



Grenada National Ecosystem Assessment (NEA) Training Series on Foresight Scenarios

Session 3 – An Overview to Foresight Scenarios, Part 2 –
Drivers and Methods

Facilitated by Dr. Adrian Cashman

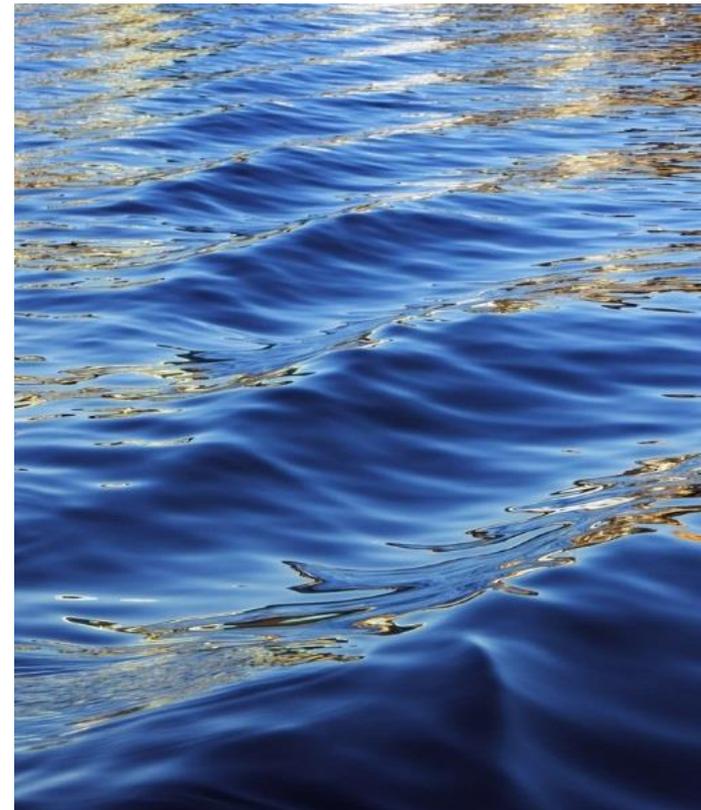
24th August 2021





Foresight scenarios

Session 3: Drivers and methods



Intro

In this session we are going to look at

- Drivers
- 3 ways to develop scenarios

Developing scenarios

- Alex Fergnani¹ (2020) suggests that there are three main scenario planning/developing approaches
 - Archetypes
 - Shell Approach
 - 2 x 2 Matrix
- All aim at exploring the limits of plausibility of the future, they all aim at creating equally probable, not normative, scenarios; and they all aim at increasing awareness and learning about possible futures, possibly to mobilise action in the present
- All of them draw on understanding DRIVERS – Indirect and Direct. So before looking at the three approaches we look at Drivers and in particular those that could influence ecosystems and biodiversity

¹ <https://medium.com/predict/4-archetypes-shell-2x2-three-scenario-planning-methods-explained-and-compared-d2e41c474a37>

Chapter 3

Modelling scenarios of indirect and direct drivers and interlinkages

Scenario Approaches

Construction of narrative storylines

Methods

- Expert-based
- Participatory

Scenarios

- Exploratory
- Target-seeking
- Ex-ante/ex-post assessment

[Section 3.2]



Assessment of driver/
variable specifications

Indirect drivers

- Economic
- Demographic
- Sociocultural
- Governmental and institutional
- Technological

[Section 3.3]



Direct drivers

- Land-use change
- Climate change
- Pollution
- Natural resource use and exploitation
- Invasive species

[Section 3.4]



Chapter 4

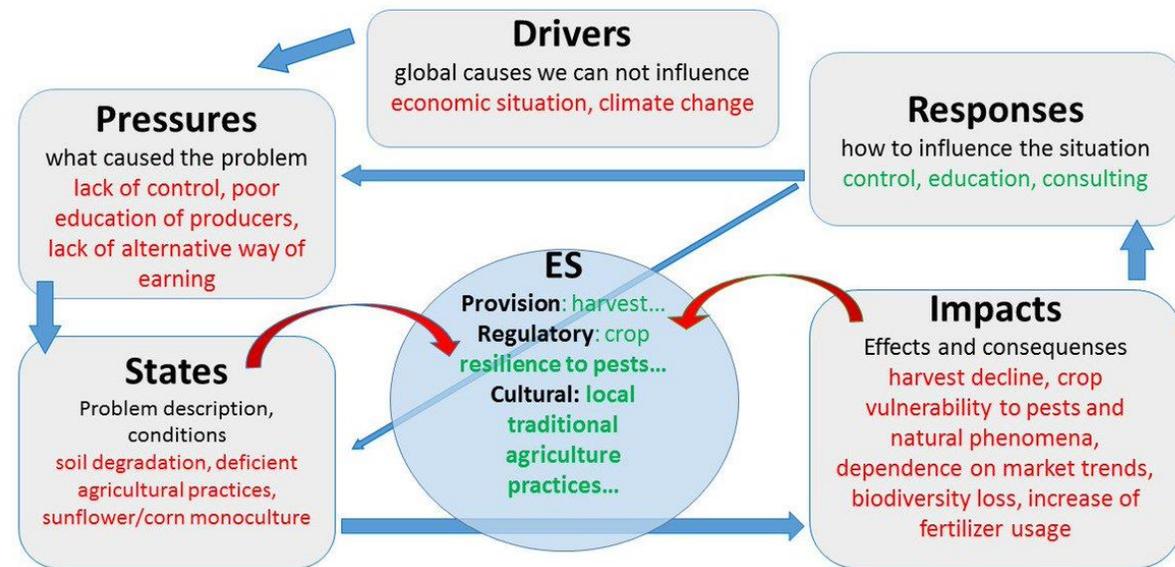
Impacts of drivers
on biodiversity and
ecosystem
services

IPBES (2016): The methodological assessment report on scenarios and models of biodiversity and ecosystem services. S. Ferrier, K. N. Ninan, P. Leadley, R. Alkemade, L. A. Acosta, H. R. Akçakaya, L. Brotons, W. W. L. Cheung, V. Christensen, K. A. Harhash, J. Kabubo-Mariara, C. Lundquist, M. Obersteiner, H. M. Pereira, G. Peterson, R. Pichs-Madruga, N. Ravindranath, C. Rondinini and B. A. Wintle (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 348 pages.

Drivers

- Drivers are an integral aspect of scenario development and subsequent analysis
- Direct drivers impact biodiversity and ecosystem change, frequently involving synergies with other direct drivers, and feeding back into indirect drivers
- Indirect drivers play a major role in influencing direct drivers of biodiversity and ecosystem change, as well as strongly influencing other indirect drivers
- We can conceptualise how this might work by using a DPSIR Framework

DPSIR approach for ecosystem services (ES) assessment



Drivers

For more detailed information see:

IPBES (2016): The methodological assessment report on scenarios and models of biodiversity and ecosystem services. S. Ferrier, K. N. Ninan, P. Leadley, R. Alkemade, L. A. Acosta, H. R. Akcakaya, L. Brotons, W. W. L. Cheung, V. Christensen, K. A. Harhash, J. Kabubo-Mariara, C. Lundquist, M. Obersteiner, H. M. Pereira, G. Peterson, R. Pichs-Madruga, N. Ravindranath, C. Rondinini and B. A. Wintle (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 348 pages.

Indirect drivers

- We are interested here with the influence of indirect drivers on biodiversity and ecosystems
- The indirect drivers can be identified and categorized first (what are they) before their effects on ecosystems and biodiversity can be explored (what will the effects be)

Commonly identified Indirect Drivers include:

- Economic trends
- Demographic trends
- Society and culture
- Governance and institutions, and
- Technology

Economic trends

- Economic drivers and economic trends impact both social and environmental dimensions of sustainable development.
- Economic growth is the main global driver of resource consumption
- These drivers have a growing effect on ecosystems and ecosystem
- Technological and institutional innovations have increased resource-use efficiency but consumption growth has outstripped increases in efficiency
- Economic trends tend to be measure in terms of changes in GDP

Demographic trends

- Changes in population size as well as demographic variables such as household size, age structure exert significant pressures on direct drivers of biodiversity and ecosystem change.
- Demographic pressures are interlinked with consumption and environmental externalities
- Greater demand for natural resources from growing populations requiring greater amounts of food, drive land-use and land-cover change through deforestation and conversion to agricultural land
- Populations with high per capita consumption rates (of goods and services) generate high demand for natural resources, threatening greater biodiversity and ecosystem services

Society and culture

- Culture in the form of the values, norms and beliefs of a group of people can act as an indirect driver of ecosystem change by affecting environmentally-relevant attitudes and behaviours.

Governance and institutions

- Institutions play an important role in the management and exploitation of biodiversity and ecosystem services
- Weak governance frequently leads to mismanagement of the commons, as well as the adoption of environmentally-unsustainable policies
- Effective institutional design and implementation is crucial
- Institutional drivers operate at various spatial scales, from global (international) to local (subnational), and include the influence of policies that encourage a particular behaviour as well as the direct impact of enacting environmental legislation
- Governance refers to the exercise of authority by different social actors through the development and implementation of explicit and implicit substantive and procedural rules to manage resources for the social good.

Technology

- The rate of technological change is considered to be an indirect driver of biodiversity and ecosystem services change because it affects the efficiency with which ecosystem services are produced or used
- Technological change can result in increased pressure on ecosystem services through increased resource demand as well as lead to unforeseen ecological risks
- Technological innovation can potentially serve as a catalyst of paradigmatic shifts in production systems with considerable societal implications

Discussion of indirect drivers session

Break out groups

1. Economic trends
2. Demographic trends
3. Society and culture
4. Governance and institutions, and
5. Technology

Think about how your Indirect driver might impact Grenada's ecosystems and biodiversity. Consider how serious this might be. You have 10 minutes.

Direct drivers

Direct drivers are subject to differing types of uncertainty. Commonly identified drivers of ecosystem change and biodiversity loss include:

- Land use change
- Climate change
- Pollution
- Natural resource use and exploitation
- Invasive species

Land use change

- Habitat modification is seen as a prime driver of biodiversity loss and changes in the level and composition of ecosystem services provided at any given location.
- Habitat modification is mostly a result of land-use change, either induced by human action or as a result of changes in the physical determinants of the habitat (e.g. due to changes in hydrology or climate).
- Habitat modification also occurs in marine environments
- In most cases, the modification of habitat due to human interference is much faster and more pronounced than changes due to climate change

Climate change

- Changes in climate and weather patterns are impacting ecosystem functioning and causing the migration of species and entire ecosystems
- Ocean temperatures and ocean acidification are expected to have profound effects upon marine ecosystems, particularly coral reefs
- Increased hurricane strength and associated hydro-meteorological impacts have had severe impacts on ecosystems and on food systems
- Wildfires brought on by dry conditions not only affect ecosystems but are also contributing to pollution of the atmosphere and water resources

Pollution

- Pollution is an important driver of biodiversity and ecosystem change throughout all biomes, with particularly devastating direct effects on freshwater and marine habitats
- Use of fertilizers and pesticides are recorded as having impacts on species and ecosystems and compromising their functioning
- Plastic debris is emerging as one of the most significant pollutants of marine environments

Natural resource use and exploitation

- Exploitation of wildlife has occurred throughout human history, leading to changes in species, biodiversity loss and extinctions
- The recent rate of loss has accelerated sharply
- Pressure on resources are increasing

Invasive species

- The type and extent of invasive species will depend on the type of habitat, soil, climatic conditions and degree of disturbance
- The dispersion of invasive species can be a function of climate and landuse change
- Disturbed habitats are more susceptible to invasion
- Most invasive species do not have natural enemies in their new environments and have to be removed using chemical, manual, mechanical or integrated methods

Discussion of direct drivers session

Break out groups

1. Land use change
2. Climate change
3. Pollution
4. Natural resource use and exploitation
5. Invasive species

Think about how your direct driver might impact Grenada's ecosystems and biodiversity. Consider how serious this might be. You have 10 minutes.

Scenario planning/developing approaches

Archetypes

This approach was developed by Dator at the University of Hawaii at Mānoa

Uses 4 generic futures and the development goes through 4 main steps

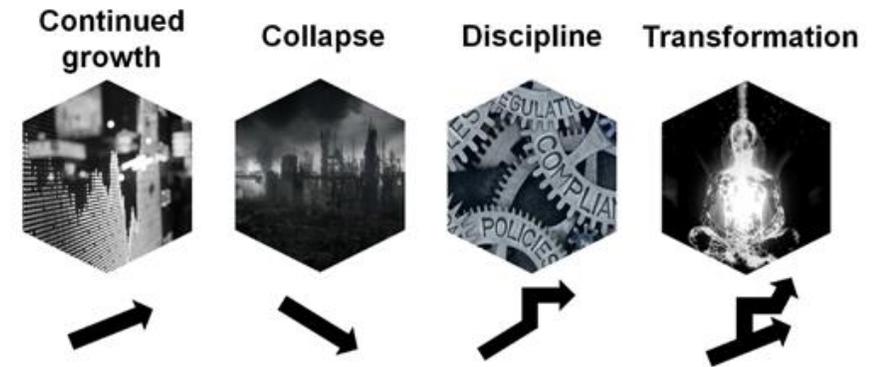
1. Identify the driving forces of change affecting the future
2. Give a value to the driving forces, that, is we determine their direction
3. Interpret the behaviour of the driving forces in the four predetermined archetypal images of the future
 1. Continued growth
 2. Collapse
 3. Discipline
 4. Transformation
4. Write scenario narratives based on the interpretation for the archetype

Interpreting the behaviour of the driving forces means that for each archetype we ask the question: *"how would the set of driving forces identified behave, together, if this archetype were to occur?"*

For a more detailed look at what follows go to <https://www.youtube.com/watch?v=vx2mu5FgsXQ&t=19s>

About this method

- Take into account all the driving forces that we had identified even if their behaviour is counterintuitive in some of the archetypes, stretch the imagination to think of counterintuitive futures, and then support such arguments with references
- The scenario archetypes are generic. They're not necessarily positive or negative, good or bad. They should be interpreted in both ways, and ideally include both positive and negative elements [1]. This is to make scenario narratives more plausible.



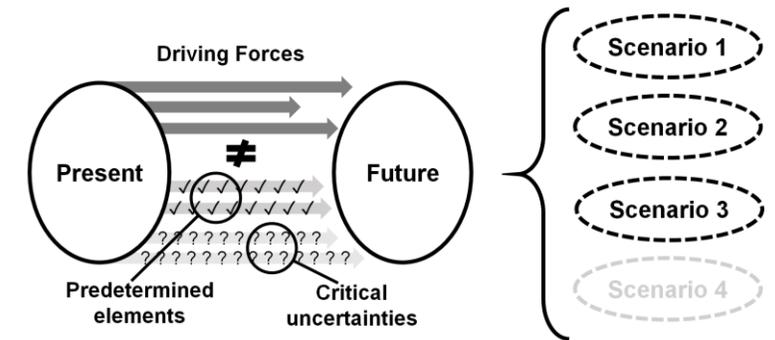
Futures:	Grow	Collapse	Discipline	Transform
Forces:				
Population	Increasing	Declining	Diminished	Posthuman
Energy	Sufficient	Scarce	Limited	Abundant
Economy	Dominant	Survival	Regulated	Trivial
Environment	Conquered	Overshot	Sustainable	Artificial
Culture	Dynamic	Stable	Focused	Complex
Technology	Accelerating	Stable	Restricted	Transformative
Governance	Corporate	Local	Strict	Direct

The Shell method

There are three major steps:

- First, identify the driving forces of change affecting the future, similarly to above
- Second, distinguish these driving forces from pre-determined elements and critical uncertainties.
 - Predetermined elements are slow changing phenomena, such as population growth, constrained political situations, or national investments already in the pipeline.
 - Critical uncertainties are highly unpredictable events or phenomena, such as the price of oil
- Third step, create two to four scenario narratives, through dialogue between members of the scenario planning team by asking “how about this or that scenario?”, “how would the driving forces, predetermined elements and critical uncertainties behave in this and that hypothetical scenarios?”

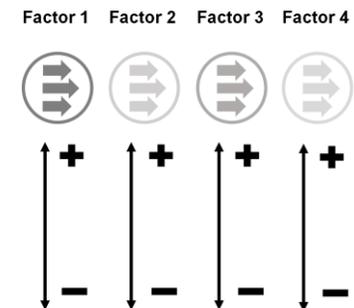
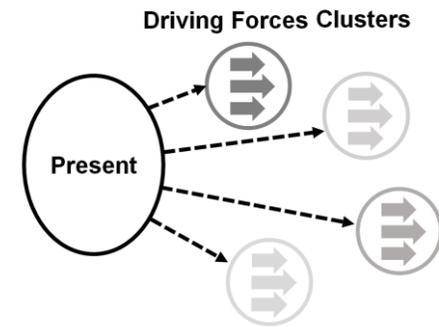
It's an iterative process



The 2 x 2 Matrix Method

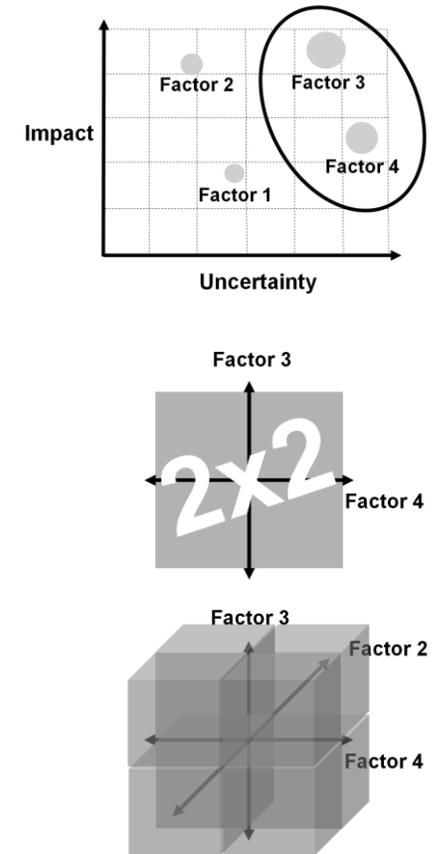
This method consists of six steps:

- Identify the driving forces affecting the futures (research & in a workshop setting). Participants are asked to work initially by themselves, and then to break out in small groups, to find as many driving forces as possible
- Cluster the driving forces in groups of driving forces that have a high mutual impact on each other
- Determine the extreme behaviors of clusters along a continuous axis, that is, we ask: “what would the two extreme behaviors of the clusters be if they were to go upwards and downwards?” These extreme behaviors are called factors



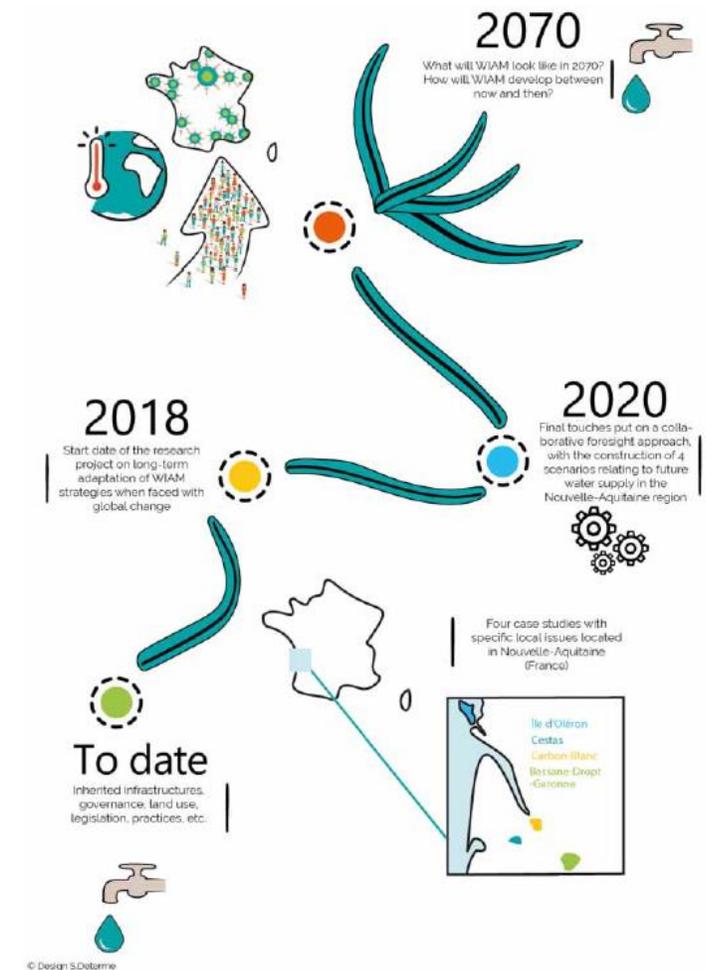
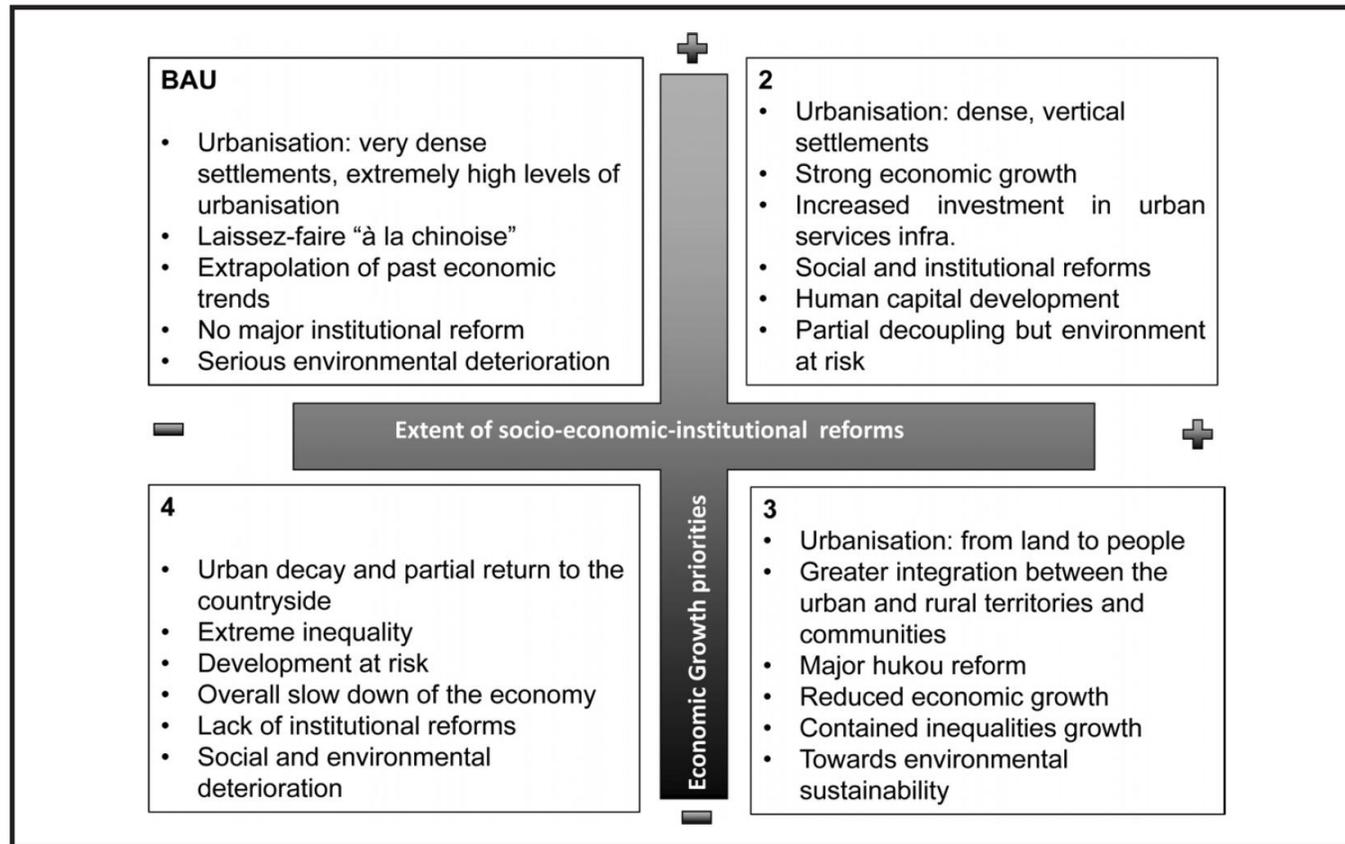
The 2 x 2 Matrix Method

- Rank these factors on two measures, impact and uncertainty, with the goal to find the two or three most impactful and uncertain factors
- Locate these two or three factors on a matrix.
 - If two factors, there would be four corresponding scenarios, if three factors, eight corresponding scenarios.
 - In the case of three axes, some combinations might be illogical, or it might make sense to merge one or more scenarios as the combinations produce very similar scenarios
 - Reduce the eight scenarios to a more manageable number
- Create scenario narratives based on the constraints of the produced matrix
 - When creating scenarios be careful not to forget those driving forces that were identified but were not chosen as critical uncertainties. Consider the behaviour of not just the forces along the matrix, but also of those forces outside of the matrix given the constraint of the matrix in that particular scenario quadrant



Examples of 2 x 2 Matrix

Figure 3 The URBACHINA scenario space



Crafting futures together: scenarios for water infrastructure asset management in a context of global change

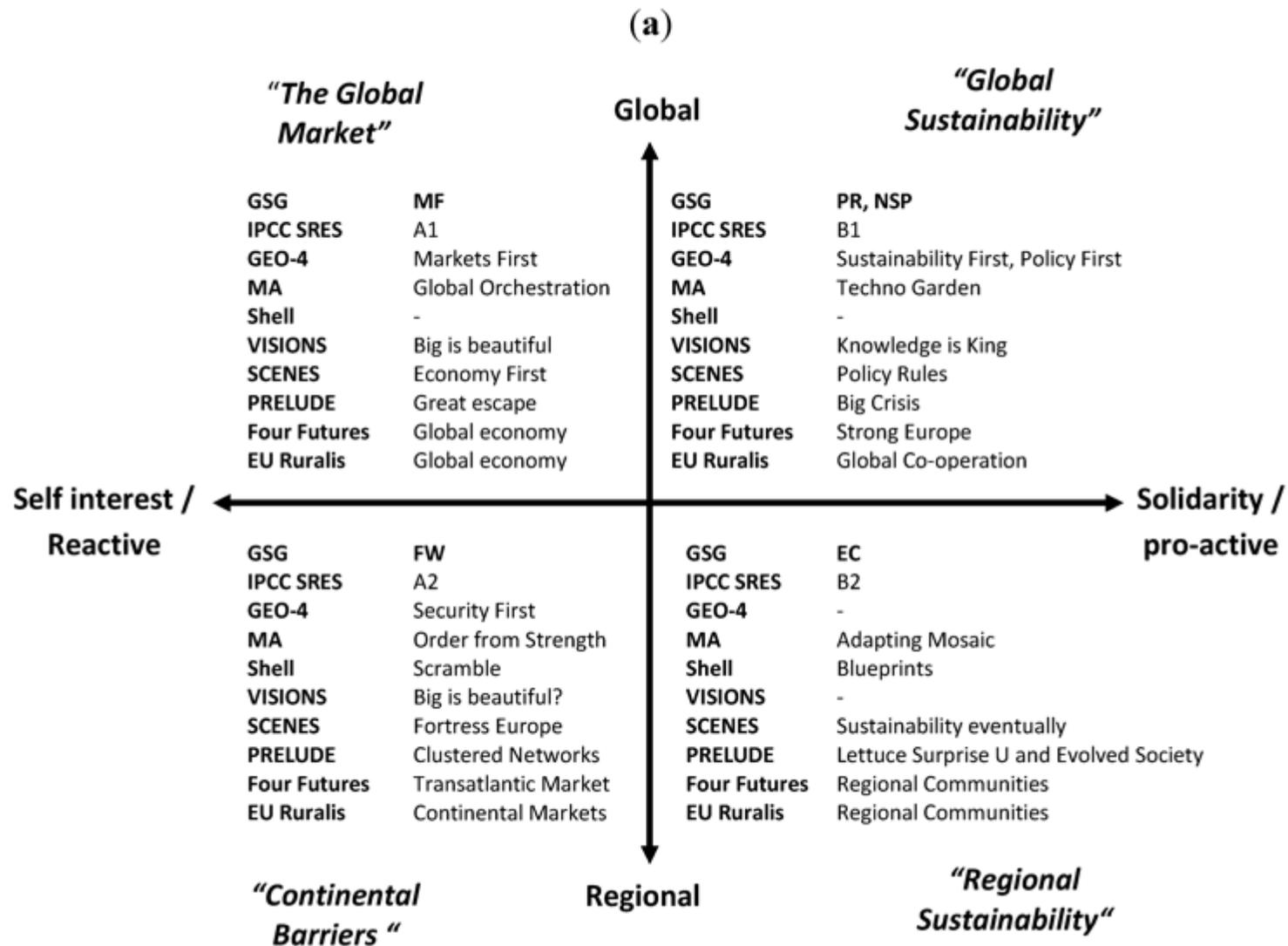
IPBES Architypes

Table 1. Overview of the original set of global archetypes and their underlying assumptions that were used as a starting point to classify scenarios within the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) regional assessments. The first column contains attributes typically used to describe scenario archetypes. Economic optimism scenarios focus on competition, efficient market, and economic growth; reformed market scenarios are similar to economic optimism but corrected for market failures; global sustainable development scenarios focus on environmental protection and reduction of inequality through global cooperation, lifestyle change using efficient technologies; regional competition scenarios feature regional self-reliance, national sovereignty and regional identity but also involve tensions with other regions; regional sustainability scenarios highlight globalization and international markets that are seen to erode traditional values and social norms; and finally business-as-usual scenarios that assume continuation of historical trends (Van Vuuren et al 2012, IPBES 2016). These were rationalized in the IPBES regional assessment (Biggs et al. 2018, Gundimeda et al. 2018, Harrison et al. 2018, Klatt et al. 2018.)

Attribute	Scenario Archetype					
	Economic optimism	Reformed markets	Global sustainable development	Regional sustainability	Regional competition	Business-as-usual
Economic development	Very rapid	Rapid	Ranging from slow to rapid	Medium	Slow	Medium
Population growth	Low	Low	Low	Medium	High	Medium
Technology development	Rapid	Rapid	Ranging from medium to rapid	Medium to rapid	Slow	Medium
Environmental technology development	Rapid	Rapid	Rapid	Ranging from slow to rapid	Slow	Medium
Main objectives	Economic growth	Various goals	Global sustainability	Local sustainability	Security	Not defined
Environmental protection	Reactive	Both reactive and proactive	Proactive	Proactive	Reactive	Both reactive and proactive
Trade	Globalization	Globalization	Globalization	Trade barriers	Trade barriers	Weak globalization
Policies and institutions	Policies create open markets	Policies targeted at market failures	Strong global governance	Local actors	Strong national governments	Mixed
Vulnerability to climate change	Medium-high	Low	Low	Possibly low	Mixed	Medium

Archetypes

GSG Archetype category	 Fortress World	 Market forces	 Policy reform	 Local sustainability	 Regional Sustainability
Main objectives	Security	Economic growth	Various goals	Local sustainability	Regional & global sustainability
Global population growth	High	Low	Low	Medium	Low
Global technology development	Slow	Rapid	Rapid	Ranging from slow to rapid	Ranging from mid to rapid
Global economic development	Slow	Very rapid	Rapid	Ranging from mid to rapid medium	Ranging from slow to rapid
Trade	Trade barriers	Globalization	Globalization	Trade barriers	Globalization
Policies and institutions	Strong national governments	Policies create open markets	Policies reduce market failures	Local steering; local actors	Strong global governance
Environmental management	Reactive	Reactive	Both reactive and proactive	Proactive	Proactive



If you want a recap

Watch this video:

<https://www.youtube.com/watch?v=vx2mu5FgsXQ>

How to choose

Alex Fergnani offers the following observations:

- The 4 archetypes method has been documented to be very quick to apply
- The 4 archetypes are also quite creative and frame breaking. Indeed, this method has been documented to enhance
- This method works best with younger audiences and audiences that are already familiar with disciplines such as storytelling and design.
- More senior audiences are more comfortable with the 2x2 method
- The 2x2 method, if done correctly, is a very comprehensive process made of many steps.
- This gives a feeling of model maturity, model legitimation, and model rigor, which will make the scenario planning process more easily accepted by such audiences

Open discussion, questions and comments

Recap

We have:

- Considered the four main types of scenarios and their uses
- Considered drivers - Indirect and direct
- Looked at three approaches to building scenarios

We have not looked at some of the tools and methods we need to use.



That's all folks

