



NG plays Key Role in the Synergy of Energy-Water-Environment Security of Central Asia

A Case Study of Sino-Central Asia NG Pipeline

Prof. XU Qinhua

Director of Centre for International Energy and Environment Strategy and Studies

Executive Dean of Eurasian Research Institute

Vice Dean at National Academy of Development and Strategy

Renmin University of China

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Question

- Do we still need NG?
- What sort of role NG will be playing?
- How can we take the most advantage of NG?

Geographic View

B



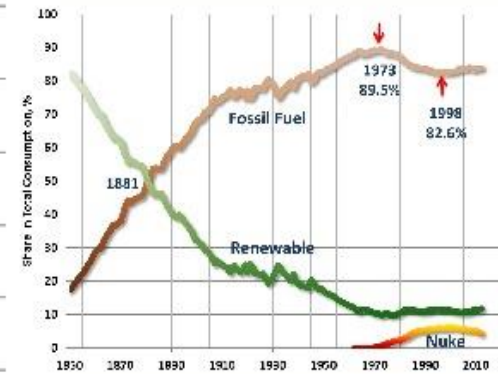
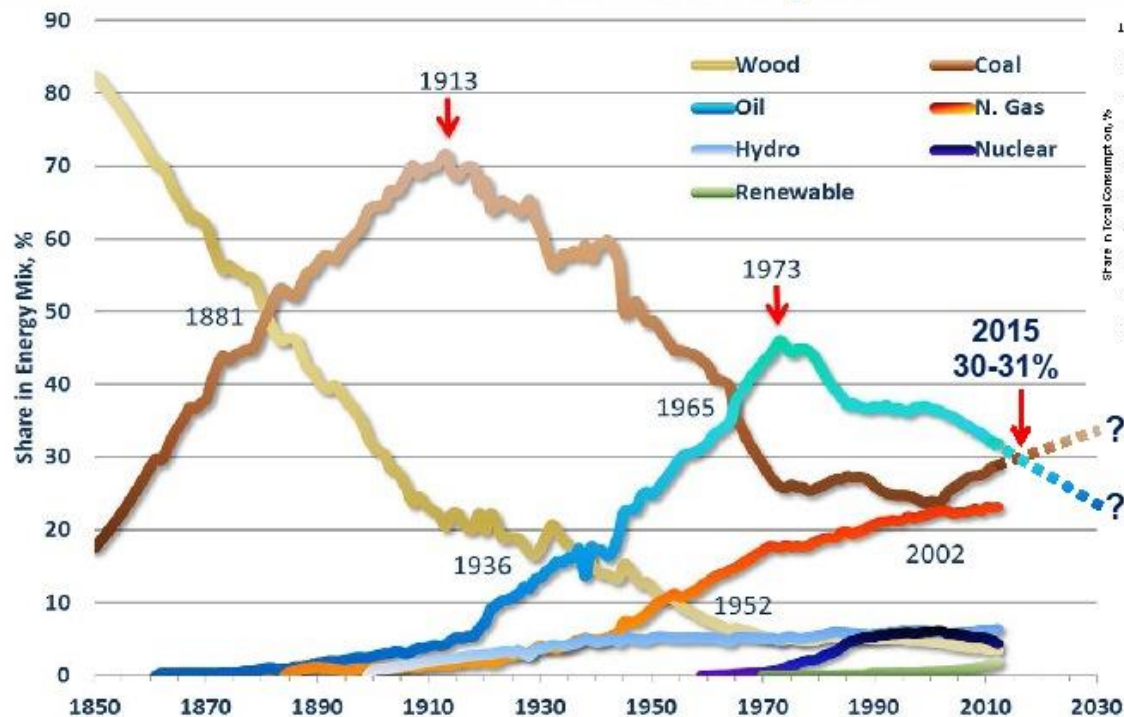
•中国人民大学国际能源战略研究中心

•Center for International Energy and Environment Strategy Studies,
RUC(CIEESS)



Historic View

Struggle for Energy Kingdom *Return of the King Coal?*



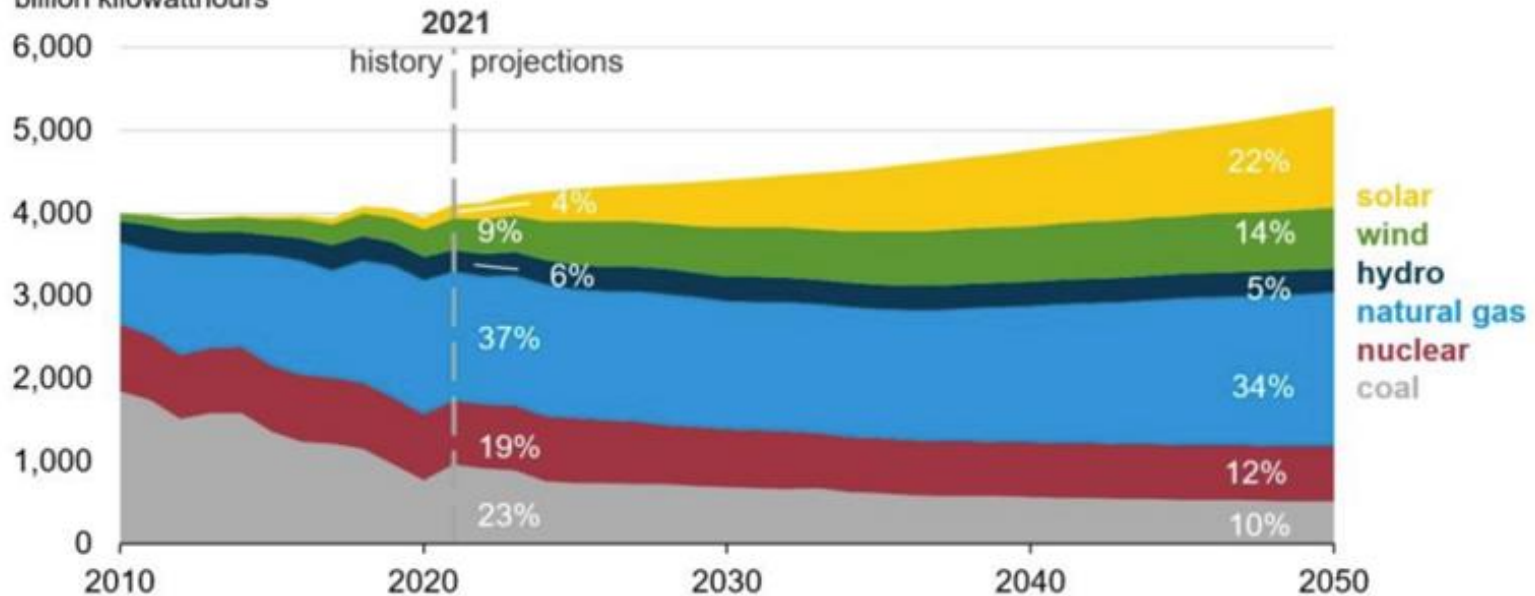
2012
Oil 32%
Coal 29%
Gas 23%



U.S. electricity generation from selected fuels

AEO2022 Reference case

billion kilowatthours



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022* (AEO2022) Reference case

Note: Solar includes both utility-scale and end-use photovoltaic electricity generation.

亚太经济合作组织国际会议 暨分布式能源论坛

APEC INTERNATIONAL CONFERENCE DISTRIBUTED ENERGY FORUM

会议资料 Conference Material

主办方:



中国人民大学
Renmin University of China

承办方:



中国人民大学国际能源战略研究中心
Centre for International Energy and
Environment Strategy Studies of
Renmin University of China

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“五位一体” 分布式 液化天然气综合利用

重庆市油气资源协调小组办公室

重庆市发展和改革委员会

江 卫

2012-12

摘要:

论文根据城市天然气消费水平和供需特点,结合当前国际、国内天然气利用及 LNG 技术发展趋势,提出关于分散式天然气储备及调峰系统的构想,即:电力调峰+天然气调峰+集中供热+集中供冷+LNG 储备的五合一综合方案。

ABSTRACT

According to the city gas consumption level and features of supply and demand currently in Chongqing municipality, the paper proposes the ideas on the distributed reservation of natural gas and peak load regulating system, i.e. a comprehensive plan of “peak load regulating power system”, “peak load regulating natural gas system”, “central heating”, “central cooling” and “reservation of LNG”

五、“五位一体”综合利用



分布式储备



LNG加注



分布式汽化发电



分布式调峰供气



CNG加注



分布式制冰储冷



配送冷能



NG-Green Hydrogen



- 短期看，2025-2030 年前要完善顶层设计，确立监管机制。充分发挥已成熟的煤化工和工业副氢生产技术优势，推进可再生能源电解水制氢技术进步和试点运行，推进碳捕捉与存储技术进步。培育市场，发挥氢能在工业减排方面的优势。高压气态运输成为主要运输方式，推进液氢运输技术研发和试点发展。在氢能产地和一线城市消费地附近实现加氢站的初步布局；中期看，2035-2040 年前实现制氢技术革新，可再生能源电解水和传统制氢方式并行成为主体制氢方式。碳捕捉与存储技术和氢燃料电池技术得到产业应用，减少传统制氢方式排放。液氢成为主要运输方式，试点进行管道运输运营。完善加氢站布局；长期看，2045-2050年前实现零碳制氢，可再生能源电解水方式成为主体制氢方式。液氢和管道成为主要运输方式。在一线城市布局加氢站设施。

Case Analysis

Water resources
in Uzbekistan
and Tajikistan

Objects of security

Amu Darya's water
resources
+
Survival of the state

Actors of security

Uzbekistan
&
Tajikistan



阿姆河流域水系示意图

Amu Darya

Case Analysis

Water resources
in Uzbekistan
and Tajikistan

Dispute over the
distribution of
water resources

Dispute over the
utilization of
water resources

Average net flow of surface water (unit: hundred million cubic meters per year)

| 表1 | 地表水流经各国平均净流量 (单位: 亿立方米/年) | | | |
|-------------------|---------------------------------------|---------------------------------------|-------------------------------------|--|
| 国家 | 锡尔河 (所占百分比) Syr Darya (proportion) | 阿姆河 (所占百分比) Amu Darya (proportion) | 咸海 (所占百分比) Aral Sea (proportion) | |
| 哈萨克斯坦 | 24.26 (6.5) | | 24.26 (2.1) | |
| 吉尔吉斯斯坦 | 276.05 (74.2) | 16.04 (2.0) | 292.09 (25.1) | |
| 塔吉克斯坦 Tajikistan | 10.05 (2.7) | 495.78 (62.5) | 505.83 (43.4) | |
| 土库曼斯坦 | | 15.49 (1.9) | 15.49 (1.2) | |
| 乌兹别克斯坦 Uzbekistan | 61.67 (16.6) | 50.56 (6.4) | 112.23 (9.6) | |
| 阿富汗和伊朗 | | 215.93 (27.2) | 215.93 (18.6) | |
| 咸海流域总水量 | 372.03 (100) | 792.80 (100) | 1 165.83 (100) | |

| country 国家 | year 年份 | socioeconomic water use 社会经济用水 亿 m³ | | | | | socioeconomic indicator 社会经济指标 | | water consumption quota 用水定额 | | |
|---------------|------------|--|--------------|----|----|-----|-----------------------------------|-------|---------------------------------|---------|----------|
| | | | | | | | population 人口 | | industry 工业 | | |
| | | | | | | | irrigation area 灌溉面积 | | agriculture 农业 | | |
| | | industry 工业 | others 其他 | 生活 | 合计 | 合计 | 人口 | 农业 | 工业 | 居民生活 | |
| | | 农业 | 工业 | 生活 | 其他 | 合计 | /hm² | /万 | /m³ /hm² | /m³ /万元 | /L/(人·d) |
| | 1994 | 110 | 5 | 4 | 0 | 119 | 85 | 569 | 12 900 | 1 073 | 198 |
| 塔吉克斯坦 | 2000 | 109 | 5 | 4 | 2 | 120 | 78.4 | 617 | 13 875 | 1 732 | 159 |
| Tajikistan | 2008 | 99 | 11 | 3 | 1 | 115 | 71 | 528 | 13 395 | 1 402 | 179 |
| | 1994 | 544 | 11 | 26 | 0 | 581 | 446.8 | 2 238 | 12 165 | 382 | 316 |
| 乌兹别克斯坦 | 2000 | 543 | 11 | 23 | 6 | 583 | 447.53 | 2 465 | 12 120 | 432 | 259 |
| Uzbekistan | 2008 | 484 | 26 | 23 | 6 | 538 | 430 | 2 731 | 11 250 | 432 | 230 |

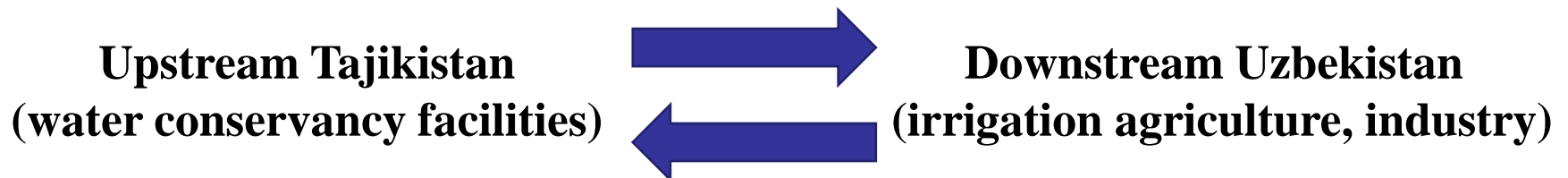
Case Analysis

Water and gas
resources
in Uzbekistan
and Tajikistan



Amu Darya water resource distribution scheme in the Soviet era

Tajikistan Summer: open sluice and release water
Winter: not allowed to release water for power generation



Uzbekistan Winter: upward transportation of oil & gas,
industrial & agricultural products

Case Analysis

Water resources
in Uzbekistan
and Tajikistan

Dispute over Rogun Hydropower Station

● A matter of life and death

Tajikistan

● To get rid of the
heavy dependence
on Uzbek natural gas

● Possibility of evolution into a water war

- Concern about economic and ecological threats
- Concern that Tajikistan may unilaterally use water resources as a tool for political pressure

Uzbekistan

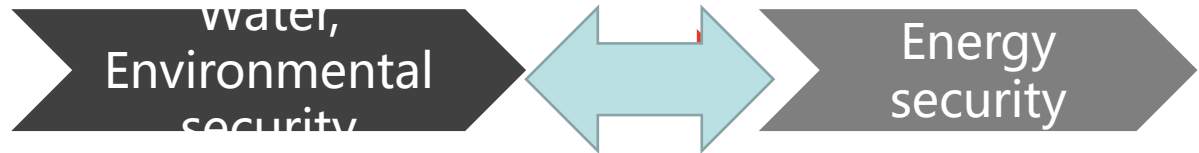
Counter-measure

- Energy blockade
- Railway blockade

Case Analysis

Water resources
in Uzbekistan
and Tajikistan

Dispute over China-Central Asia Gas Pipeline (Line D) between Uzbekistan and Tajikistan

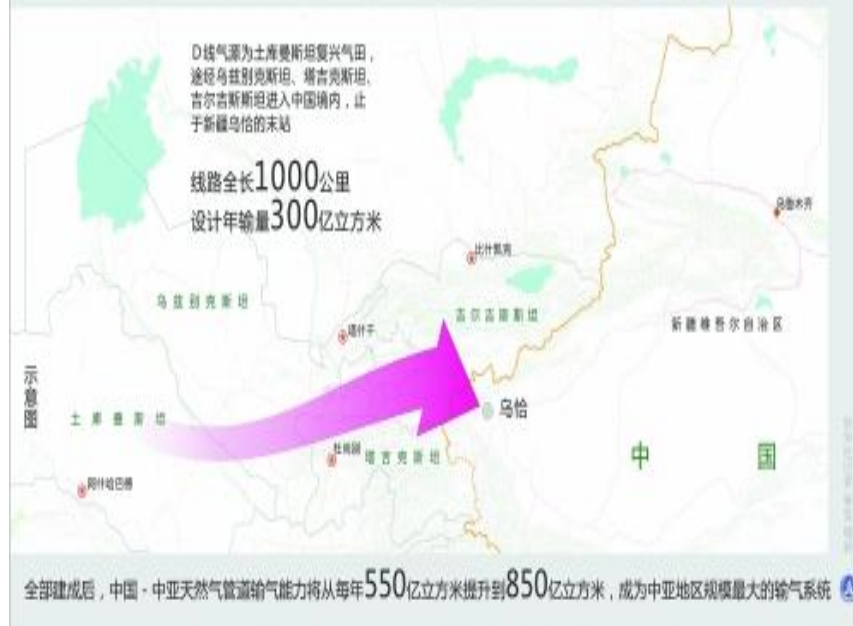


Environment sometimes causes problems to spill over from one area to another.

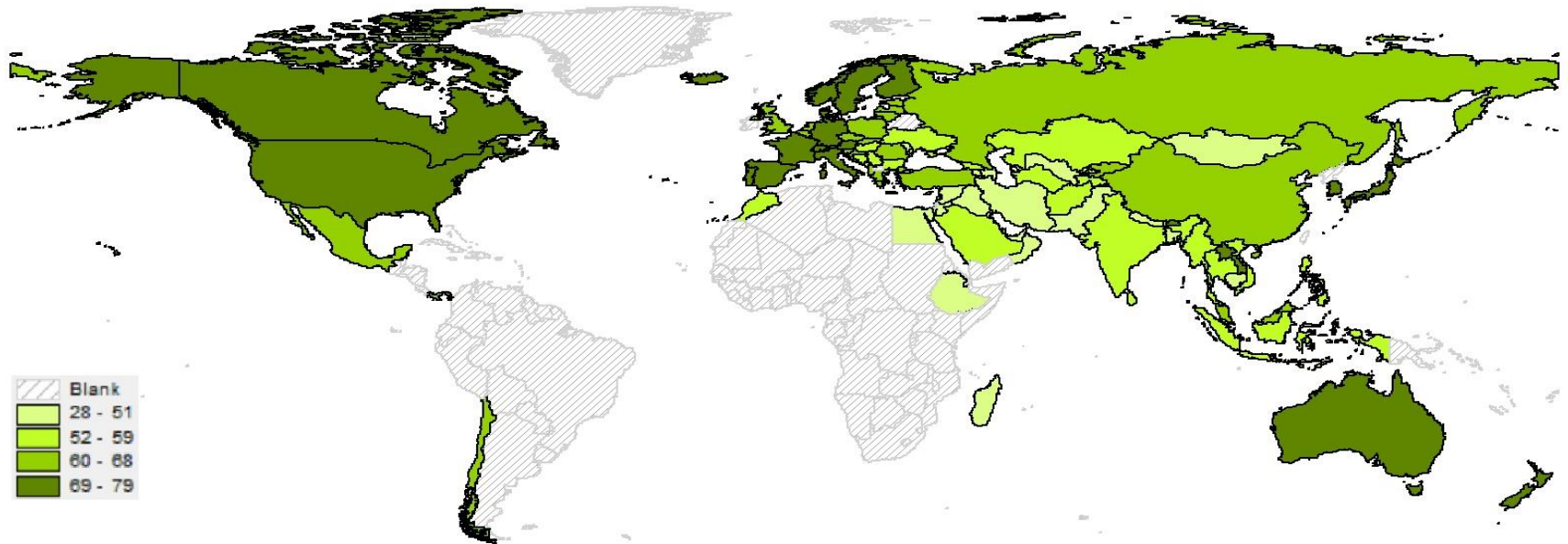


中国 - 中亚天然气管道D线 China-Central Asia Gas Pipeline (Line D)

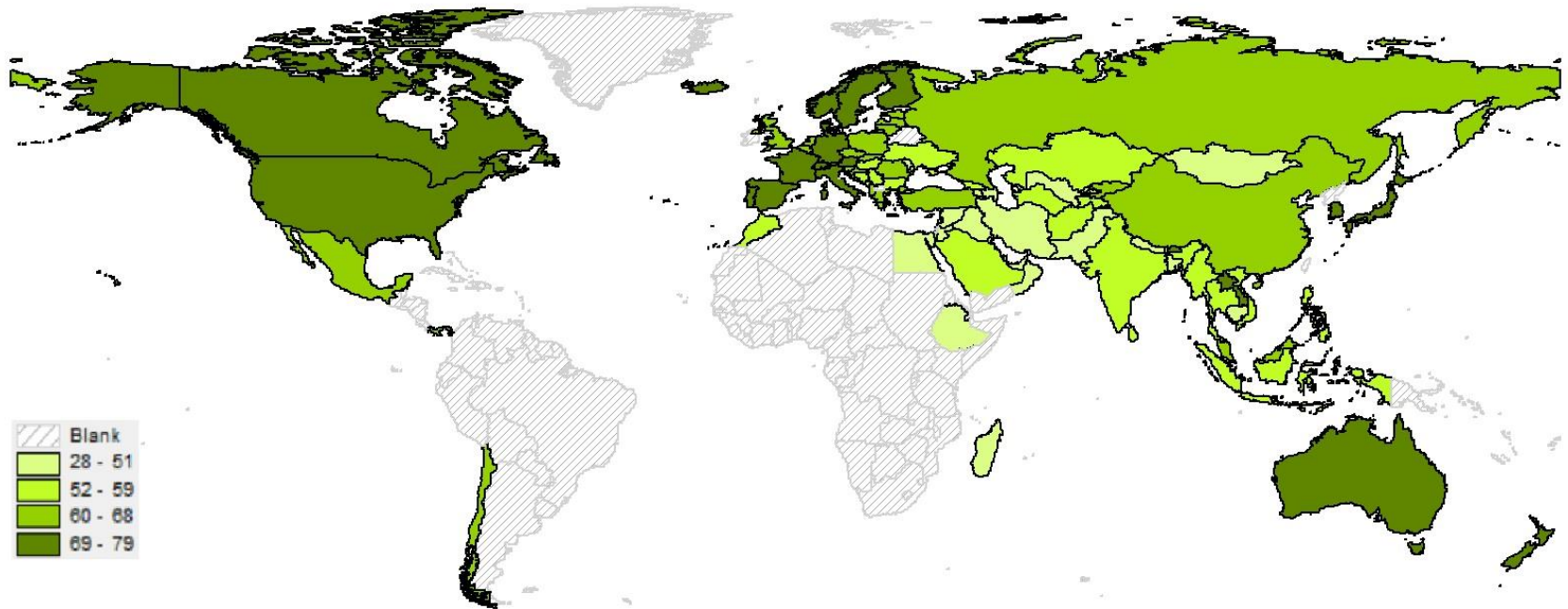
中亚天然气管道D线是建设“丝绸之路经济带”的具体体现和有效实践。2013年9月，在习近平主席访问中亚期间，中国政府分别与乌兹别克斯坦、吉尔吉斯斯坦、塔吉克斯坦政府签署了关于中亚天然气管道D线建设运营的合作协议。



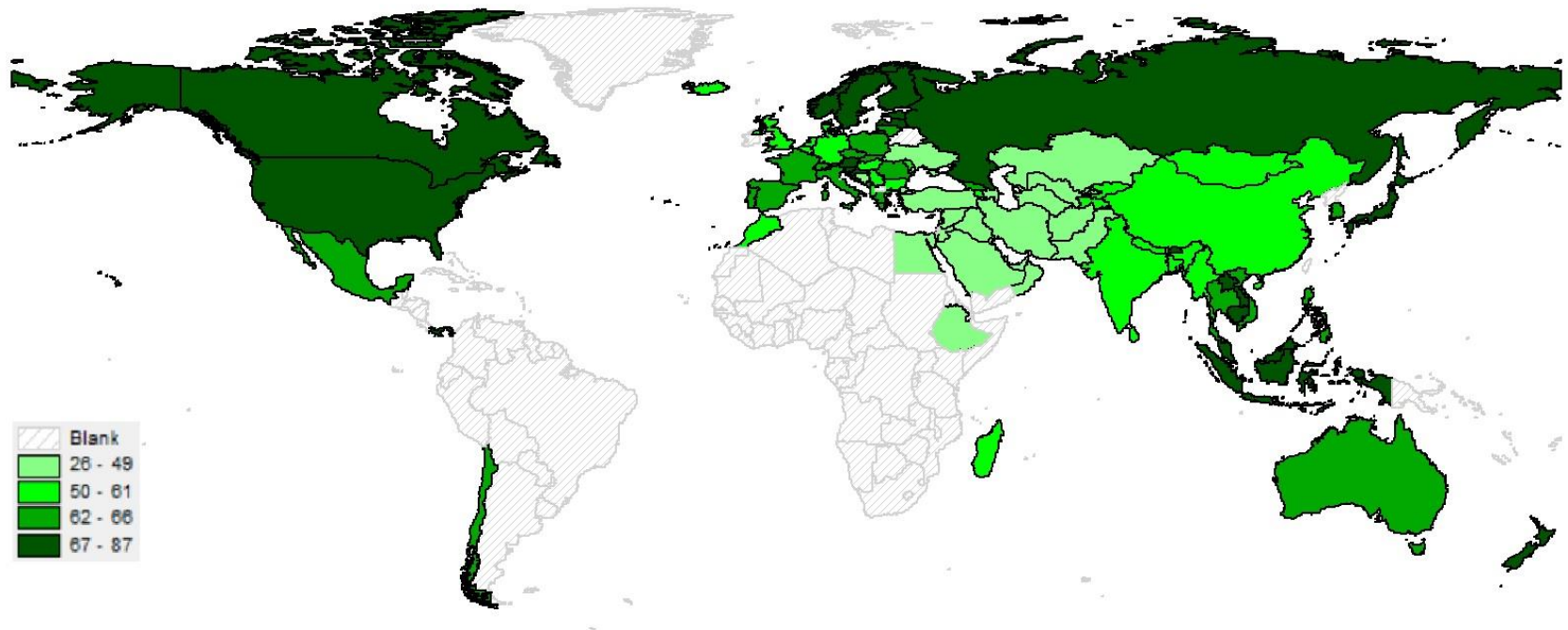
GDI: Final Score 2015



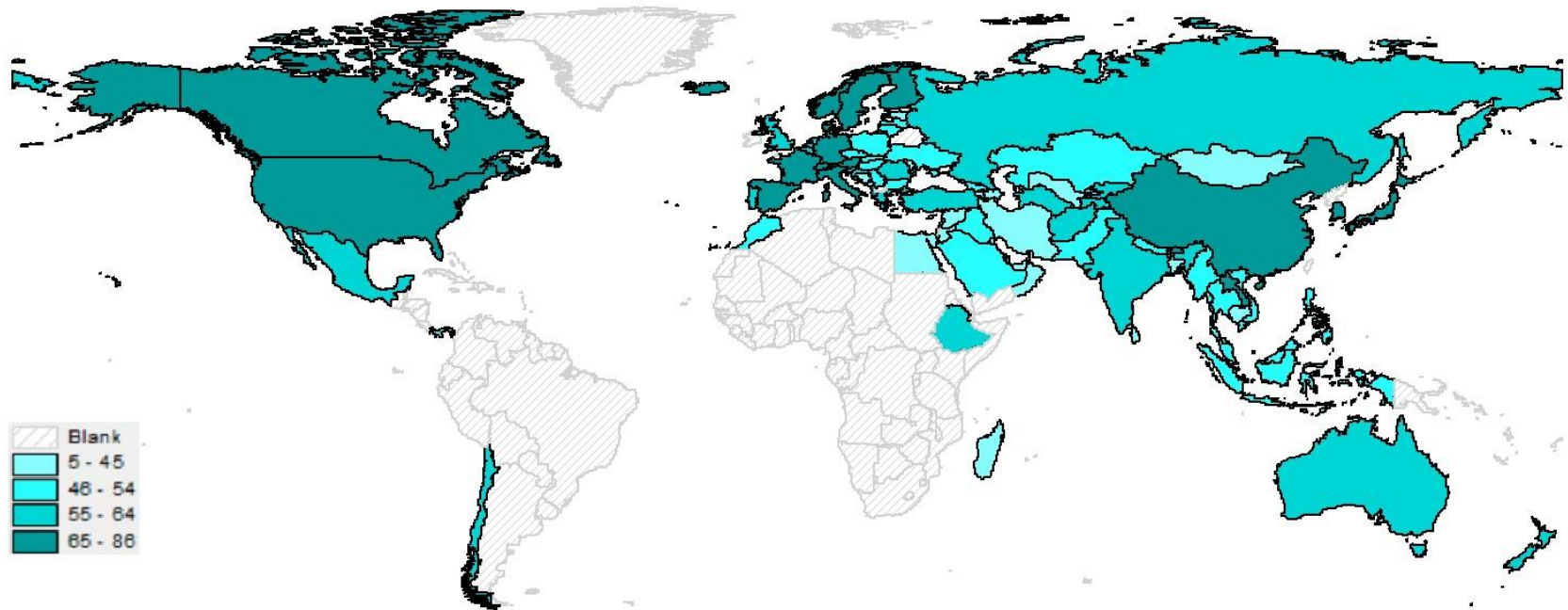
GDI-sub: Natural Assets 2015



GDI-sub: Green Technologies 2015



GDI-sub: Development Outcomes 2015





The research group visited many countries, such as US, Australia and Sri Lanka, communicate with Columbia University, National University of Australia and other institutions to discuss the methodology and results of GDI and BRI green development case.

Thank you for your attention!

Contact:
Dr. XU Qinhua
xuqh@[ruc.edu.cn](mailto:xuqh@ruc.edu.cn)