TECHNOLOGY FOR A SUSTAINABLE ENERGY FUTURE

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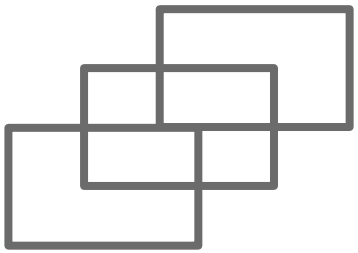
These factors also should be considered by the reader. Each forward-looking statement speaks only as of the date of this scenarios presentation, 23 September 2013. Neither Royal Dutch Shell nor any of its subsidiaries undertake any obligation to publicly update or revise any forwardlooking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this scenarios

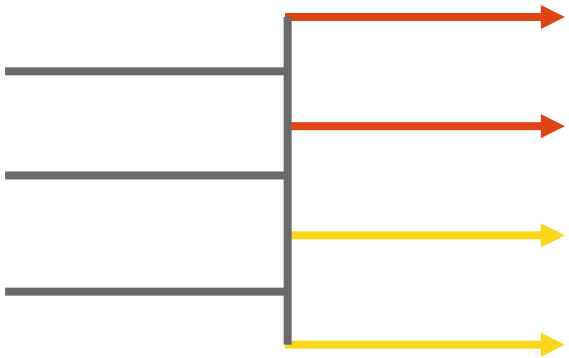
WHY DO WE DO SCENARIOS?

Scenarios help us wrestle with possible futures

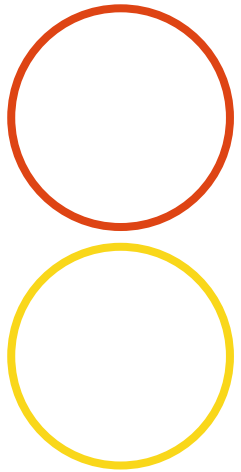
Current Realities
(mental models)



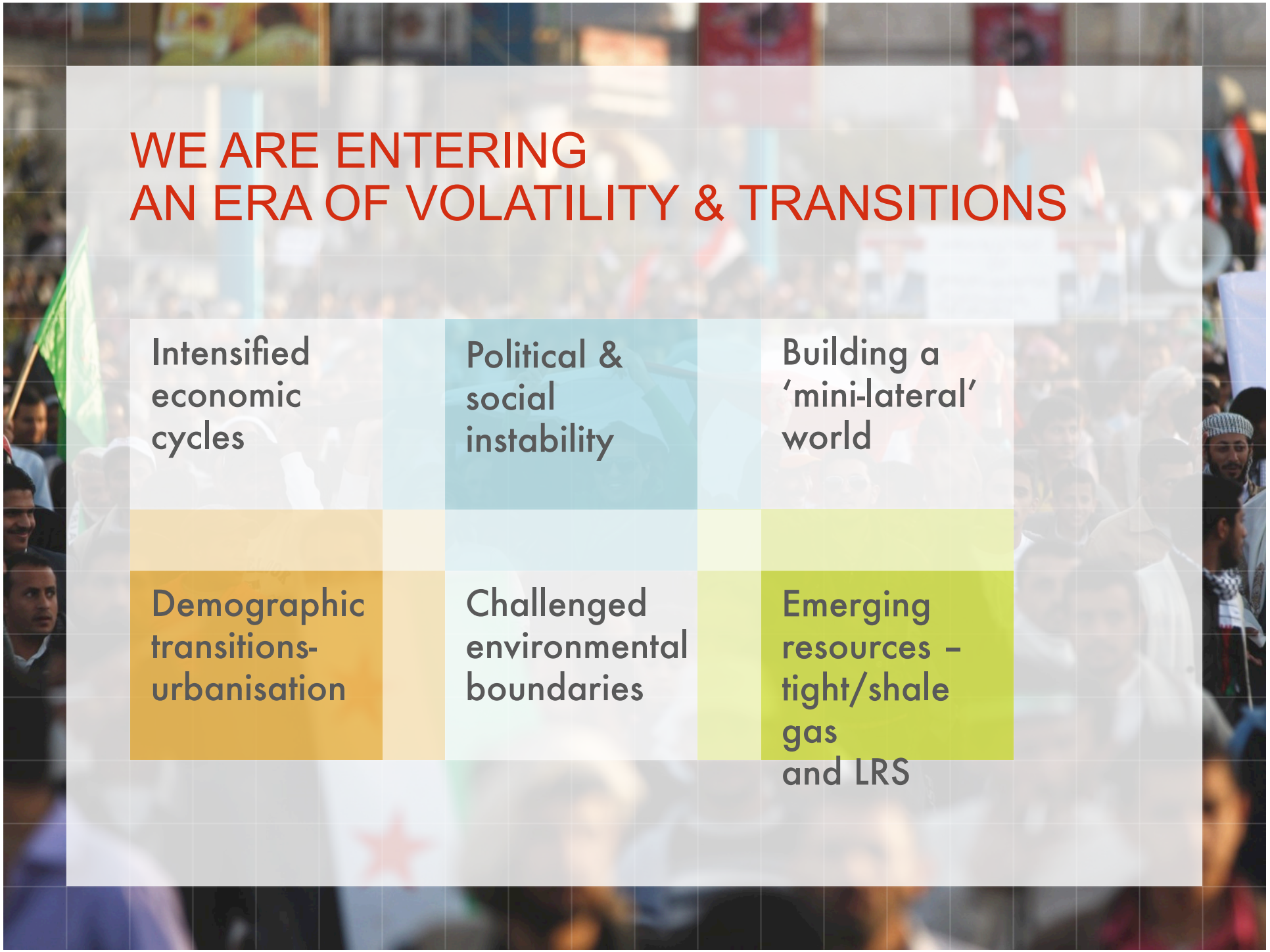
Multiple Paths



Alternative
Future Images



SCENARIOS


WE ARE ENTERING
AN ERA OF VOLATILITY & TRANSITIONS
Intensified economic cycles
Political & social instability
Building a 'mini-lateral' world
Demographic transitions-urbanisation
Challenged environmental boundaries
Emerging resources – tight/shale gas and LRS

PARADOXES & PATHWAYS

The Prosperity Paradox

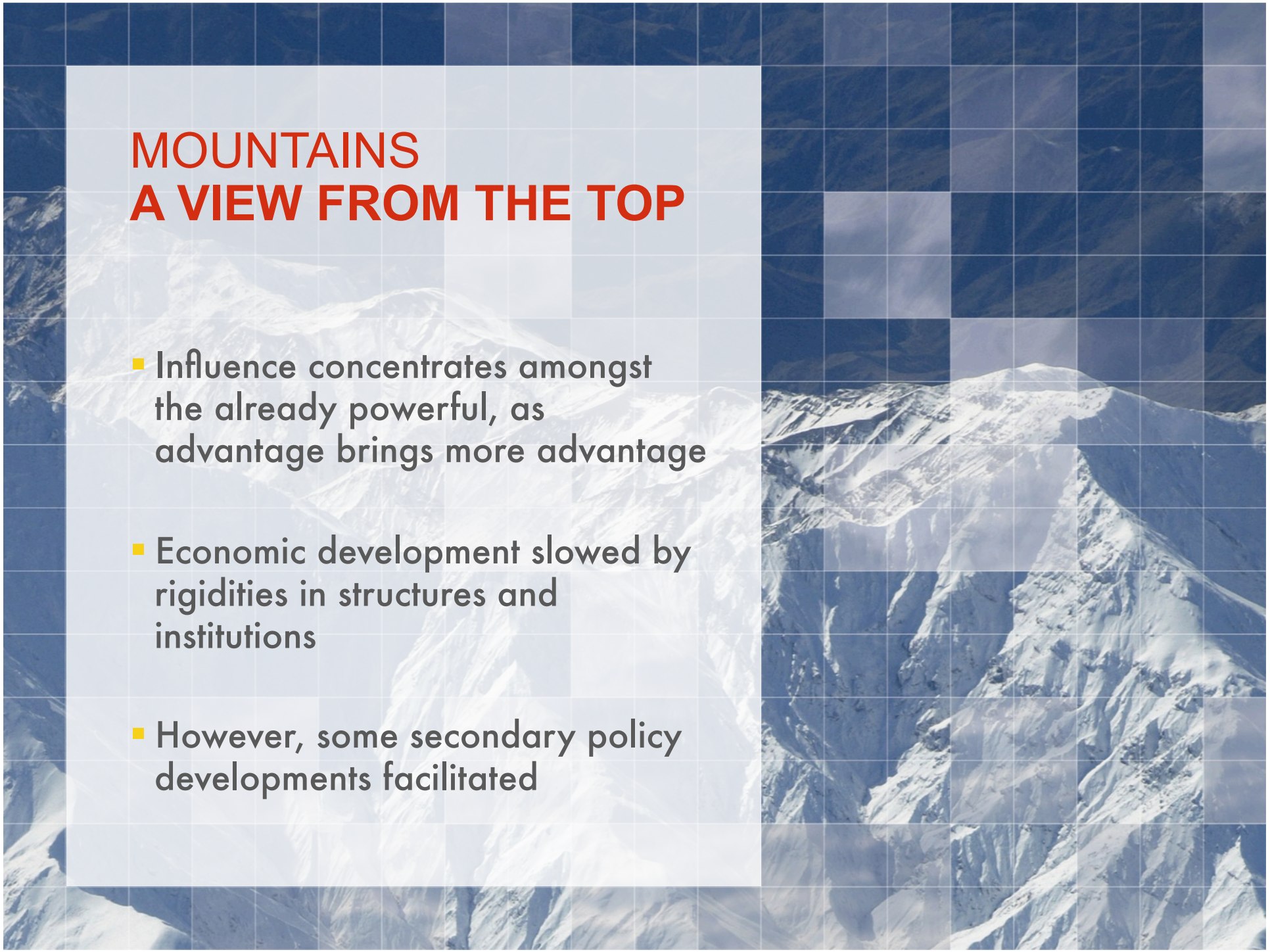
The Leadership Paradox

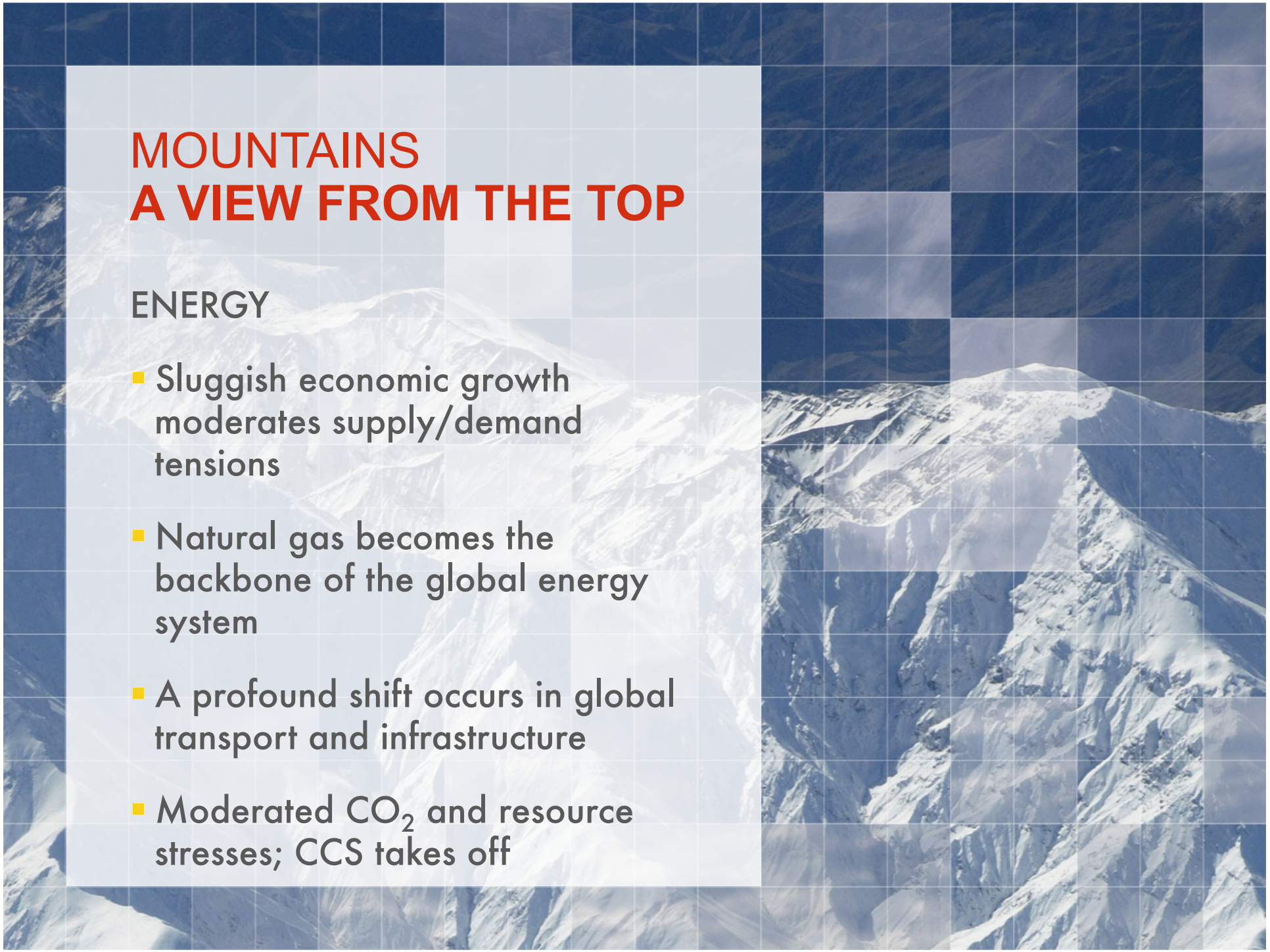
The Connectivity Paradox

Trapped Transition

Room To Manoeuvre


MOUNTAINS
OCEANS


MOUNTAINS
A VIEW FROM THE TOP
Influence concentrates amongst the already powerful, as advantage brings more advantage
Economic development slowed by rigidities in structures and institutions
However, some secondary policy developments facilitated

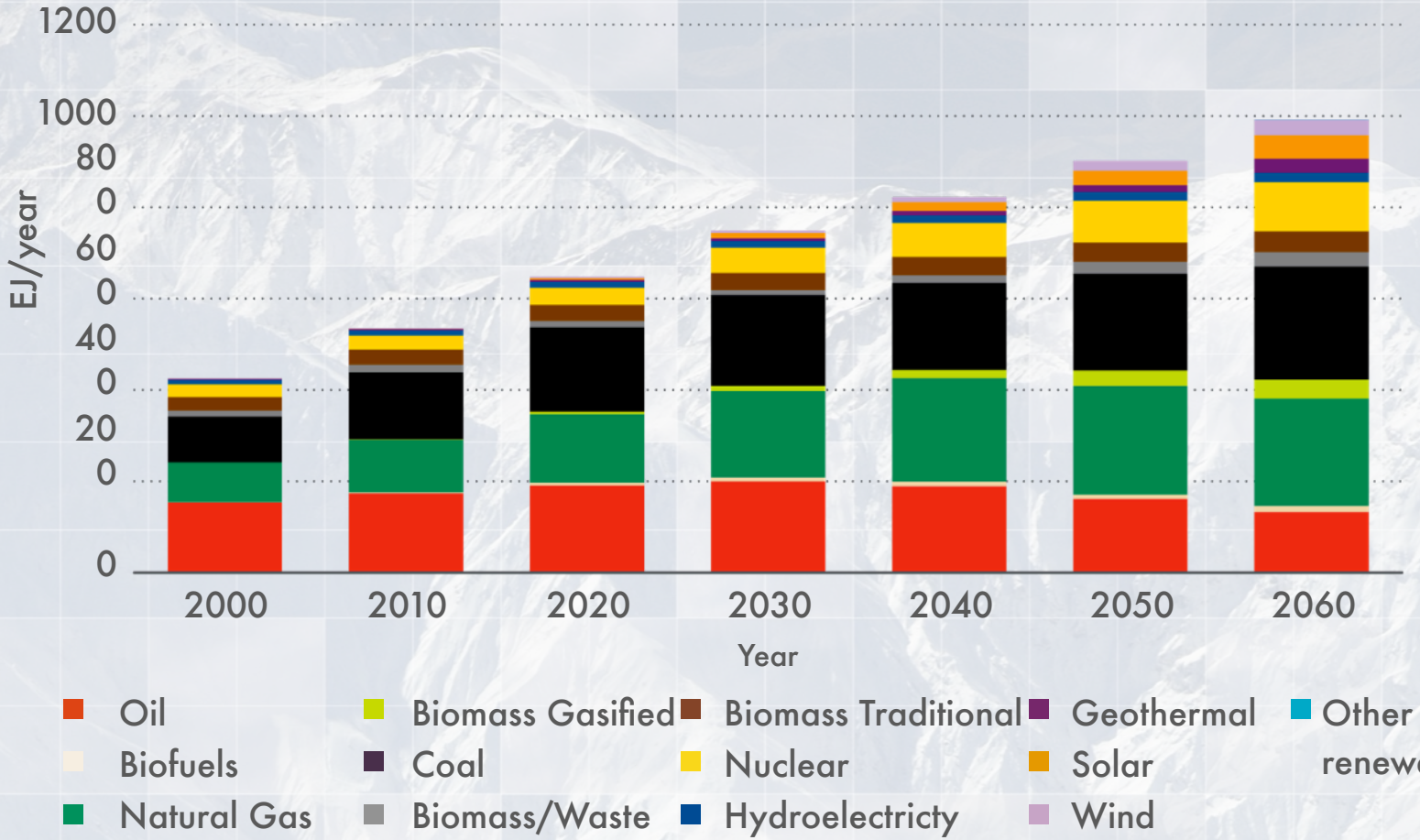


MOUNTAINS
A VIEW FROM THE TOP

ENERGY

- Sluggish economic growth moderates supply/demand tensions
- Natural gas becomes the backbone of the global energy system
- A profound shift occurs in global transport and infrastructure
- Moderated CO_2 and resource stresses; CCS takes off

MOUNTAINS
TOTAL PRIMARY ENERGY BY SOURCE



OCEANS
A VIEW OF THE HORIZON

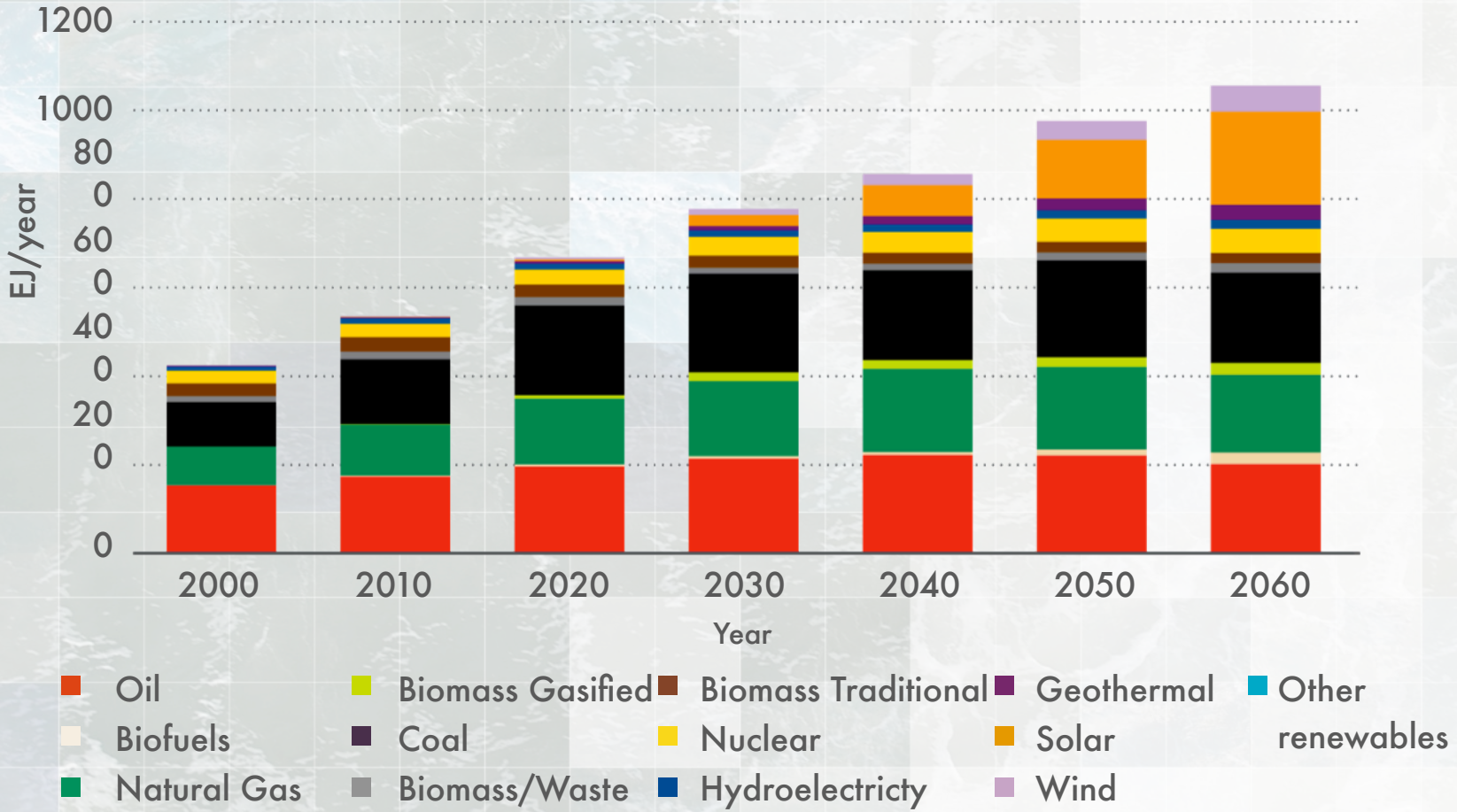
- Emerging interests intermittently accommodated
- Core reforms unleash growth – and expectations for further reform
- However, more empowered constituencies hinder some secondary policy advancement

OCEANS
A VIEW OF THE HORIZON

ENERGY

- Supply/demand tightness and high prices unlock expensive resources and drive user efficiency
- Liquid fuels and coal continue to dominate as gas undershoots global hopes, until solar becomes new backbone
- High CO_2 and resource impacts. CCS only mandated later

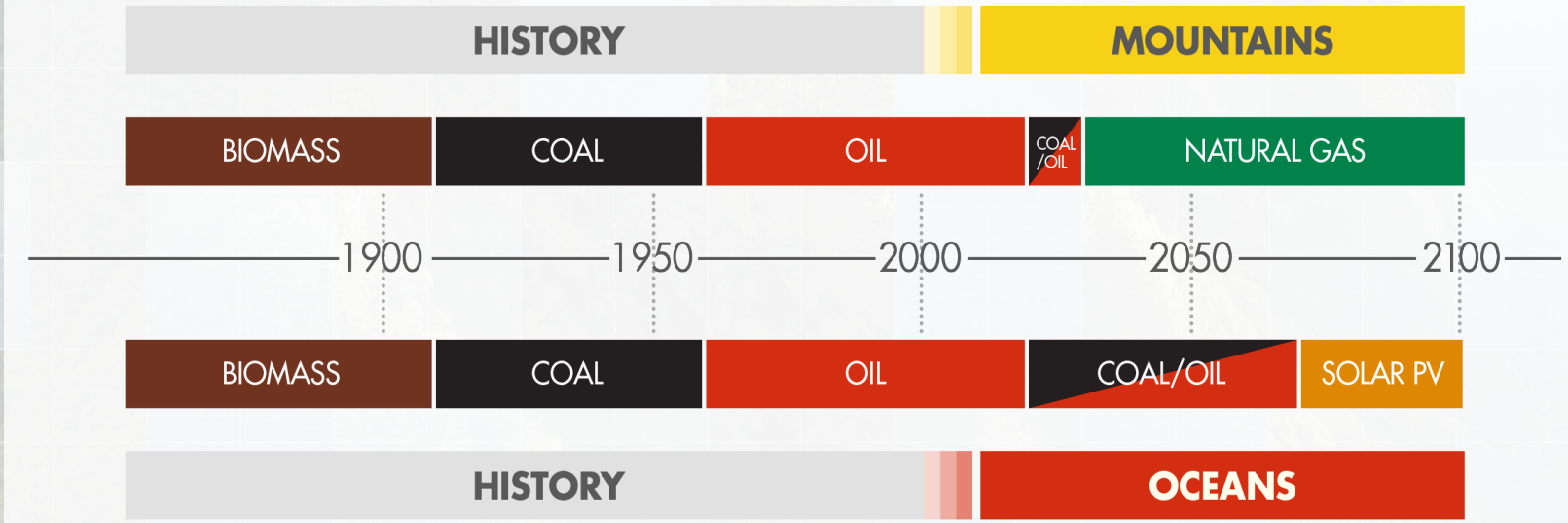
OCEANS
TOTAL PRIMARY ENERGY BY SOURCE



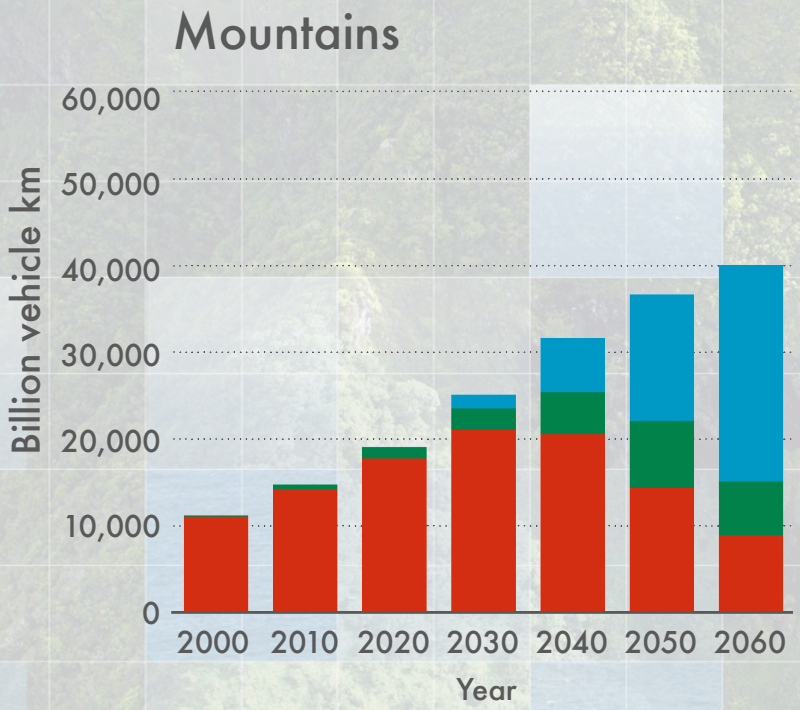
COMPARING MOUNTAINS & OCEANS
KEY FEATURES

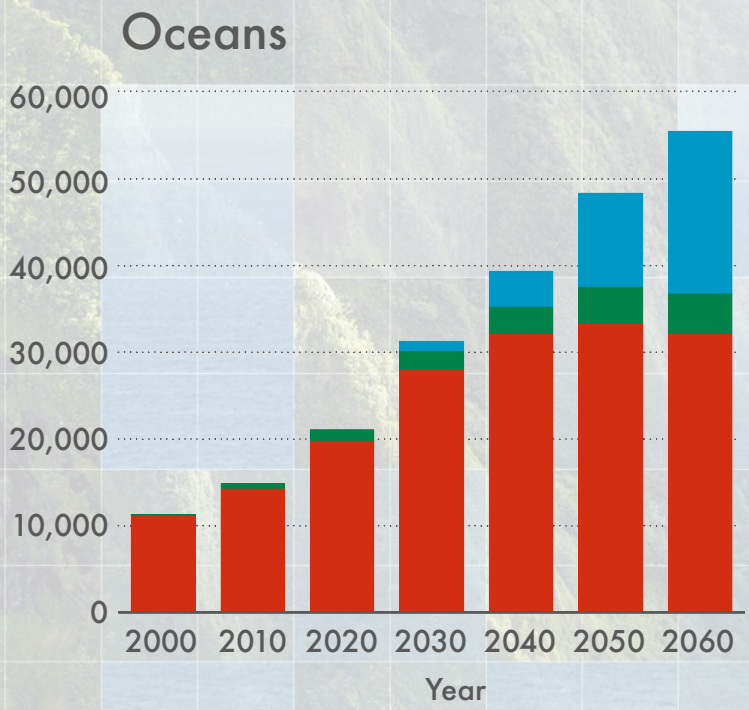
- Different political, economic & social trajectories, but each with counter-currents
- Total energy consumption similar (+80% energy consumption by 2050), but supply/demand shaped very differently
  - **Both have extra-ordinary moderation of demand-growth & extra-ordinary acceleration of supply**
- Key energy-related differences are price trajectories, resource mix, sector-level details, and stresses

RESOURCE MIX CONTRAST:
WORLD'S LARGEST PRIMARY ENERGY SOURCES



SCENARIO CONTRAST:
WORLD PASSENGER TRANSPORT



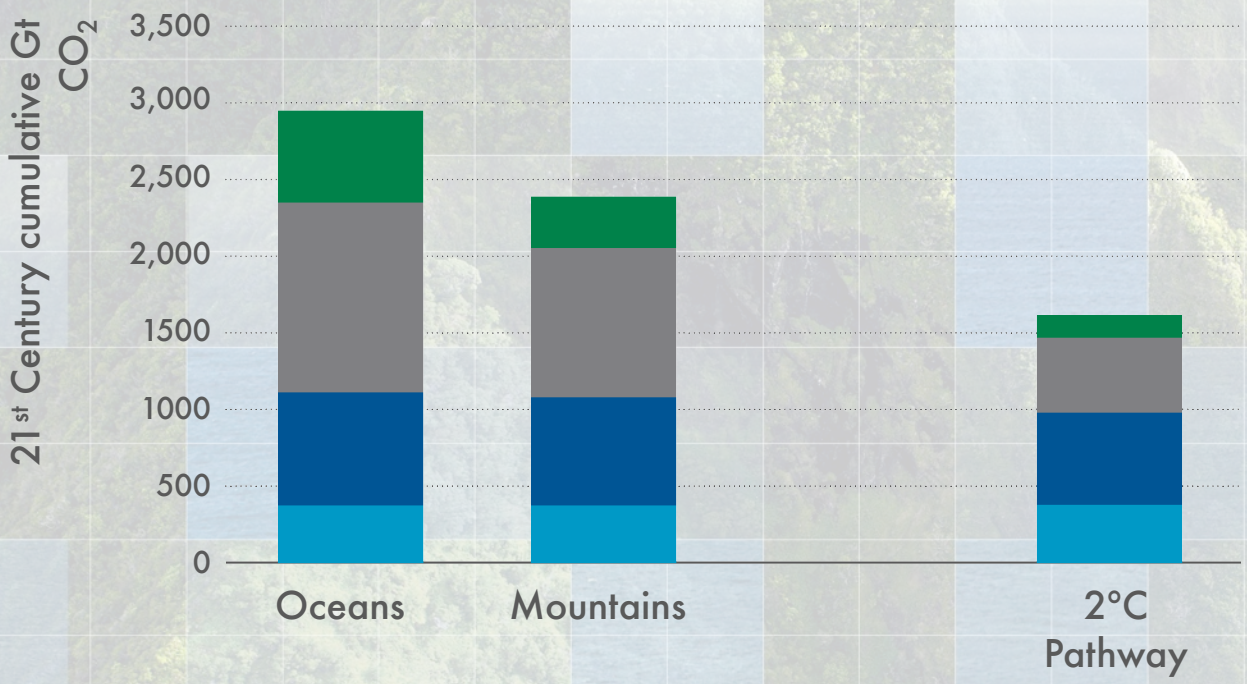


- Electricity and Hydrogen
- Gaseous Hydrocarbon Fuels
- Liquid Hydrocarbon Fuels & Biofuels

Combined with the impact of higher economic development, *Oceans* sprawling suburbs lead to higher travel needs than *Mountains* compact cities

EMISSIONS CONTRAST

WORLD CUMULATIVE ENERGY-RELATED CO_2 EMISSIONS



The 2°C profile needs lower cumulative emissions in the 30 years after 2030 than the 18 years until then

HISTORICAL CONTRAST:
ENERGY EFFICIENCY (OCEANS)

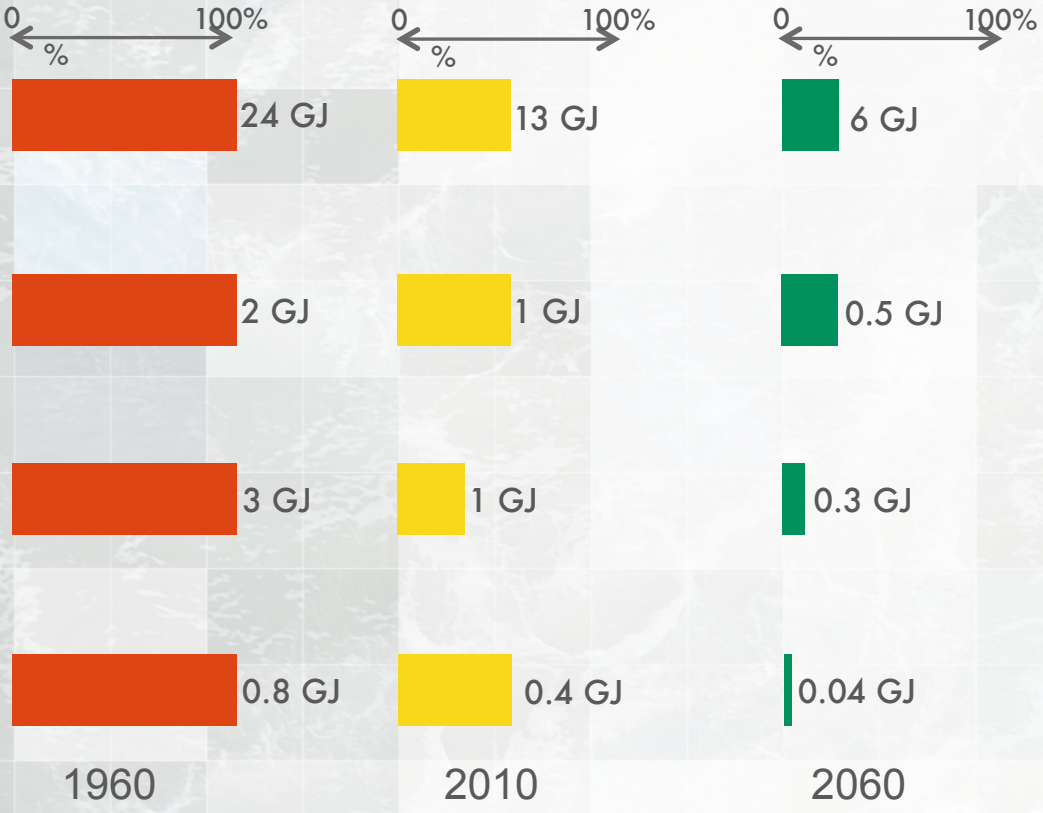
In these sectors, efficiency has doubled over the last 50 years and could double again, or better, over the next 50 years

To make 1 tonne of steel, enough to build one car:

To travel 350 km your car uses:

Your fridge uses in 1 year:

Lighting uses:



WATER- ENERGY - FOOD NEXUS

ENERGY is needed to clean and transport water

WATER is needed to generate energy

FOOD transports (virtual) water

WATER is needed to grow food

ENERGY
+40% DEMAND

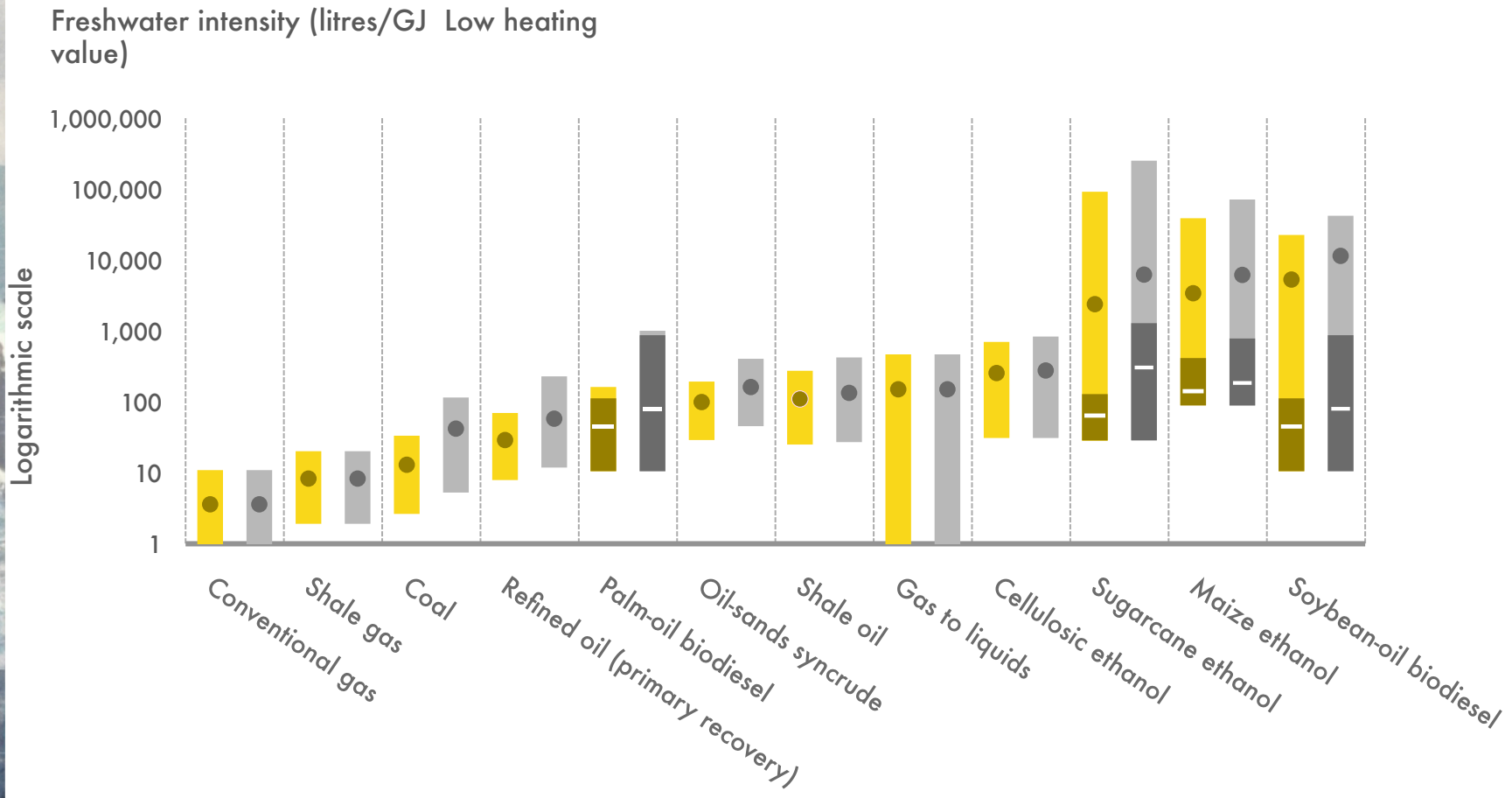
ENERGY is needed to produce food

FOOD can be used to produce energy

FOOD
+50% DEMAND

% Increase in demand by 2030

SHELL ANALYSIS OF WATER USE IN ENERGY PRODUCTION



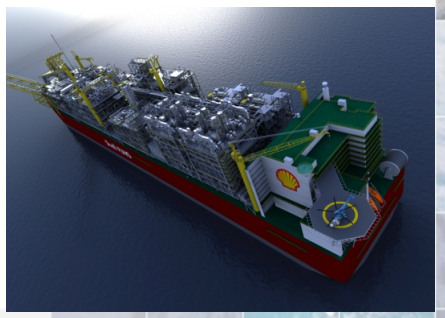
THE ENERGY & WATER CHALLENGES AHEAD



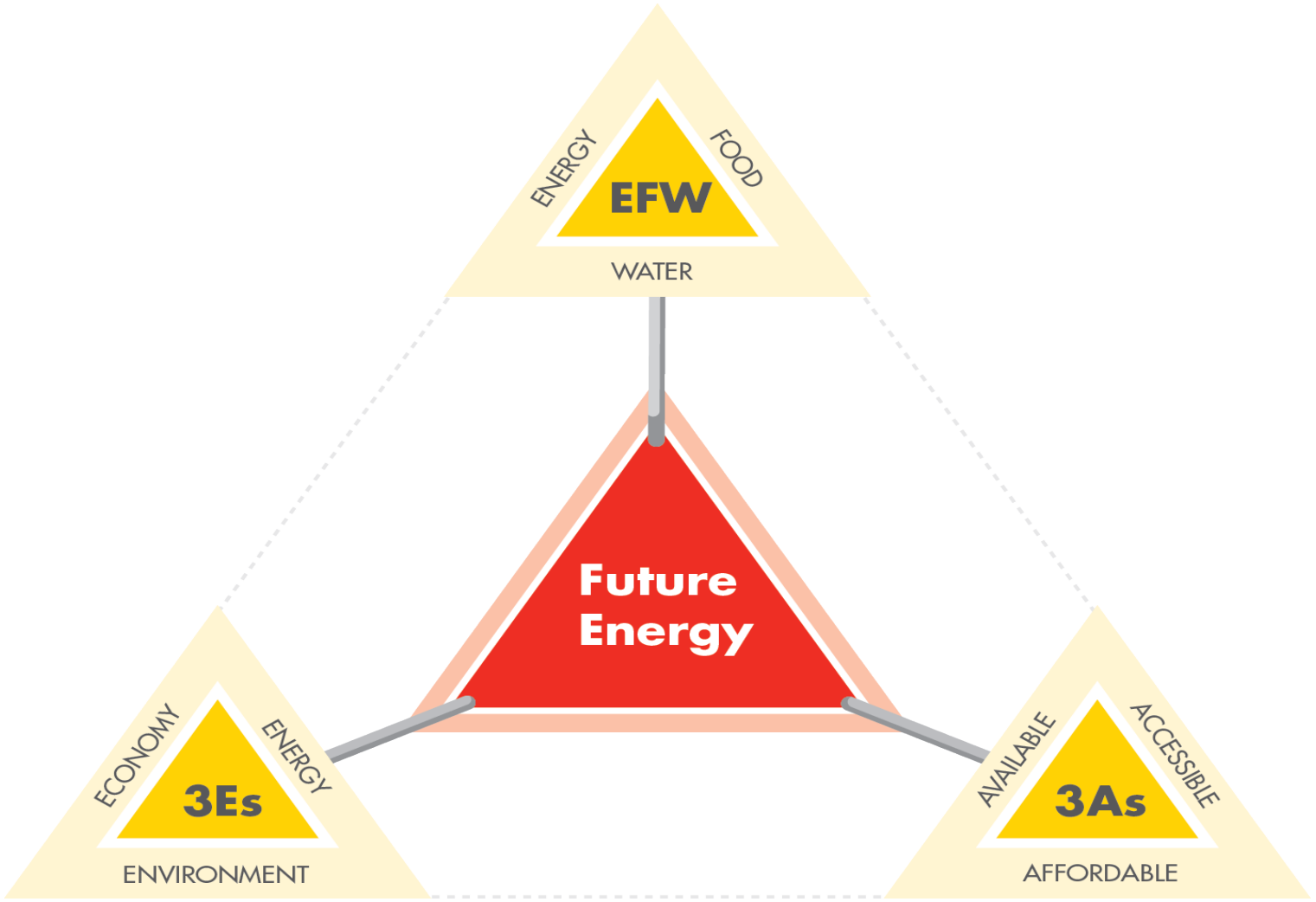




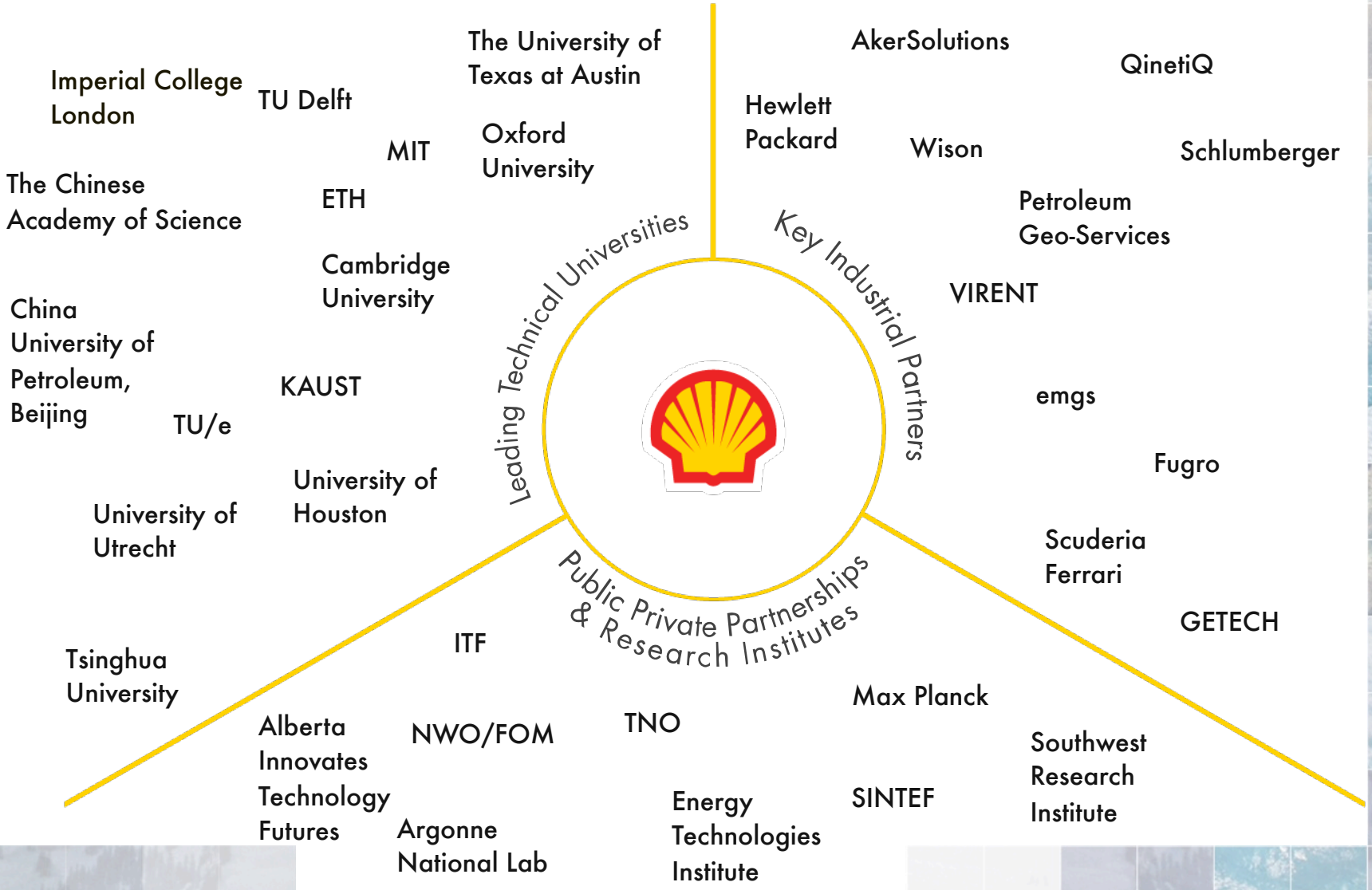




FUTURE ENERGY: A TRIPLE TRILEMMA



TECHNOLOGY SOLUTIONS THROUGH COLLABORATION



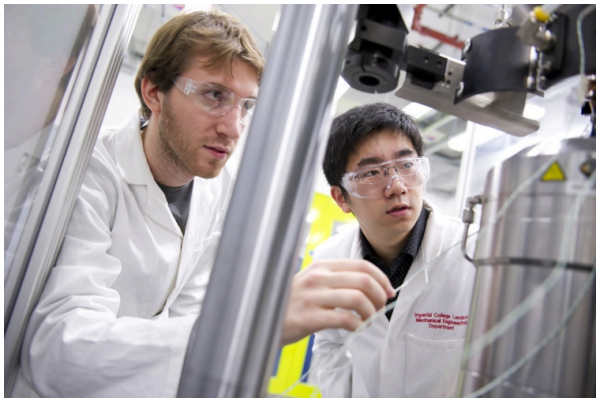
QATAR CARBONATES AND CARBON STORAGE RESEARCH CENTRE (QCCSC)

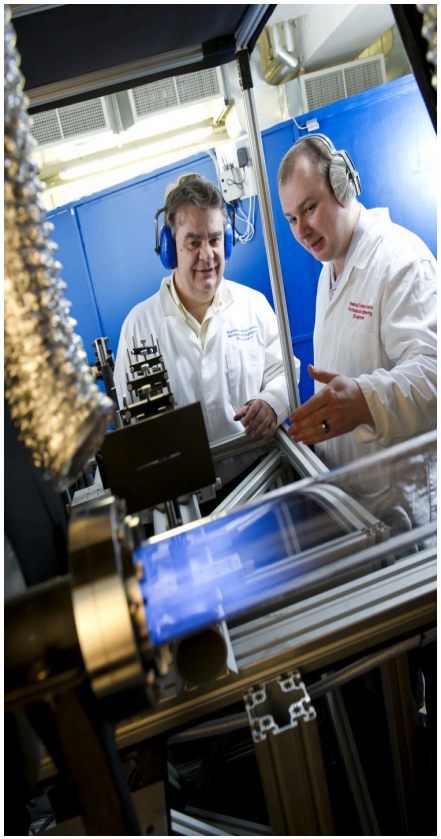
World's largest suite of laboratories to research the storage of the greenhouse gas CO2 in carbonate rock formations

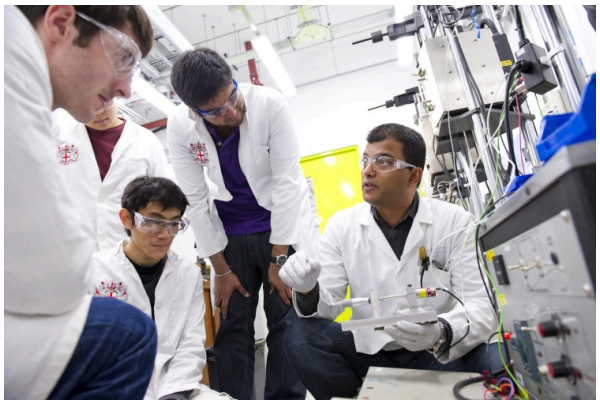
Shell, Qatar Petroleum and Qatar Science and Technology Park

Part of $70 million, 10 year research partnership between Shell, Qatar Petroleum, Qatar Science and Technology Park & Imperial.

NEW UNIVERSITY TECHNICAL CENTRE WITH IMPERIAL COLLEGE







WHAT ARE WE LEARNING?

- **Value in considering longer time horizons & taking a broad view of drivers & interactions between markets, economics, & politics**
- **Both scenarios have positive and troubling features**
- Multiple opportunities, but resource stresses complex and urgent
- Clean *and* Green important: Cleaner fossil fuels (with CCS) a backbone – with a revolution in renewable energy as well
- Technology deployment important… But political, policy and societal choices as influential as resources and technology
- **Innovative cross-boundary collaborations are key to success**