

Decarbonization of the economy of Northeast Asia region: lessons learnt from DDPP project



NATIONAL RESEARCH
UNIVERSITY

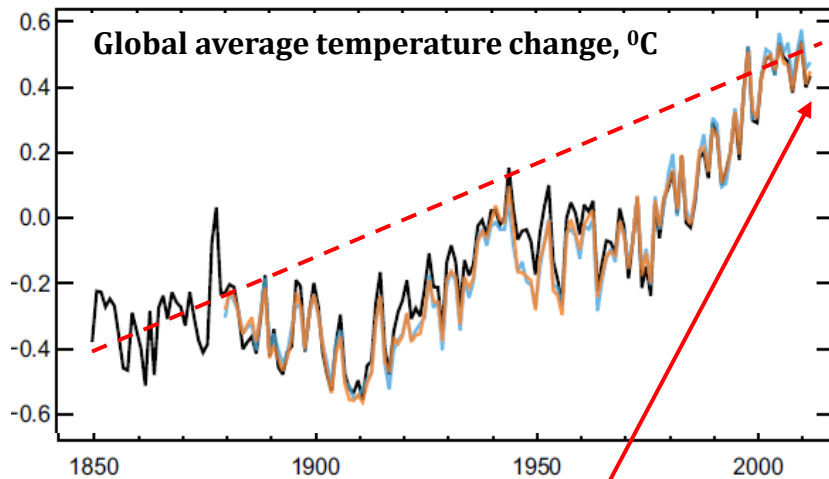
Dr. George Safonov

Director, Center for Environmental and Natural
Resource Economics

National Research University –
Higher School of Economics, Russia

13 March, 2018, Jeju Island, Republic of Korea

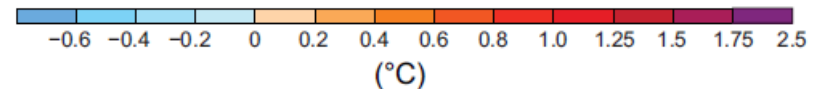
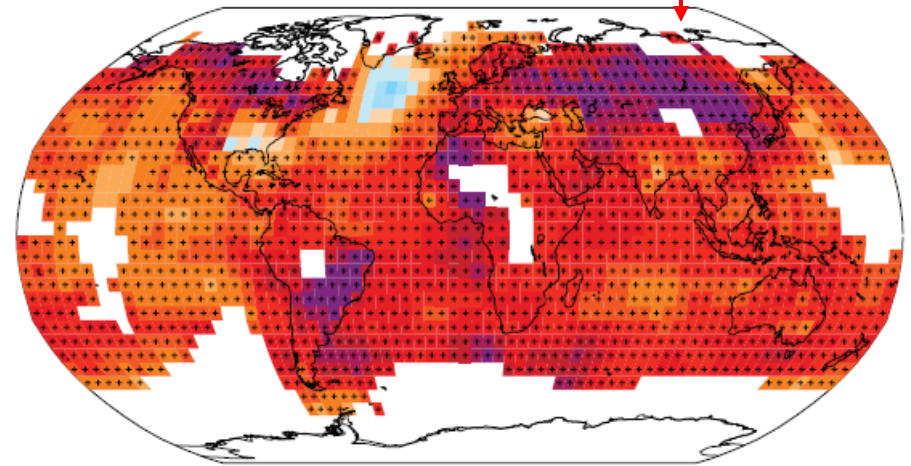
Climate change is evident and extremely dangerous



Since 1850,
the global average temperature
increased by 0,8°C

Northeast Asia is a
dramatically
warming area

Observed change in Earth surface temperature,
1901-2012



Source: IPCC Fifth Assessment Report

Expected damage is huge



*Sir Nicolas Stern, LSE, author of the
Climate Change Economics report*

The damage associated with climate change may reach **5-20% of global GDP** in the 21st Century

In the long-run, it will affect all countries, even those who can benefit in the short-term perspective

The North East Asia countries are highly vulnerable to these risks too!

Climate challenges

Paris Agreement aims at:

- “...holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels...” (art. 2)
- “Parties aim... to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (art. 4)



Global carbon emission limit

Limit of emissions
for 2°C target

*With current
trend, the rest
will end up
in the 2040s*

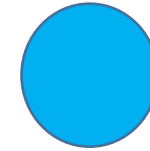


*Over 50%
of capacity
has already used...*



Carbon dilemma

**Carbon stored in fossil fuel
resources in the world
(coal, oil, gas)**



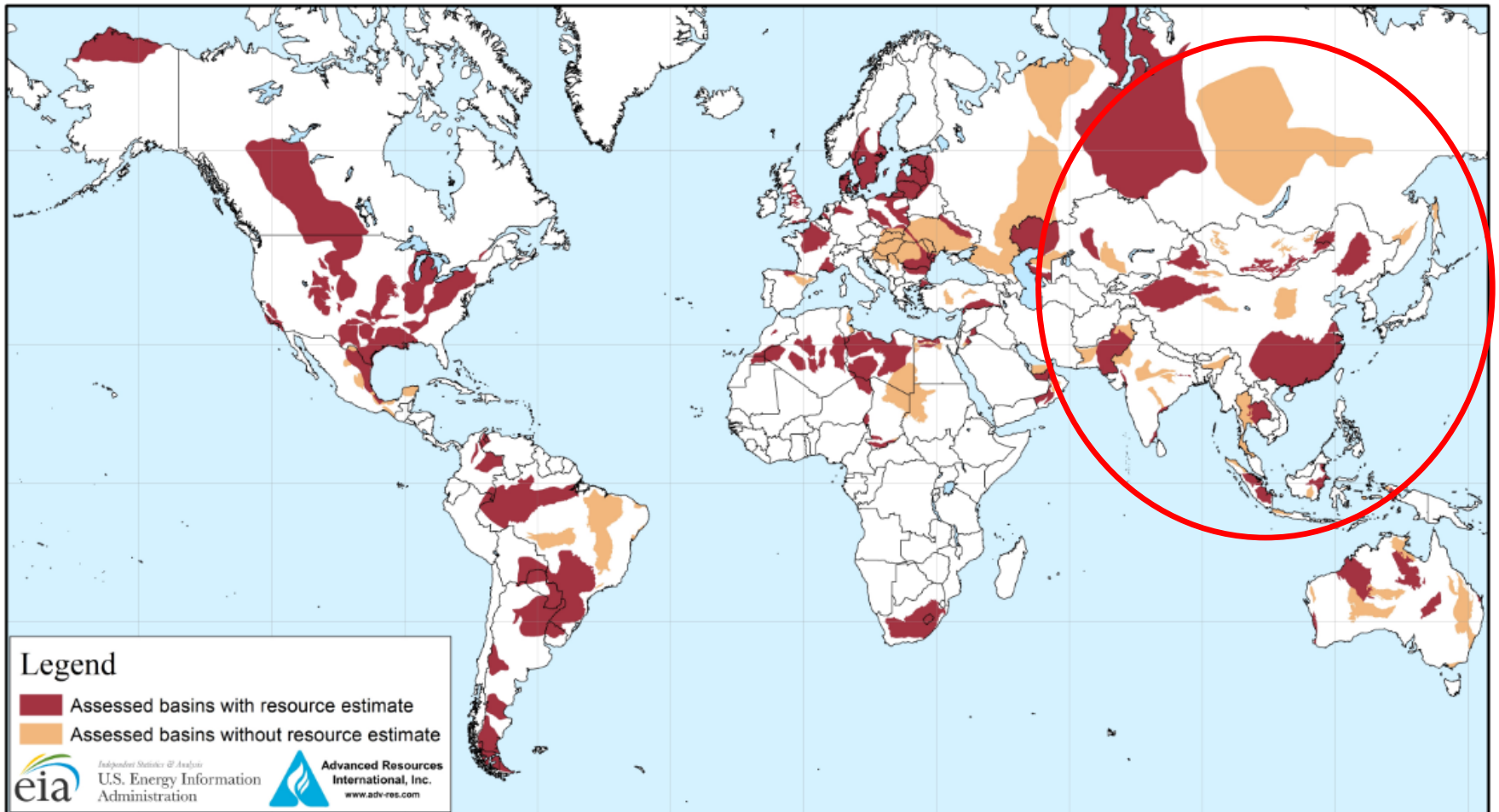
**Carbon emission
sufficient to warm the
Earth by 2°C**

World Coal Deposits



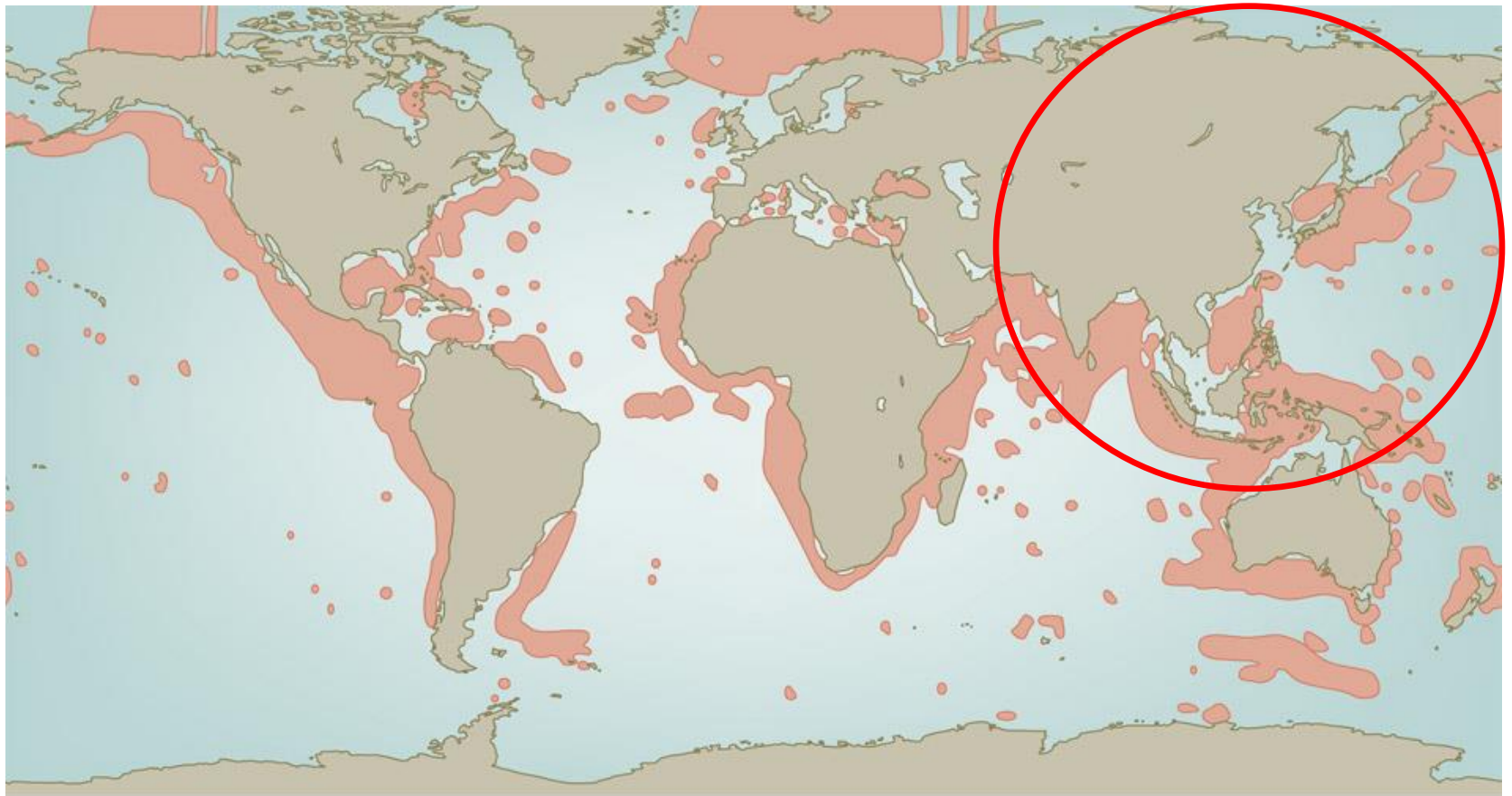
Source: Maps of world <http://www.mapsofworld.com/business/industries/coal-energy/world-coal-deposits.html>

Shale Oil and Gas Resources



Source: Energy Information Administration,
<http://www.eia.gov/analysis/studies/worldshalegas/>

Methane-hydrates



Occurrences of methane hydrates

Source: World Ocean Review <http://worldoceanreview.com/en/wor-1/energy/methane-hydrates/>

A matter of technology?

- Extraction of huge unconventional stocks of carbon is just a matter of time and technology
- USA is highly successful in shale gas and oil already
- Japan, China announced a breakthrough in gas-hydrates extraction technologies

Shale oil extraction



RAW SHALE DELIVERY
VALVE SYSTEM
HOPPER
CAST-IRON



中国地质调查



Japan has successfully extracted natural gas from frozen methane hydrate off its central coast, in a world first. Methane hydrates, or clathrates, are a type of frozen "cage" of molecules of methane and water. The gas field is about 50km away from Japan's main island, in the Nankai Trough. Researchers say it could provide an alternative energy source for Japan which imports all its energy needs.

Methane hydrate is also known as burnable or flammable ice

Reserves of Conventional and Non-conventional Fuels in the North East Asia

	Coal	Oil	Natural gas	Shale oil	Shale gas	Gas-hydrates
Reserves of fuels, bln toe						
China	79.8	2.6	2.9	90.2	94.9	100.0
Russia (Siberia+Far East)	121.8	14.4	27.1	174.0	0.3	913.0
Mongolia	70	<i>na</i>	<i>na</i>	11.9	0.05	<i>na</i>
South Korea	0.1	<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>	1.2
North Korea	3.2	0.1	<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>
Japan	0.2	<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>	16.6
Total reserves, billion toe	275.1	17.1	30.0	276.1	95.2	1030.8
Carbon, Billion tCO2-eq	1,090	53	76	848	224	2,421

Is there an alternative “climate friendly” pathway for the world and for Asia?

- For some countries we already know the answer: **YES**
- Deep Decarbonization Pathways Project (DDPP):
 - 16 countries, more to join
 - National scenarios for emission reduction by 50% and more by 2050

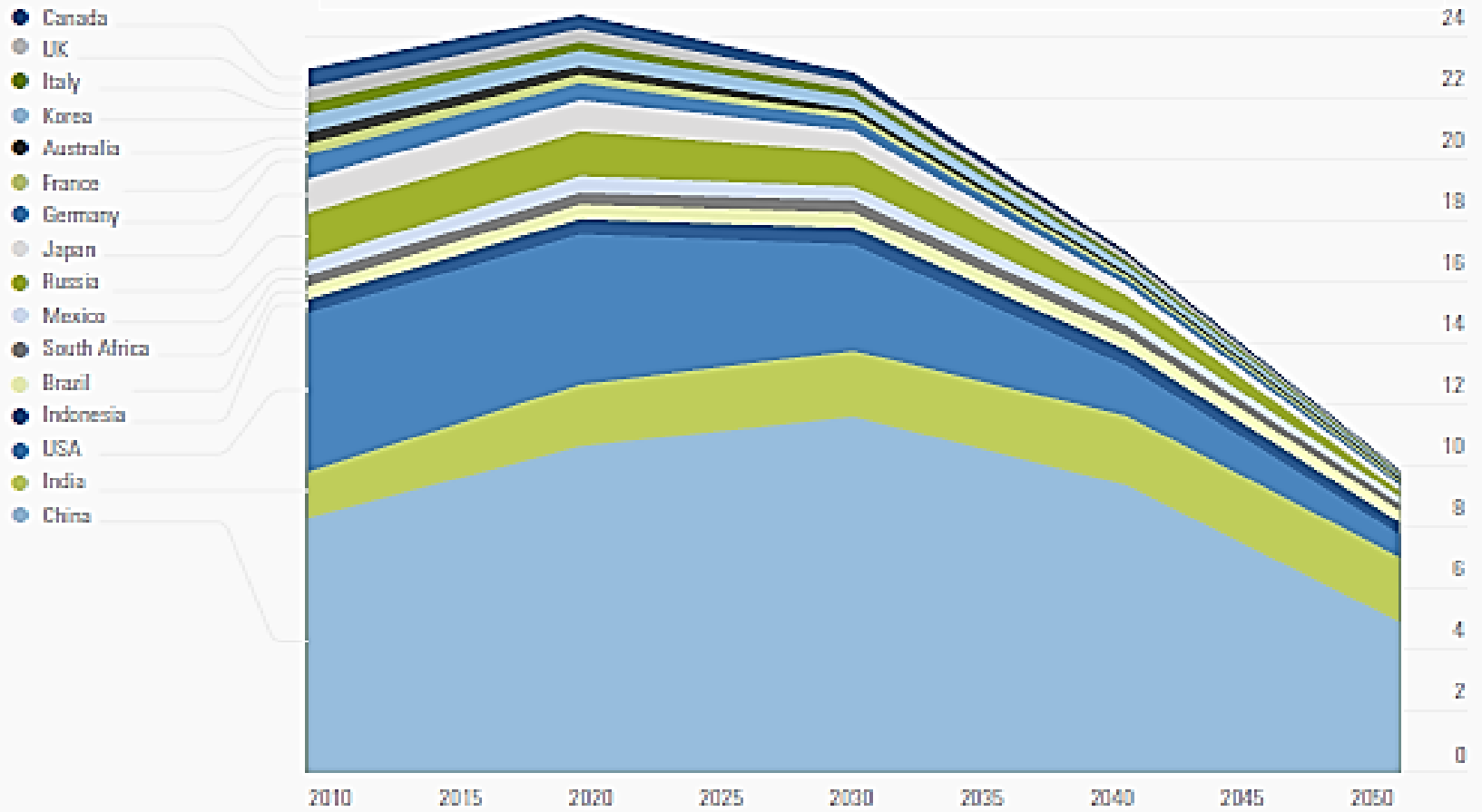
www.deepdecarbonization.org



DEEP
DECARBONIZATION
PATHWAYS
PROJECT

Decarbonization pathways for 16 largest economies

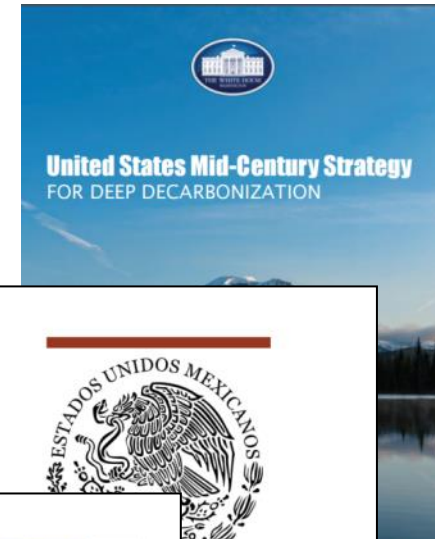
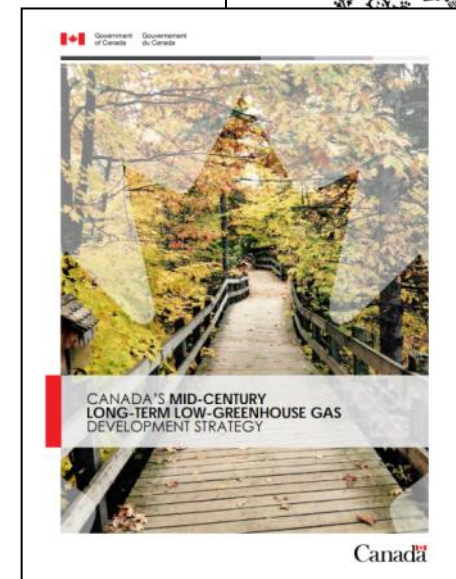
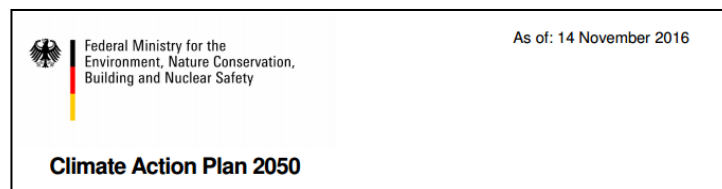
Carbon emissions from energy use, billion tCO₂



Source: DDPP (2015)

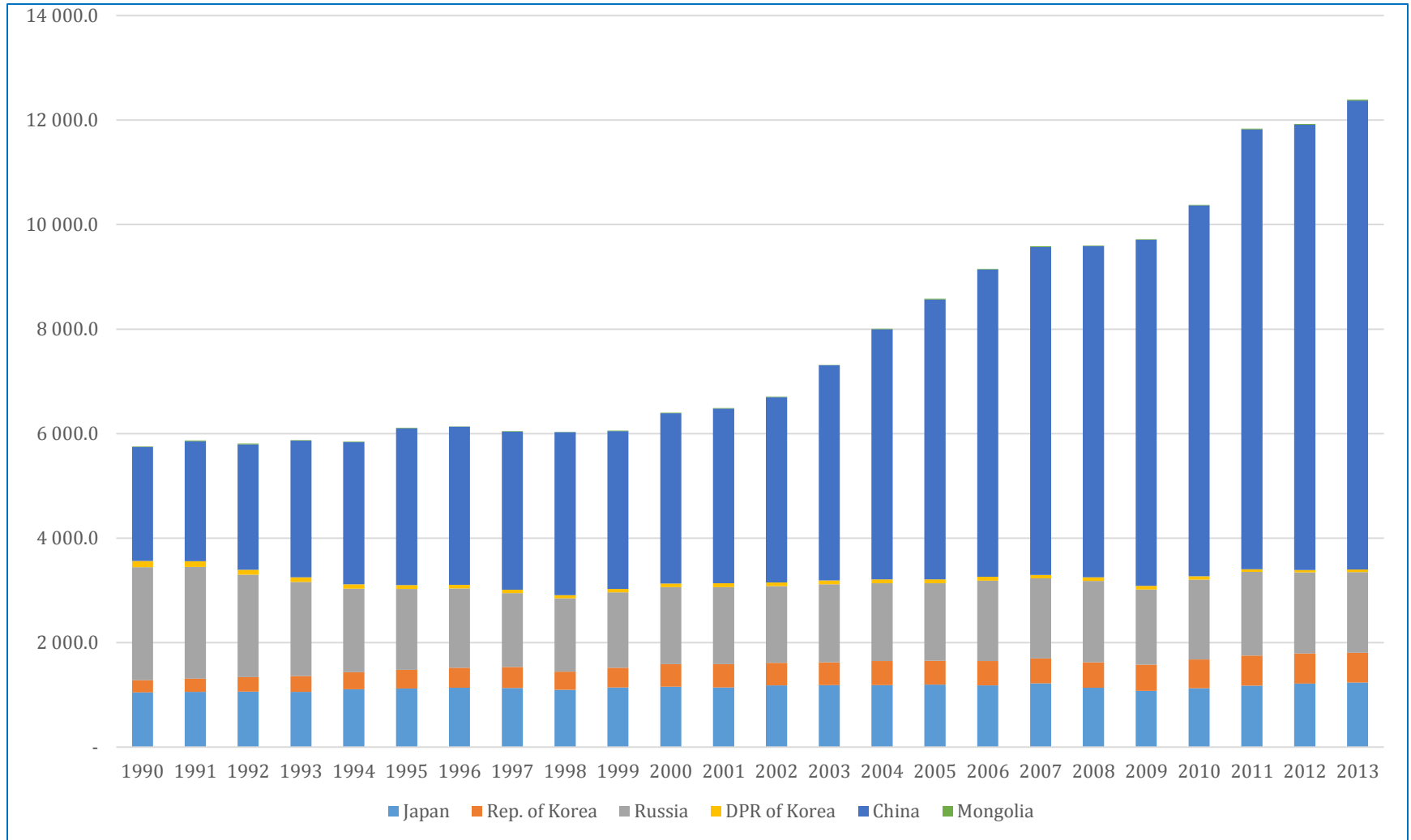
DDPP: theory vs reality

- In 2016 the first decarbonization strategies were officially submitted
 - USA: -80% below 2005 by 2050
 - Canada: -80% below 2005 by 2050
 - Mexico: -50% below 2005 by 2050
 - Germany, France: “nation-wide” carbon neutrality



What about the Northeast Asia countries?

CO₂ Emissions by NEA Countries, MtCO₂

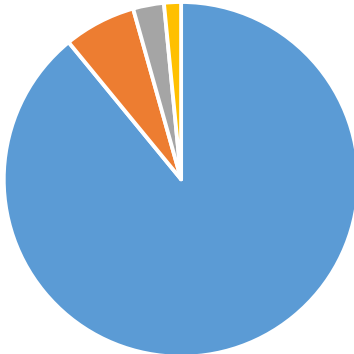


Source: IEA database

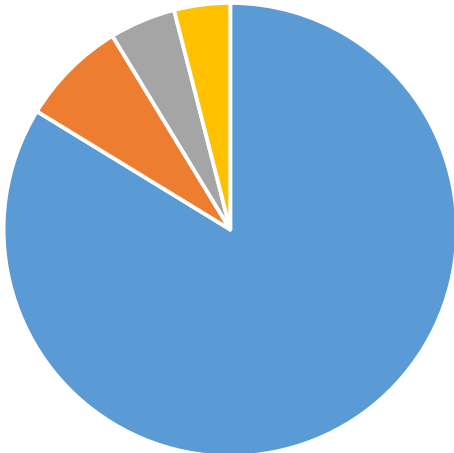
NEA: GHG Emissions by Sources

- Energy
- Industry
- Agriculture
- Waste

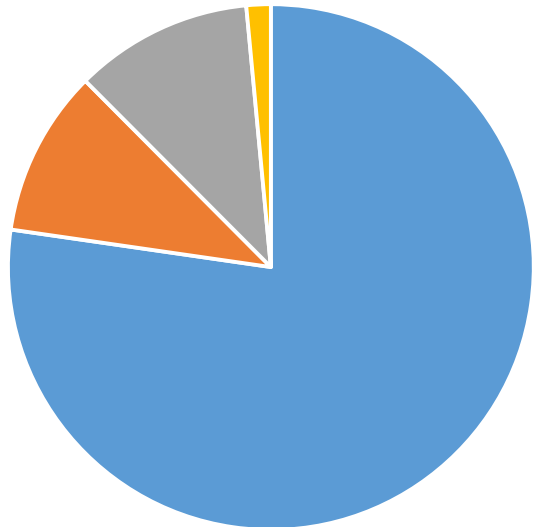
JAPAN (2014)



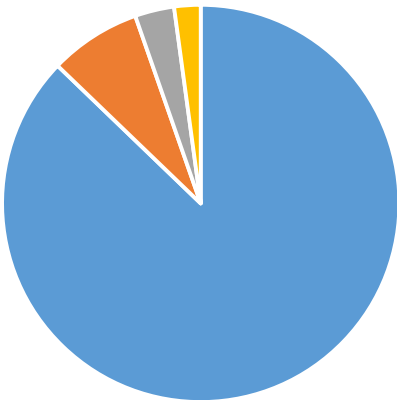
RUSSIA (2014)



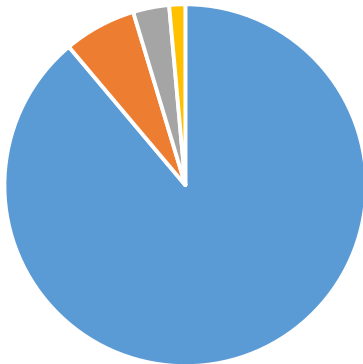
CHINA (2005)



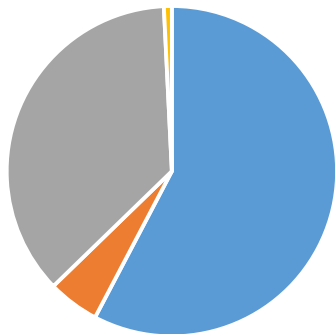
Rep. of Korea (2012)



DPR of Korea (2002)

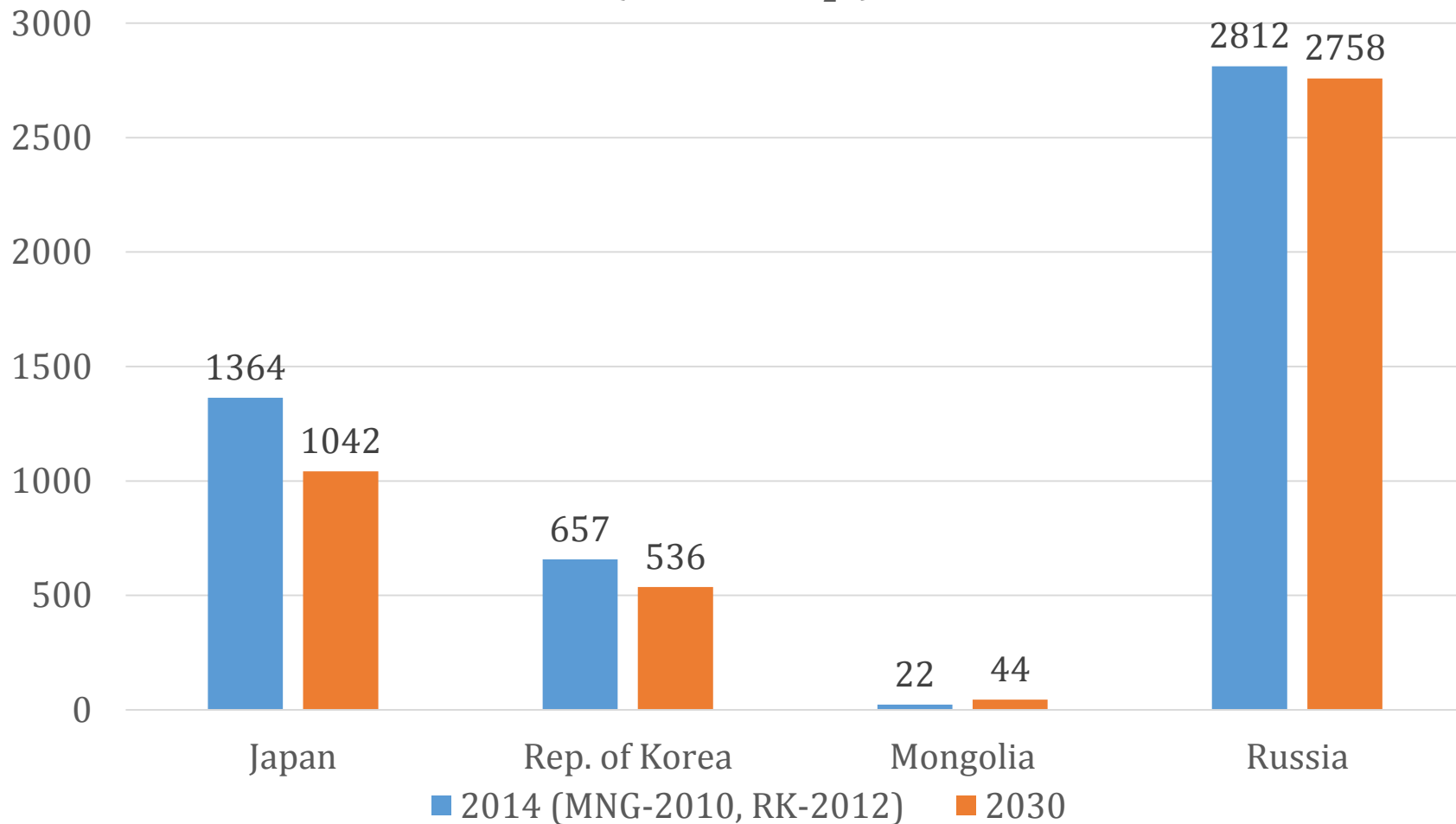


MONGOLIA (2006)



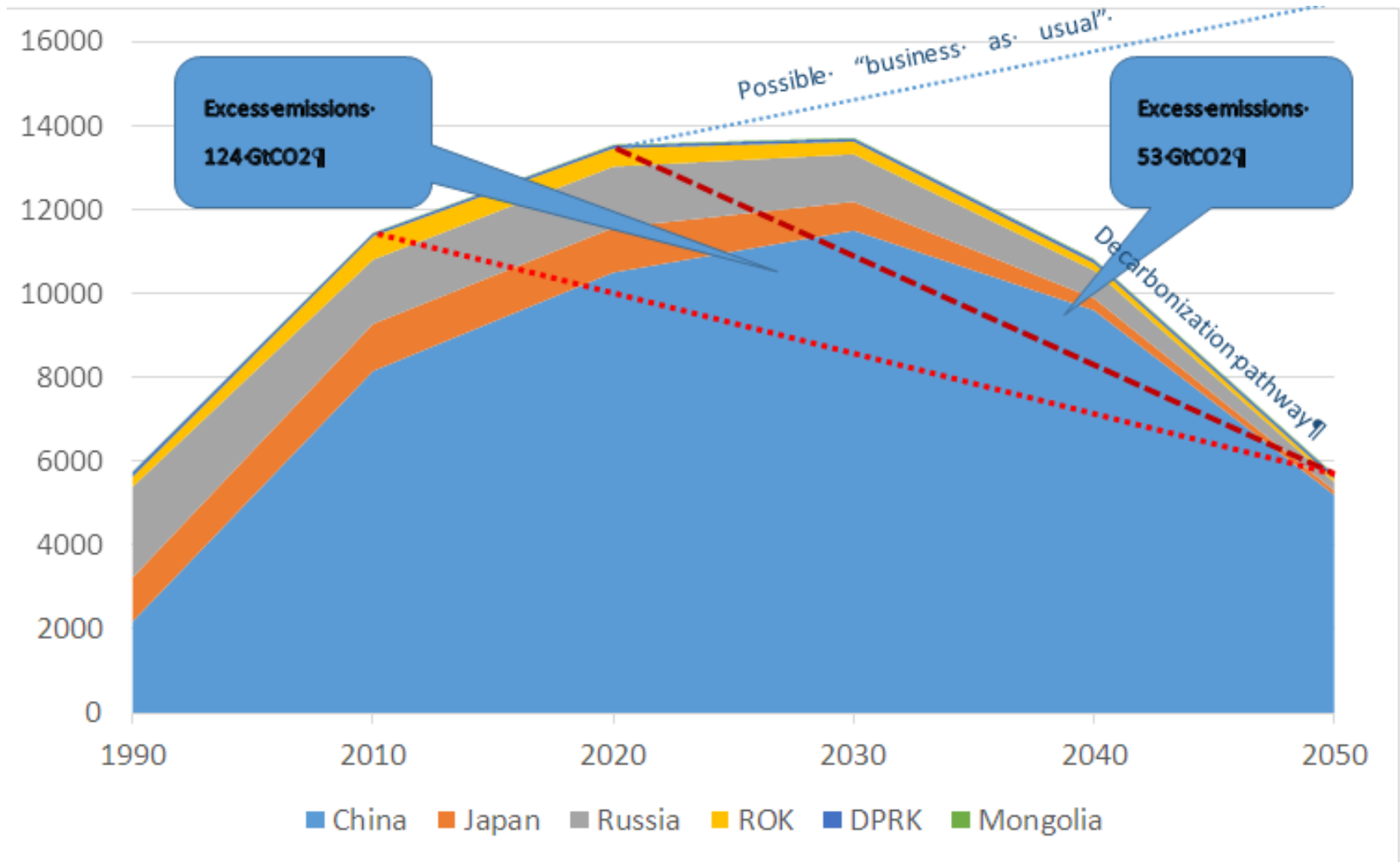
Source: UNFCCC database

National GHG Reduction Targets under the Paris Agreement (Million CO₂e)



China: Peak by 2030, reduce CO₂ emissions per unit of GDP by 60% - 65% by 2030 from the 2005 level

But much more needs to be done: decarbonization pathways for Northeast Asia countries (MtCO₂e)



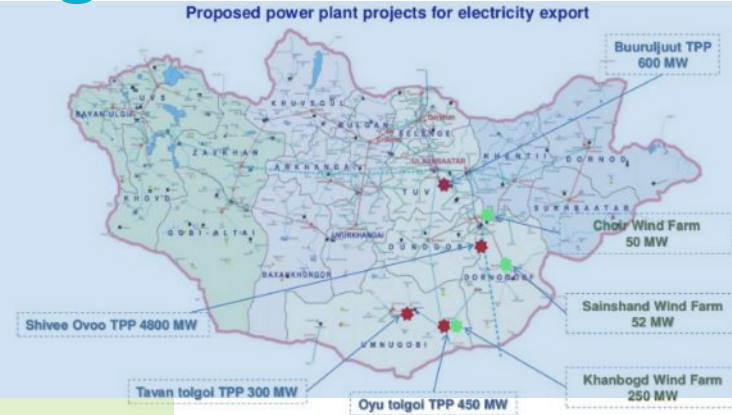
Green energy options for Northeast Asia



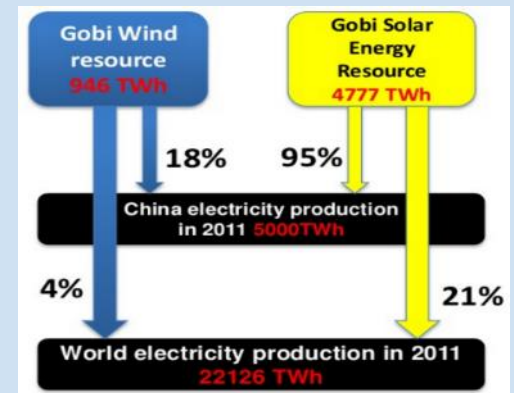
	Wind	Solar PV	Hydro	Biomass	Geothermal	Tidal
China	1500 - 2800 GW	2700 GW	400 - 700 GW	273 - 648 Mtce/y	na	20 - 100 GW
Japan	1800 GW	350 GW	44 GW	na	14 GW	>87 TWh/y
Russia (Siberia+Far East)	3910 TWh/y	2300 mtce/y	1441 TWh/y	>500 TWh/y	>20 TWh/y	>100 GW
Mongolia	900 - 1100 GW	>1000GW	6.4 GW	na	na	na
Rep. of Korea	186.5 TWh/y	10.4 TWh/y	na	na	na	>4 GW
Total Estimates	>6,300 GW	>10,000 GW	>850 GW	>850 GW	>34 GW	>322 GW

More can be done together

- Wind and solar PV (Mongolia):
 - Gobitech: ~5800 TWh/y
 - Power supergrid to Eastern Asia



- Tidal power generation (Russia):
 - Penzhinskaya station and Tugursky bay: ~100-120 GW

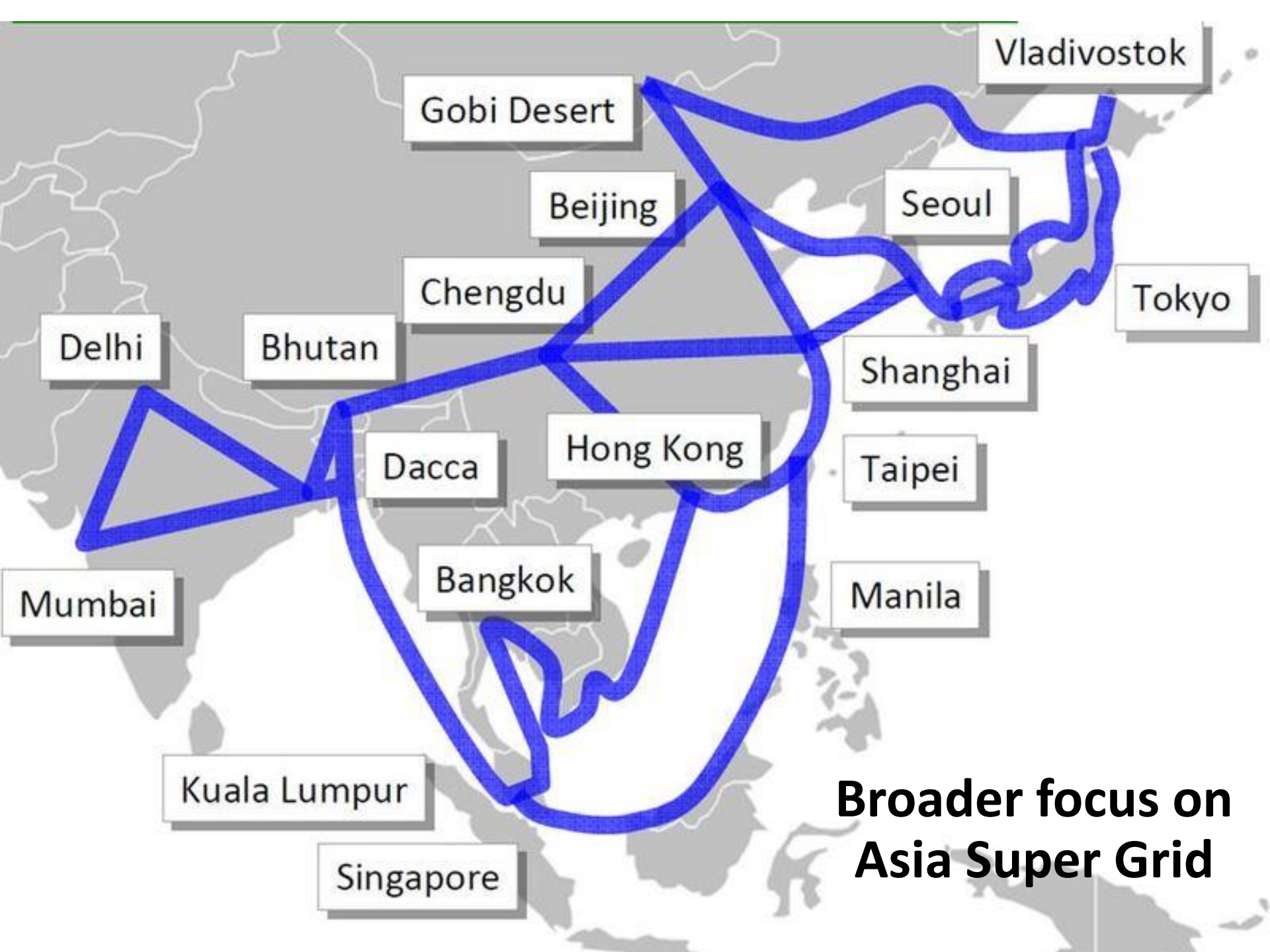


- Nano-tubes application for basic materials (Russia+S.Korea...):
 - Globally - 331 bln tCO2 reduction by 2100
- And much more!



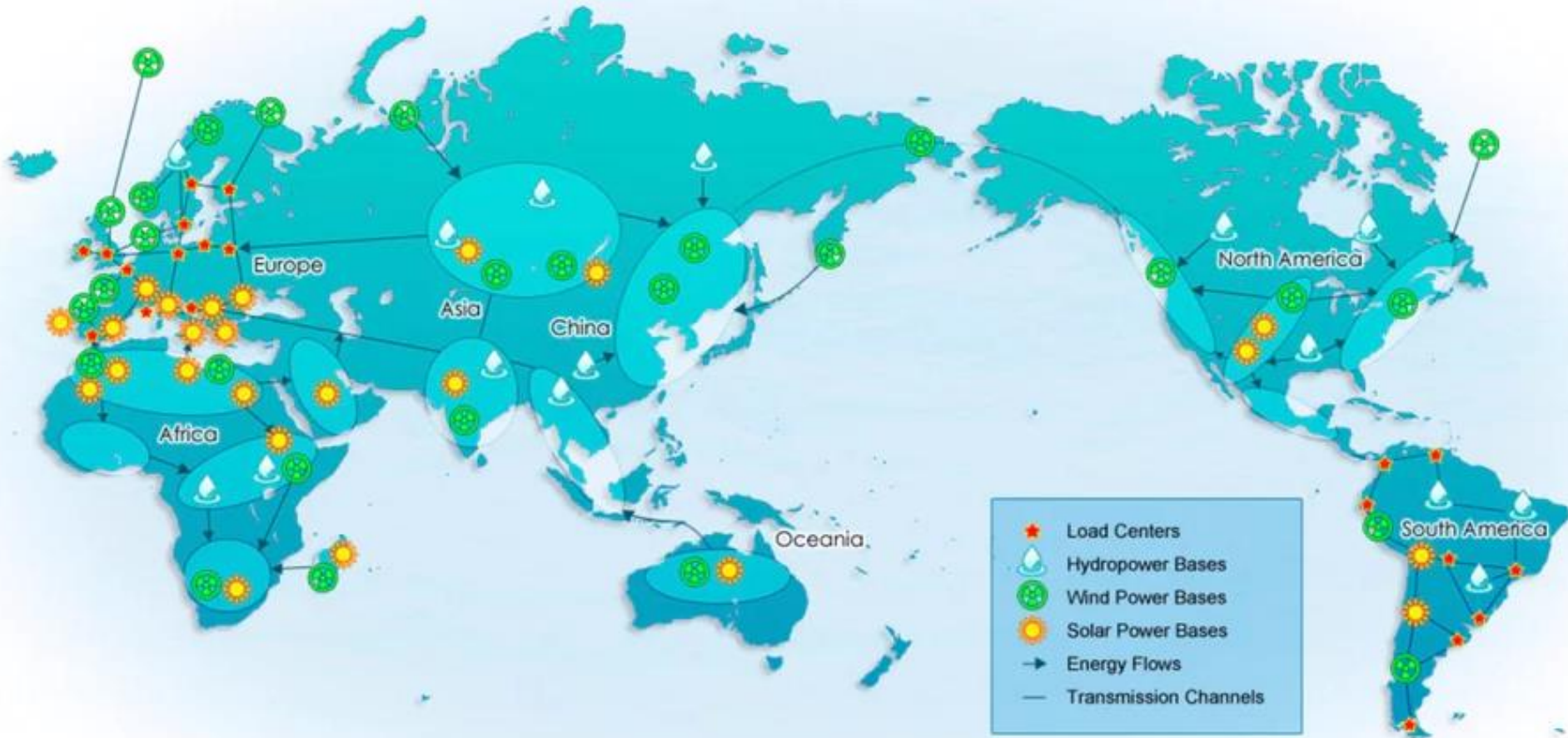
Asia Super Grid initiative





Broader focus on Asia Super Grid

Broader: global energy vision



Global Energy Interconnection

Global 2050 Pathways Platform

- The initiative launched at COP22
 - “The platform will support countries seeking to develop long-term, deep decarbonization strategies, including through the sharing of resources (finance, capacity building), knowledge and experiences”.
 - “it will be a space for collective problem-solving”.
- First global forum of the Platform
 - 24-25 April 2018 in Paris



**High-Level Climate Champions Launch
2050 Pathways Platform**
*Support for Long-Term Low GHG Emission
Development Strategies*



Knowledge sharing through the network of regional decarbonization networks



Perspective decarbonization network in Asia

- Could facilitate development of national and regional decarbonization strategies
- Expertise and methodological support from DDPP and 2050 Pathways Platform
- Knowledge and experience sharing



Thank you!

George Safonov
gvsafonov@gmail.com