

Scenarios to support decision-making

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Motivation

- Working with mitigation and adaptation decision-makers has been our starting point
- We find that in these situations, policy-makers often need a way to think about future conditions, and especially regarding exogenous factors outside their locus of control – but important for their decisions
- We realized that it may be useful to examine these decision-making contexts in more detail to identify key uncertainties that seem to matter; and the attributes of scenarios that would help decision-makers think through the implications of these uncertainties

Case 1: India's Low Carbon Expert Group

- **Origin / context:** Copenhagen Accord pledge and follow-up to the National Action Plan on Climate Change. Mandated to produce a road-map for low-carbon growth, with the Planning Commission as the client. Supported by the government, but not a formal inter-ministerial process
- **Framing:** Low-carbon development for inclusive growth – not mitigation, but policy choices that meet growth objectives with lower emissions; Explicit adoption of a co-benefits framework
- **Policy choices and the decision space:** Fuel prices; investments; regulations (example appliance standards, building codes); Determining level of climate mitigation desired – policy scenarios (determined effort – 23-25% emission intensity reduction by 2020, aggressive effort – 33-35% reduction)
- **Endogenous factors (criteria, variables):** Economic growth target (real GDP growth of 8-9% till 2020); Meeting demand projections;
- **Exogenous factors / uncertainties:** Technology availability & cost (particularly for renewables); Global and domestic growth projections (feasibility of growth target and dependence on global conditions); Resource distribution & availability (availability of oil, coal, gas); Policy / institutional issues (coal sector restructuring; geopolitics with regard to access to fossils; investment flows)

Framing: Inclusive growth and burden-sharing

Low-carbon policies that are inclusive need to be differentiated across sectors based on national priorities and transaction costs of implementing the policy. In sectors such as land, water and forests; livelihood considerations such as income generation and poverty alleviation must dominate our policy choice, even if it requires overriding carbon emission concerns. Who bears the burden and whether it is equitably distributed, need to be examined and considered explicitly during the formulation and implementation of low-carbon strategies

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Scenarios: Options for policy choices

1. Determined Effort [Lower End of the Emission Reduction Range]
Determined Mitigation Effort implies policies that are already in place or contemplated are pursued vigorously and implemented effectively up to 2020. This is by no means automatic as it requires continuous up-gradation of technology as well as finance from both public and private sources

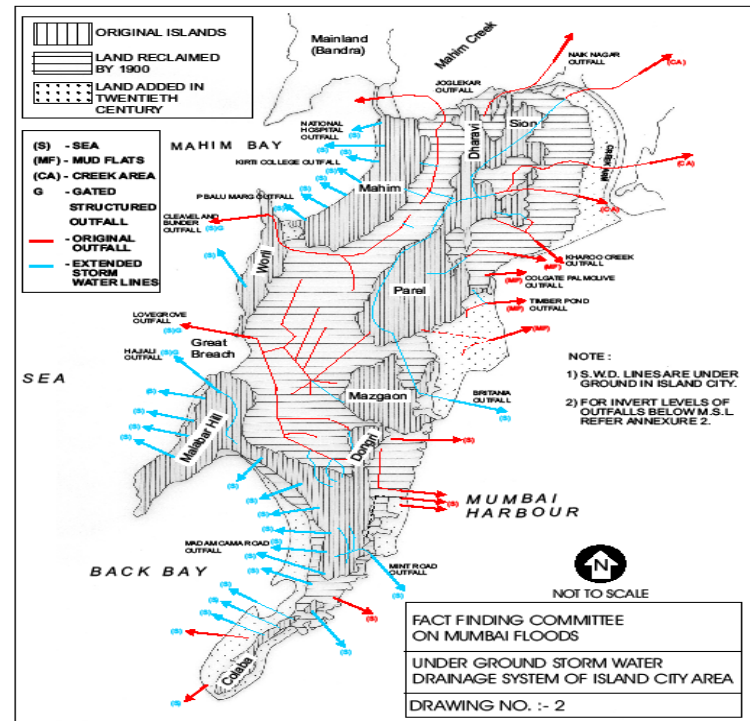
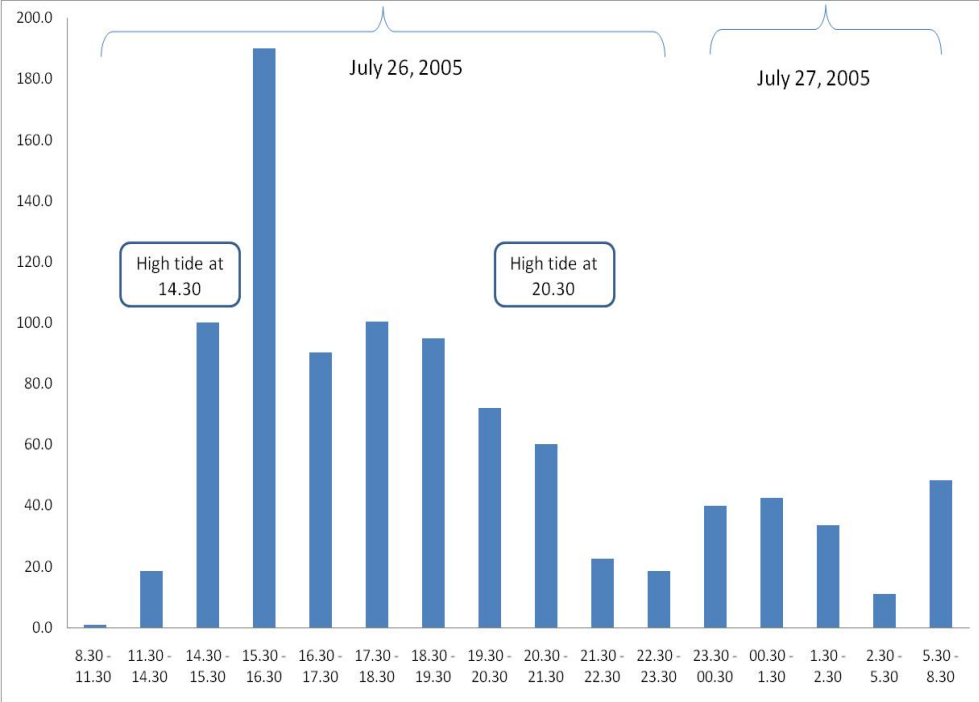
2. Aggressive Effort [Higher End of the Emission Reduction Range]
Aggressive Mitigation requires, in addition to the above, introduction as well as implementation of new policies. This requires new technology as well as additional finance

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Case 2: Responding to flooding in Mumbai

- **Origin (context):** Extreme precipitation in July 2005 (944 mm rainfall in 24 hours) led to massive flash floods; Development of local disaster management plan and revamping of the century old storm water drainage system; Monsoon flooding is a chronic hazard in Mumbai; Actual flooding a complex outcome of land use, pre-monsoon actions (drain cleaning), tidal state and rainfall
- **Framing:** Disaster management / mitigation; Slum redevelopment; City growth and changes in patterns of economic activity (and associated land-use) in the city
- **Policy choices and decision space:** Disaster management plan and institutional response (state and city government); Upgradation of storm water drainage system (city with local and central support); 30-year development plan (city); Major urban infrastructure investments (central and city)
- **Endogenous factors (decision criteria):** Costs and benefits of infrastructure investments; Observation & warning capability; Economic & non-economic losses with flooding – non-insured loss
- **Exogenous variables / uncertainties:** Population growth and distribution; Finance / investment constraints; Climate outcomes (sea level rise and precipitation); Coordination among city and state; Political pressures and policies for implementation (slum redevelopment); Private responses



Reference - Gazetteer of India, Maharashtra State, History of Bombay, Modern Period 1987



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Vulnerability: Are we measuring (and projecting) what matters?

Public sector (municipal) losses: \$55 million

Insured losses (approximate): \$400 million

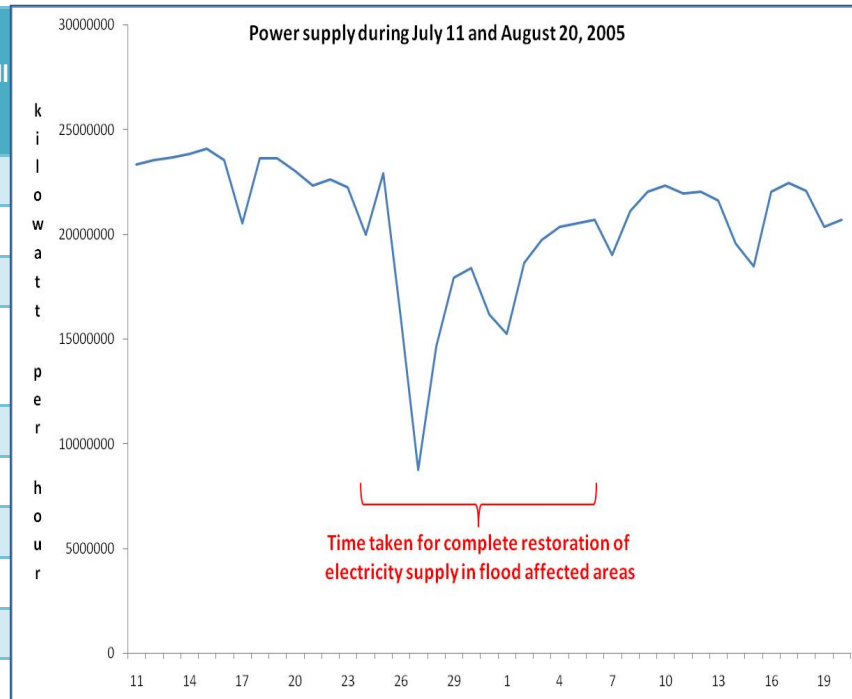
Household losses (uninsured, primary survey, likely underestimate): \$270 million

Business losses (uninsured, primary survey, likely underestimate): \$150 million

Indirect effects

Problem	% among surveyed households (n=1168)	% among surveyed commercials & small industries (n=792)
House/office flooded with water	70	82
Non-availability of local transportation	87	82
Price rise of essential commodities	67	65
Non-availability of food and other household supplies	62	-
Non-availability of raw materials	-	56
Disruption in communication services	61	66
Disruption of electricity	83	88
Non-availability of clean drinking water	75	79
House flooded with sewerage/garbage	80	-
Non-availability of fuel	51	46.5

Impact vs. recovery



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Adaptation: Private response – are we observing (and analyzing) what matters?

Item	% of commercial & industrial establishments (n=792)
Increase the height of the surrounding plot	72.9
Reconstruction with stilt parking	12.5
Repairing and/or elevating electrical meters	50.1
Repairs inside the office premises	42.6
Repairs outside the office premises	17.2
Repairs done to elevate and protect inventory	7.3

Small business / commercial responses

Household responses

Item	% of households (n=1168)
Increasing height of surrounding ground	42
Reconstruction of house with stilt parking	11
Repairing & elevating electrical meters	27
Repairs inside house to elevate furniture	31
Repairs inside house to elevate electronic gadgets	33
Repairing/ modifying toilets	11

Case 3: Electricity system planning (US ISO's)

- **Origin / context:** stakeholder engagement in model development project: independent system operators, utilities, regulatory agencies, bioenergy and agricultural interests, consumer and environmental groups
- **Framing:** Evolution of electric system including implications of climate policy options, socioeconomic conditions, and climate change for choice of generation technology, transmission requirements, etc.
- **Policy choices and decision space:** investment decisions in generation and transmission capacity; plant up-grades; investment in bioenergy production
- **Endogenous factors (decision criteria):** electricity prices, crop prices, employment impacts, GHG emissions
- **Exogenous conditions/uncertainties:** demographic and economic conditions; oil and gas prices; technology cost and performance; EPA regulations (e.g., coal ash disposal); cooling water regulations/temperatures; agriculture commodity prices
 - Factors affected by interactions at regional, national, and even global scale

Key exogenous factors & uncertainties

- Demographics & progress towards development goals
- Magnitude & distribution of growth
- Policy and institutional context and public & private response
- Technology / resource price and performance
- Climate / environmental outcomes

Approaches

- Parametric analysis
- Uncertainty analysis
- Scenario-based exploration

Parametric approach

- Vary uncertain factors jointly to develop a few scenarios with combinations of high and low values that affect demand, supply, and/or price of inputs or outputs, and / or exposure / hazard
- Test for plausibility, i.e., do not include combinations that defy logic
- Evaluate against a (limited number) of cases – reference and policy

Key Uncertainties	Variables	Base case	Worst case
Climate outcomes	Sea level rise; 24-hour precipitation	Choices & outcomes	Choices & outcomes
Development outcomes	Housing stock; Slum population; Sanitation	Choices & outcomes	Choices & outcomes
Policy & institutional context	Development plan includes SLR; Implementation of DRM	Choices & outcomes	Choices & outcomes

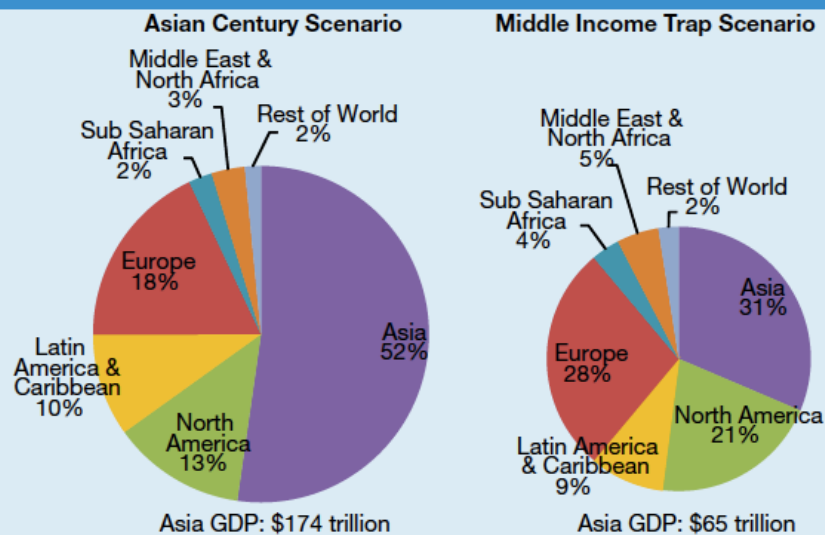
Narrative/quantitative scenarios

- Explore points of divergence in global outcomes
- Address three sets of inter-related uncertainties:
 - Economics/demographics
 - Technology price/performance
 - Policy
- Provide an underlying logic for assumptions and values for driver variables
- Provide approach for communicating with high level decision makers
- Do not consider climate or other environmental aspects but incorporate these through climate scenarios

Key sources of divergence in global outcomes

- Global growth: Magnitude and distribution and the role of emerging markets
 - ADB: The Asian Century vs. the Middle Income trap
 - McKinsey: Emerging markets as the engines of global growth
- Governance & power: Concentrated, top-down and organized vs. Distributed, bottom-up and sometimes chaotic
 - Shell: Mountains vs. Oceans
- Balance between social progress and growth:

Asian Century vs. Middle Income Trap



Source: Centennial Group International projections, 2011. Figures use market exchange rates (MER).

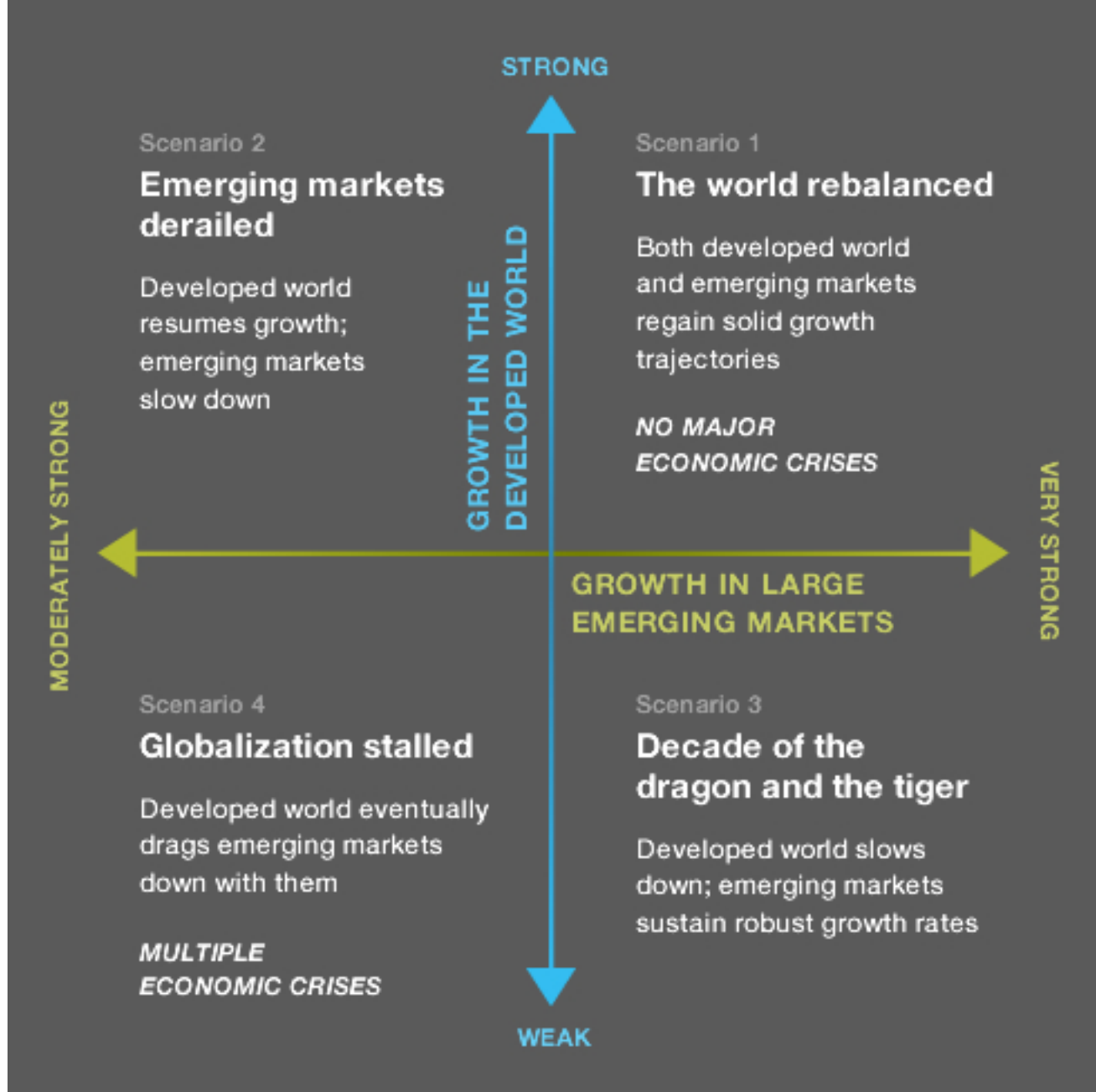
Scenarios for Asia in 2050 (ADB, 2011)

Table 1 Economic 2050 outcomes under two scenarios—Asian Century and the Middle Income Trap

Share of Global GDP (MER)	Asian Century	Middle Income Trap
Asia	51%	32%
PRC	22%	11%
India	14%	6%
United States	14%	21%
GDP (trillions \$ MER)		
Asia	148	61
PRC	63	21
India	40	12
United States	40	40
World	292	191
GDP per capita (\$ PPP)		
Asia	38,600	20,300
PRC	47,800	23,700
India	41,700	17,800
United States	98,600	98,600
World	36,600	25,900

Source: Centennial Group projections, 2011.

McKinsey scenarios (2011)



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- **Balance between social progress and growth**

Progress towards the MDG's / social goals

Conventional economic progress may be slow, but effective governance and institutions ensure progress towards social goals

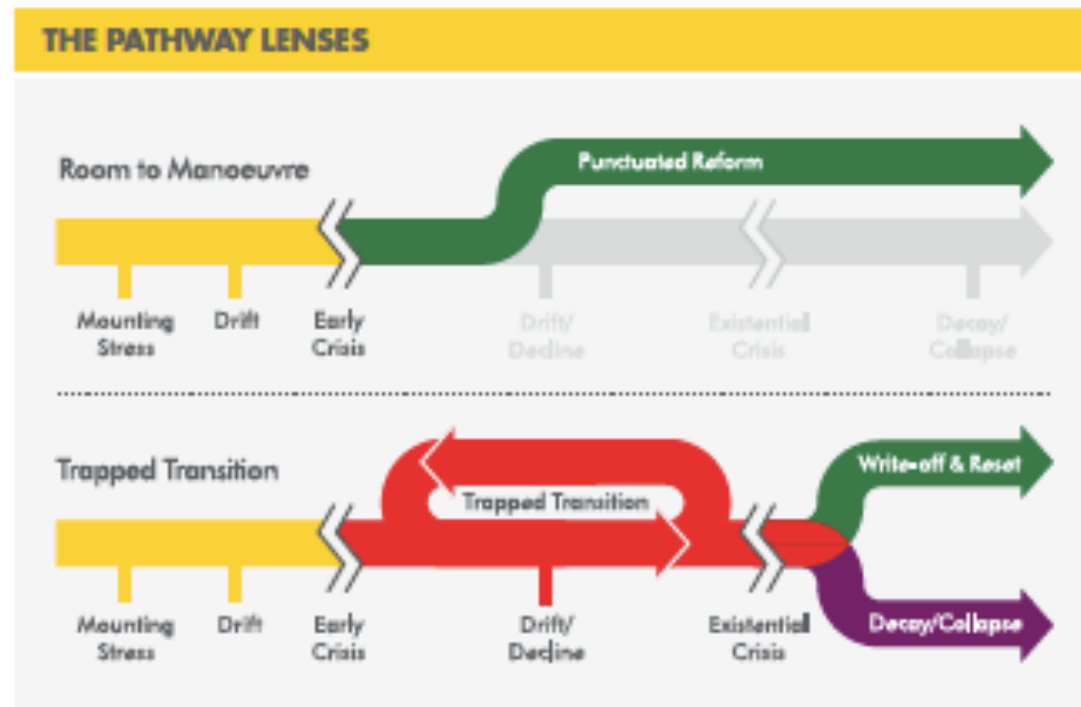
Economic progress goes together with strong improvement in social indicators

Growth
(magnitude & distribution)

Weak economic progress is combined with lack of progress in social indicators lead to a future with large developmental challenges including poverty and inequality

Economic growth may be rapid, but may be concentrated and not widespread, and is prioritized over social goals leading to questions about its sustainability and ability to meet developmental challenges

Scenarios for end state or scenarios for the dynamics of the pathway?



Source: New lens scenarios from Shell

Where do we need to go? Expectations

- Scenario logic is translatable across different scales of decision-making (spatial, institutional)
- Users can tailor the logic to their own needs – avoid over-specification, be minimalist
- Ability to lead to divergent, but not implausible futures – capture the points of divergence
- Provides a logic and framework that helps users place their decisions and choices in the broader context