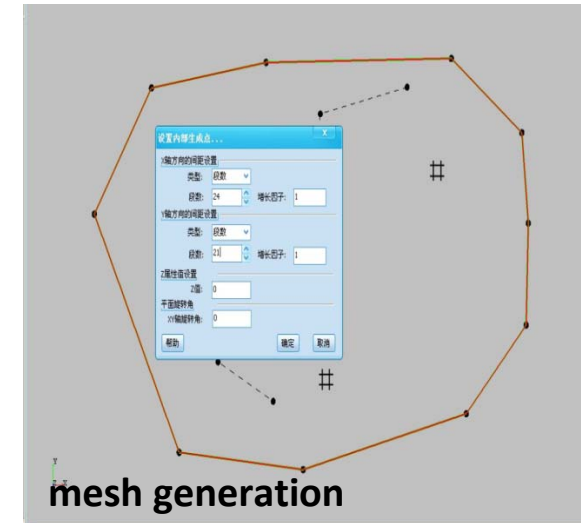
前后处理功能拓展

Improvement of TOUGHREACT Software

parallel computing

Visualization in Scientific Computing

Function extension of pre- and post- treatment



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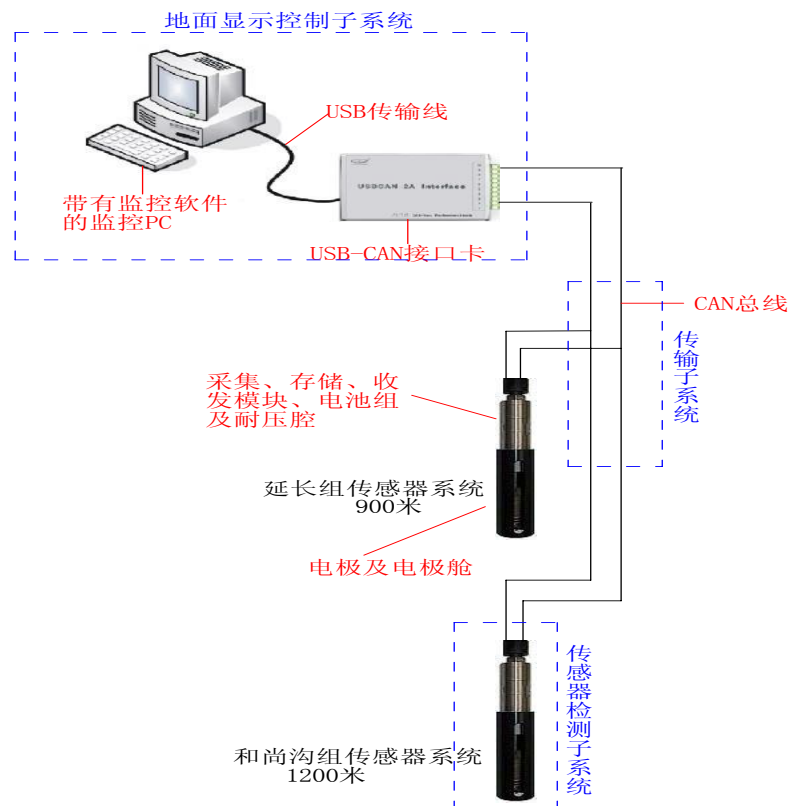
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二氧化碳地质储存监测设备研发

Monitoring Equipment of CO₂ Geological Storage

开发了用于深层原位pH值监测的传感器及自动监测系统
Developed pH sensor used to monitor pH Value in deep aquifers



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中澳二氧化碳地质封存



国际合作

International Cooperation of CO₂ Geological Storage

中澳二氧化碳地质封存国际合作(CAGS)项目

管理单位：澳大利亚地球科学局和中国21世纪议程管理中心

参加单位：中国地质调查局

主要内容：深部咸水层二氧化碳地质储存选址方法及指标体系研究

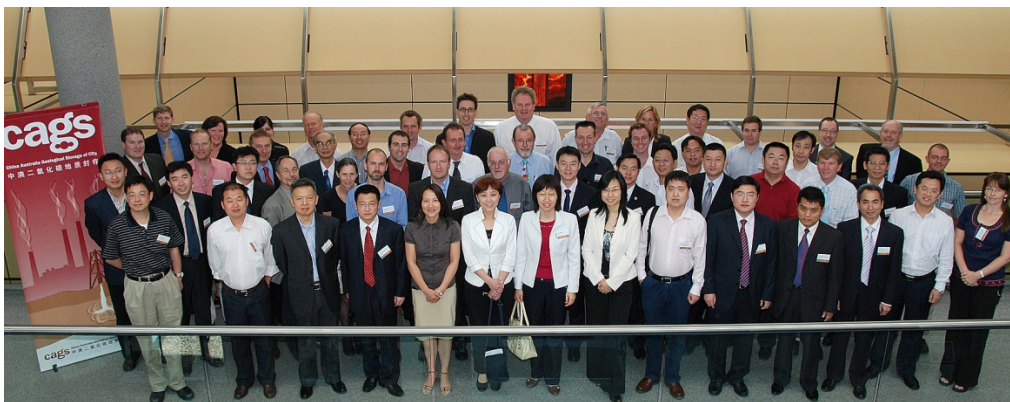
The China Australia Geological Storage of CO₂ (CAGS) Project

Managers: Geoscience Australia (Australia)

Administrative Centre for China's Agenda 21, MOST

Partners: China Geological Survey

Tasks: Site Selection Method and Criteria of CO₂ Geological Storage in Deep Saline Aquifers



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China Australia Geological Storage of CO₂
中澳二氧化碳地质封存



国际合作

International Cooperation of CO₂ Geological Storage

中德二氧化碳地质储存国际合作项目

(中德地质科学技术合作协议内容之一)

管理单位：中华人民共和国国土资源部和德国经济技术部

实施单位：中国地质调查局和联邦德国地学与自然资源研究院

主要内容：二氧化碳地质储存潜力与适宜性评价方法 研究

Geological Storage of CO₂——Cooperation in the Areas of Geological Sciences and Techniques

Managers: Ministry of Land and Resources of the People's Republic of China

Ministry of Economics and Technology of the Federal Republic of Germany

Partners: China Geological Survey

Federal Institute for Geosciences and Natural Resources of Germany (BGR)

Tasks : Methodology on Capacity and Suitability of CO₂ Geological Storage

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PROSPECTING

1. 2012完成中国二氧化碳地质储存潜力评价与适宜性编图，并定期对评价数据进行更新
2. 建设中国二氧化碳地质储存潜力评价地理信息系统，为政府、企业和公众提供地学服务
3. 继续实施鄂尔多斯二氧化碳地质储存示范工程，完善二氧化碳地质储存调查评价与工程技术方法体系

1. In 2012, complete the Capacity assessment and suitable mapping of CO₂ geological storage in China, and regularly refresh the data in future.

2. Develop the GIS of Capacity assessment of CO₂ geological storage in China to supply geoscience services for government, companies and publics.

3. Implement the Ordos CCS demo-project, and to further improve the techniques and methods of survey, development and management on CO₂ geological storage .

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PROSPECTING

- 4.开展碳源集中分布区1：5万二氧化碳地质储存潜力勘查，圈定一批二氧化碳地质储存工程靶区，编制二氧化碳地质储存规划。
- 5.继续开展国际合作，提升二氧化碳地质储存研究水平。

4. Launch 1 : 50000 exploration of CO₂ geological storage in CO₂ distribution regions, delineate project targets and Compile planning on of CO₂ geological storage.

5. Participate the international cooperation and improve research capacity on CO₂ geological storage .



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Thanks for your attention!

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