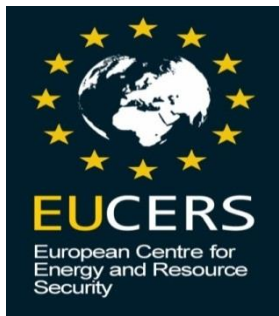


Global Energy Security – Mega-Trends and Challenges

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Forecast/Foresight Scenarios of Alternative Energy Futures

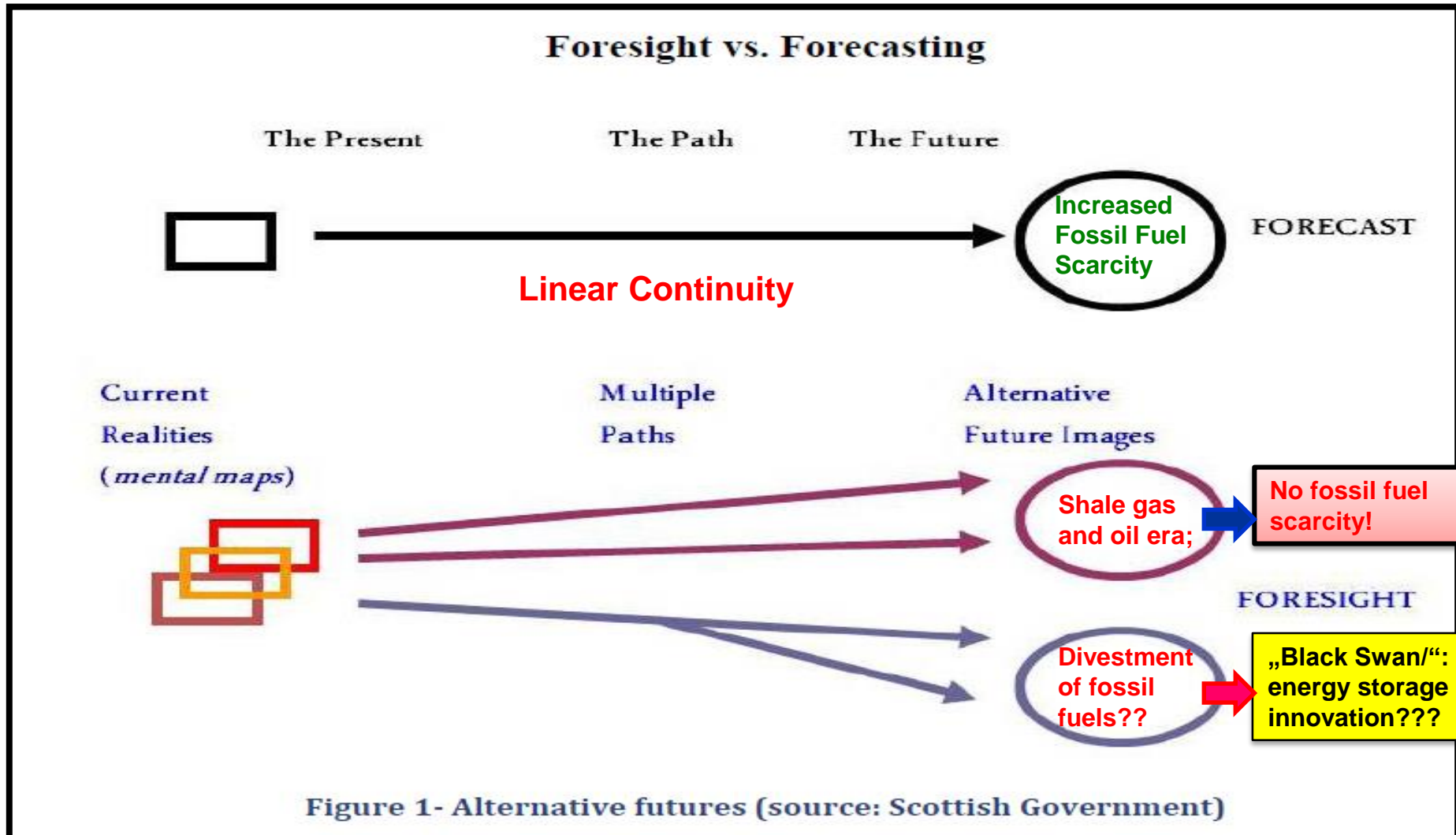


Figure 1- Alternative futures (source: Scottish Government)

Economics/Resources Theme

Increased Competition for Natural Resources (Increased Resource Scarcity) versus Oversupply on Resource Markets

Findings and Implications 2015

- Nations need increasing amounts of energy and raw materials to sustain growth and maintain an advantage in the globalized world;
- Energy security will remain a major concern with large resource deposits located in unstable regions of the world. Availability of resources to maintain a steady growth for developing countries is just as critical for the developed countries that aim to maintain the standard of living of their societies.
- The energy demand is expected to increase by 30-40% by 2040. This might result in competition for resources that leads to instabilities in different regions from the Middle East to the Arctic, and from the South China Sea to South America. Energy resources increasingly will be used to achieve political ends, and balancing this behaviour by developing new technologies and strategies to reduce dependency will be given higher priorities in national security agendas (diversification, RES, shale oil and gas, energy storage etc.).
- Oil price instability will continue to have a direct impact on the geopolitical stability of major producer countries and their national budgets should be monitored closely.

Increased Competition for Natural Resources (Increased Resource Scarcity) versus Oversupply

- **Lengthy Discussion concerning the validity and clarity of this trend.**
- ***Recommendations for new titles such as:***
- **“Geopolitical Dimensions of Resources”;**
- **“Increased Resource Challenges”;**
- **“Increased Complexity to Resource Challenges”;** or
- **“Increased Complexity in Natural Resource Geopolitics”.**

Findings and Implications 2016

- **Oversupply may cause instability in producing/exporting countries, with 2nd and 3rd order effects. Present day example is the impact and upheaval on the economies and stability of oil ex-ported nations caused by the dramatic reduction in the cost of oil in direct relationship to oversupply and competition with increased natural gas production. A 2nd order effect compounding natural energy 3rd order effect discussed was environment/climate concerns due to burning natural gas vs. coal, where methane is >25-times more damaging to ozone than CO₂;**
- **New technologies demand new resources and change geopolitics. This is particularly indicated in critical raw materials (example: rare-earth resources) required in advanced electronics and RES. Nations that have an advantage in critical raw materials can leverage this in power politics and hybrid warfare.**
- **Increasing interdependencies between energy, raw materials, water and other resources can have either a balancing, stabilizing effect (quid pro quo) or cause further compounding destabilization if held by a single power broker.**

Economics/Resources Theme

Increased Competition for Natural Resources (Increased Resource Scarcity) versus Oversupply on Resource Markets

Findings and Implications 2016

- Paris COP21 summit findings:
 - Even with full implementation, global warming: $>2.7^{\circ}\text{C}$;
 - **Most oil and gas producing countries not prepared (and having the political will) at all for a decarbonized world energy system!**
- Differentiation between short-to medium-term trends (i.e. over-supply of fossil fuels) and longer-term trends (decarbonization);
- **Short-to-medium term future :**
 - Oversupply of fossil fuels;
 - Expansion of RES (and nuclear power?)
- „black swan“: energy storage technology innovation (available and affordable)

Increased Competition for Natural Resources (Increased Resource Scarcity) versus Over-supply on Resource Markets

- Water Supply Security and Management

Findings and Implications 2016

- WHO, Power Politics;
- 2nd effects:
 - Mass migration;
 - Megacity trends;
- New technologies:
 - Desalination;
 - Reclamation;
 - Mass distribution pipelines and other transport options;
- New opportunities:
 - New resources;
 - Exploration.
- NATO-operations in other countries:
 - Logistical needs and supplies.
- **Need for discussion how far NATO's crisis management/preventive diplomacy goes (in rivalry towards the EU, UN etc.) – in particular regarding non-military/non traditional security threats:**
 - Trend: Coping with existential risks needs to include all civilian and military means and instruments:
 - Coping with decreased capabilities of civilian defence| disaster relief increases pressure on using military capabilities.