Integrating facts and values to support robust decision-making

OREGON BOARD OF FORESTRY WORKSHOP

7 NOVEMBER 2019

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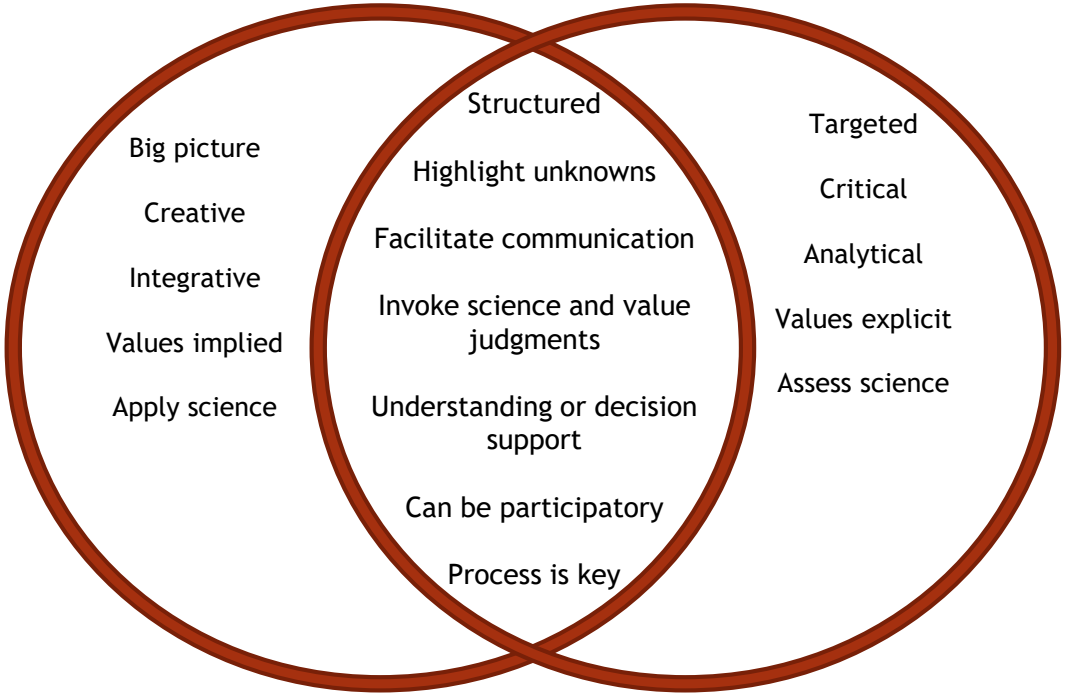
Agenda

- Focused assessments: argument analysis ~90 minutes
  - Introductory presentation with exercises ~40 minutes
  - Workshop ~40 minutes
  - Report out ~10 minutes
- Long-term strategy: scenario planning ~90 minutes
  - Introductory presentation ~30 minutes
  - Scenario exercise 1 ~30 minutes
  - Scenario exercise 2 ~30 minutes

Decision support in the face of wicked environmental problems

Scenario planning

- Complex, dynamic social-ecological systems riddled with uncertainty
- Requires systems-level thinking and planning



Argument analysis

- Diverse stakeholders with diverse values
- Requires transparency regarding the values that inform decisions

What is argument analysis?

Objectives:

- To **understand** the underlying claims/assumptions (scientific and normative) that are embedded in proposed management actions

- To **evaluate** proposed management actions by determining whether/to what extent they are supported by sound reasoning

- To create **transparency** by explicitly articulating both the facts and values that underpin proposed management actions

What is argument analysis?

Process:

1. State the question
2. Create a table of reasons
3. Formulate an argument
4. Evaluate the argument
5. Return to the table of reasons
6. Reflect

What is an argument?

Arguments are comprised of

- Premises: claims/propositions, which together lead to
- Conclusion (descriptive or prescriptive)

P1. All Douglas firs are conifers.

P2. All conifers produce cones.

C. Therefore, all Douglas firs produce cones.

What is an argument?

FOR A SOUND ARGUMENT

All premises must be true/appropriate

P1. All Douglas firs are trees.

P2. All trees have leaves.

C. Therefore, all Douglas firs have leaves.

What is an argument?

FOR A SOUND ARGUMENT

All premises must be true/appropriate

Conclusion must follow from premises (validity)

P1. All Douglas firs are trees.

P2. Some trees have leaves.

C. Therefore, all Douglas firs have leaves.

The practical syllogism

P1. Statement of fact

P2. Statement of value

C. Prescriptive conclusion about what ought to be done.

P1. Spotted owls are threatened.

P2. Threatened species ought to be protected.

C. Therefore spotted owls ought to be protected.

A more complex argument

"We should use ecological forestry to manage our PNW forests. Ecological forestry balances economic, environmental, and social objectives, and forest management in the 21st century must be sustainable to maintain healthy, resilient landscapes."

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P2. Ecological forestry balances ecological, economic, and social objectives.

C1. Therefore, ecological forestry is sustainable forest management.

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P2. Ecological forestry balances ecological, economic, and social objectives.

C1. Therefore, ecological forestry is sustainable forest management.

P3. If we practice sustainable forest management, the resilience of the PNW landscape is maintained.

C2. Therefore, if we practice ecological forestry in the PNW, the resilience of the PNW landscape is maintained.

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C2. Therefore, if we practice ecological forestry in the PNW, the resilience of the PNW landscape is maintained.

P3. We should maintain the resilience of the PNW landscape.

C3. Therefore, we should practice ecological forestry in the PNW.

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C2. Therefore, if we practice ecological forestry in the PNW, the resilience of the PNW landscape is maintained.

P3. We should maintain the resilience of the PNW landscape.

C3. Therefore, we should practice ecological forestry in the PNW.

Hmmm…

P1 (C2). If we practice ecological forestry in the PNW, the resilience of the PNW landscape is maintained.

P2 (P3). We should maintain the resilience of the PNW landscape.

C(C3). Therefore, we should practice ecological forestry in the PNW.

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P1. If A, then B. → P1. If we clearcut the entire landscape, short-term fire hazards will be reduced.

P2. O(B) → P2. Short-term fire hazards should be reduced.

P3. O(A) → C. Therefore, we should clearcut the entire landscape.

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P3. O(A) → C. Therefore, we should clearcut the entire landscape.

The ends don't NECESSARILY (logically) justify the means!

Let's try!

P1. OLD-GROWTH FORESTS CREATE MICROCLIMATES THAT BUFFER BIRD POPULATIONS AGAINST THE EFFECTS OF CLIMATE CHANGE.

C. THEREFORE, WE SHOULD PRESERVE OLD-GROWTH FORESTS.

Let's try!

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C. THEREFORE, WE SHOULD PRESERVE OLD-GROWTH FORESTS.

Let's try!

P1. IF WE DE-COMMISSION DAMS ON THE SNAKE RIVER, SALMON POPULATIONS WILL RECOVER.

P2. SALMON POPULATIONS SHOULD RECOVER.

C.

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AFFIRMING THE CONSEQUENT - INVALID

P1. IF A, THEN B.

P2. B.

C. THEREFORE, A.

Let's try!

P1. IF WE DE-COMMISSION DAMS ON THE SNAKE RIVER, SALMON POPULATIONS WILL RECOVER.

P2. WE SHOULD DE-COMMISSION DAMS ON THE SNAKE RIVER.

C. THEREFORE, SALMON POPULATIONS SHOULD RECOVER.

MODUS PONENS

P1. IF A, THEN B.

P2. A.

C. THEREFORE, B.

Let's try!

P1. IF THE COLUMBIA RIVER GORGE IS SALVAGE LOGGED, FIRE FUELS WILL BE REDUCED.

P2. THE COLUMBIA RIVER GORGE SHOULD NOT BE SALVAGE LOGGED.

C.

Let's try!

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C. THEREFORE FIRE FUELS SHOULD NOT BE REDUCED.

DENYING THE ANTECEDENT

P1. IF A, THEN B.

P2. NOT A.

C. THEREFORE, NOT B.

Let's try!

P1. IF THE COLUMBIA RIVER GORGE IS SALVAGE LOGGED, FIRE FUELS WILL BE REDUCED.

P2. FIRE FUELS SHOULD NOT BE REDUCED.

C. THEREFORE, THE COLUMBIA RIVER GORGE SHOULD NOT BE SALVAGE LOGGED.

MODUS TOLLENS

P1. IF A, THEN B.

P2. NOT B.

C. THEREFORE, NOT A.

What is argument analysis?

Process:

1. State the question
2. Create a table of reasons
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5. Return to the table of reasons
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Question: should we use ecological forestry to manage federal forestlands in western Oregon?

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Table of Reasons

Yes, we should	No, we should not
Mimics natural processes	Harms late-successional species
Increases timber production	Slows old-growth restoration
Creates complex early seral	Doesn't create complex early seral
Balances multiple objectives	Not feasible
Enhances landscape heterogeneity	Unknown consequences
Compatible with old-growth restoration	Removes carbon

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Question: should we use ecological forestry to manage federal forestlands in western Oregon?

P1. Increasing timber production would increase revenue and employment for rural OR communities.

P2. Ecological forestry on federal forestlands in western OR would increase timber production.

C1. Therefore, ecological forestry on federal forestlands in western OR would increase revenue and employment for rural OR communities.

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C1. Therefore, ecological forestry on federal forestlands in western OR would increase revenue and employment for rural OR communities.

P3. Forest management practices that would increase revenue and employment for rural OR communities should be implemented.

C2. Therefore, ecological forestry on federal forestlands in western OR should be implemented.

Question: should we use ecological forestry to manage federal forestlands in western Oregon?

Argument Table

Premise	Type of premise	True or appropriate?	Controversial?
P1. Increasing timber production on federal forestlands in western OR would provide revenue and employment for rural OR communities.	Descriptive (economic)	Probably	Somewhat
P2. Ecological forestry would increase timber production on federal forestlands in western OR.	Descriptive (proposed)	Yes	No
C1. Therefore, ecological forestry would provide revenue and employment for rural OR communities.			
P3. Forest management practices that would increase revenue and employment for rural OR communities should be implemented.	Normative		
C2. Therefore, ecological forestry should be implemented on federal forestlands in western OR.			

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Question: should we use ecological forestry to manage federal forestlands in western Oregon?

P1. Historic changes in forest management decreased revenue and employment for rural OR communities.

P2. Decreased revenue and employment caused significant harms for rural OR communities.

P3. These harms should be redressed.

P4. Implementing management practices that increase revenue and employment for rural OR communities would redress these harms.

C. Therefore, forest management practices that would increase revenue and employment for rural OR communities should be implemented.

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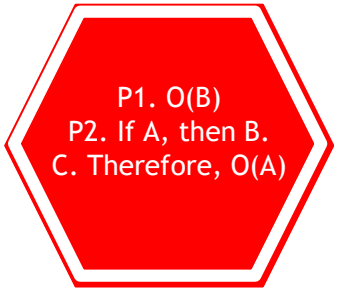

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C. Therefore, forest management practices that would increase revenue and employment for rural OR communities should be implemented.

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C1. Therefore, ecological forestry would provide revenue and employment for rural OR communities.			
P3. Forest management practices that would increase revenue and employment for rural OR communities should be implemented.	Normative	Defensible but debatable	Yes
C2. Therefore, ecological forestry should be implemented on federal forestlands in western OR.			

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Argument analysis can

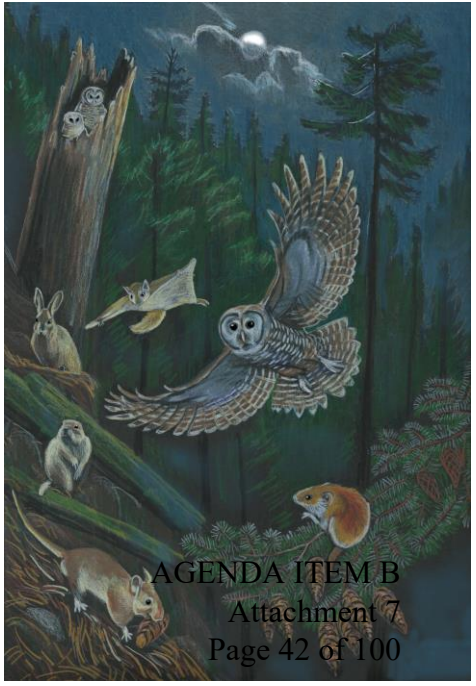
- Clarify the premises underlying management proposals
- Create a platform for dialogue between scientists, stakeholders, and decision-makers
- Enhance the openness and transparency of decision-making deliberations
- Reveal key knowledge gaps
- Highlight shared values and reveal points of contention

Argument analysis cannot

- Tell you what to do
- Resolve conflicts of value

Workshop: should we use lethal management to control Barred Owl populations in the PNW?

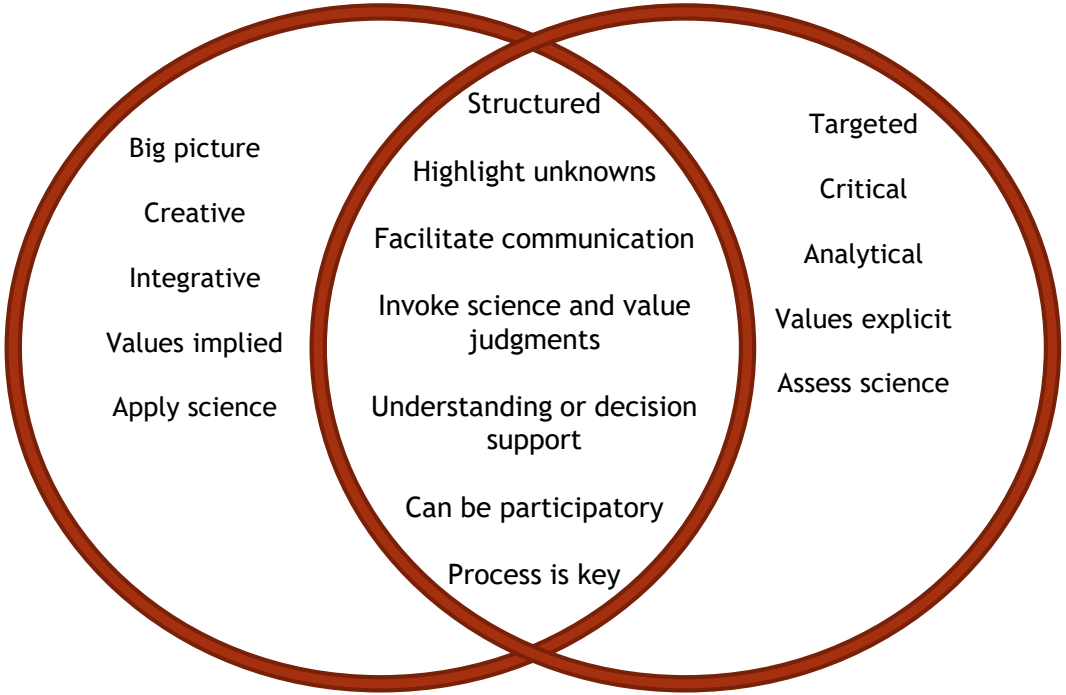
1. Create a table of reasons
2. Formulate one argument
3. Evaluate the argument
4. Secondary argument, if time
5. Reflect



Decision support in the face of wicked environmental problems

Scenario planning

- Complex, dynamic social-ecological systems riddled with uncertainty
- Requires systems-level thinking and planning



Argument analysis

- Diverse stakeholders with diverse values
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What is scenario planning?

- “Scenario planning involves thinking about a wide range of plausible futures, factoring in both well-known trends and uncertainties, and using this information to provide a set of story lines that can guide decision making.” (Bennett et al. 2003)

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- "Scenario planning is a systematic method for creatively analyzing complex futures." (Enfors et al. 2008)

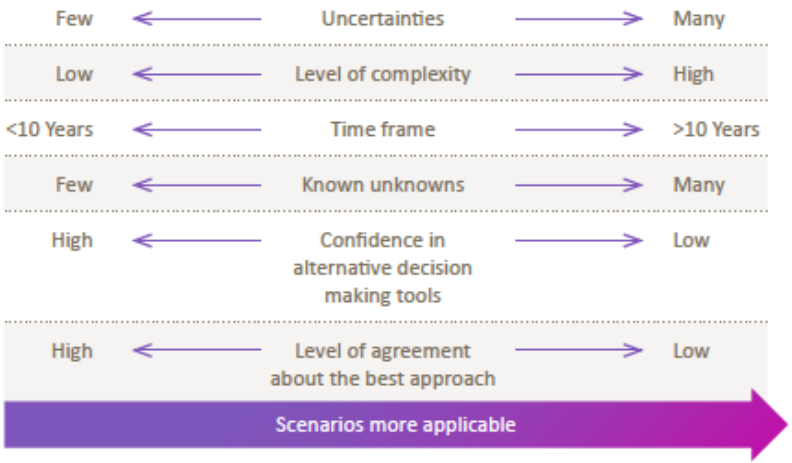
What is scenario planning?

"Scenario analysis is a means of characterizing the future and its uncertainties through structured, but imaginative thinking as a process that pushes us beyond the axioms and norms that are the constraints of conventional wisdom" (Rounsevell and Metzger 2010)

What is a scenario?

- Scenarios are plausible narratives depicting alternative pathways to the future (Bohensky et al. 2006)

- Scenarios are NOT
  - Predictions
  - Projections
  - Generally associated with probability or likelihood of occurrence



Wiseman et al. 2011

Why scenario planning?

1. Understanding and outreach

2. Scientific research

3. Decision support and strategic planning

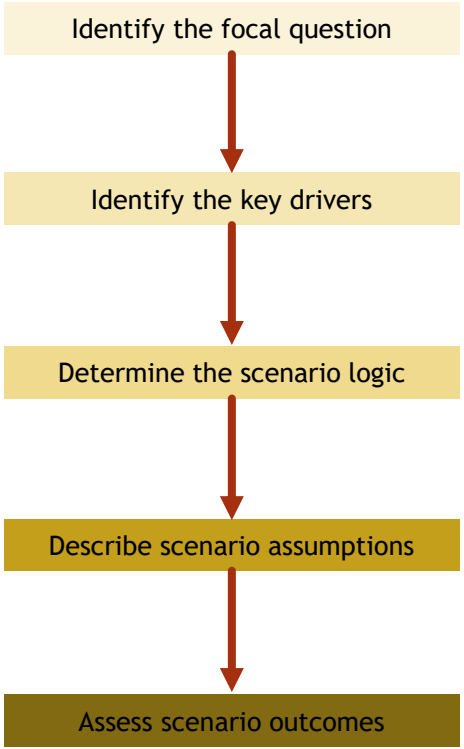
Wiseman et al. 2011

Process

Phase 1: Preparation and scoping

Phase 2: Build and refine scenarios

Phase 3: Use scenarios



Rowland et al. 2014

Rounsevell and Metzger 2010

Preparation and scoping

- What are the objectives?
- What is the scope of the exercise?
- Who is the intended audience?
- How will you approach the exercise?
- Who will participate?
- How far into the future will you consider?
- How long will the process take?
- What are the final products, and how will they be shared?

Dimensions of variability	Range of variation	
Purpose	Exploratory	Decision support
Motivation	Scientific inquiry	Policy support
Focus	Process	Outcome
Inclusion of norms	Normative	Descriptive
Approach	Quantitative	Qualitative
Information source	Formal, scientific	Local, intuitive
Uncertainty	Low	High
Focal scales	Single	Multiple
Links between scales	Loosely linked	Tightly coupled
Storylines	One	Multiple
Starting point of story	Future (backcasting)	Present
End point of story	Future snapshot	Story of events
Drivers	Exogeneous/external	Endogenous/internal
Dynamics	Simple	Complex
Stakeholders	Active participants	Objects of analysis
Outreach	No communication	Extensive

Oregon State University

Biggs et al. 2007

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Participatory scenario planning

Usually stakeholders are involved:

- In constructing scenarios
- In evaluating scenarios, and/or
- In supporting decision-making based on scenarios

BENEFITS INCLUDE:

Increase perceived legitimacy

Capacity building

Sense of ownership

Enhanced equity

Opportunity for idea exchange and social learning

Learn about fears/expectations of stakeholders

DRAWBACKS INCLUDE:

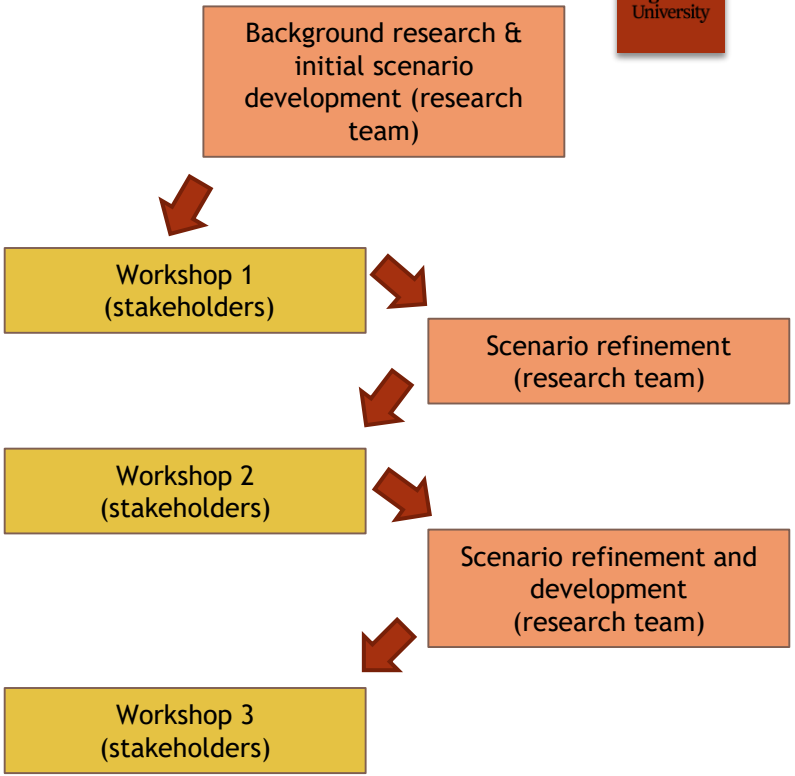
Time/resources

Tradeoff with scientific credibility

Kok et al. 2007; Enfors et al. 2008; Reed et al. 2013; McBride et al. 2017

Participatory scenario planning

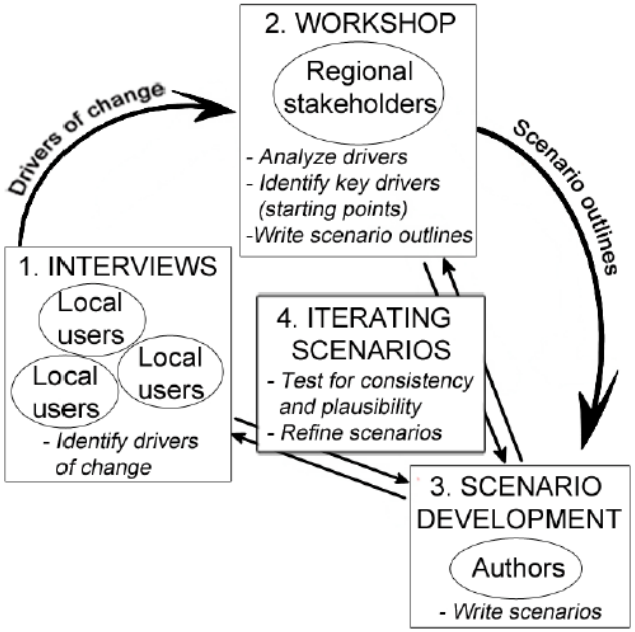
LOW ENGAGEMENT



Cairns et al. 2016

Participatory scenario planning

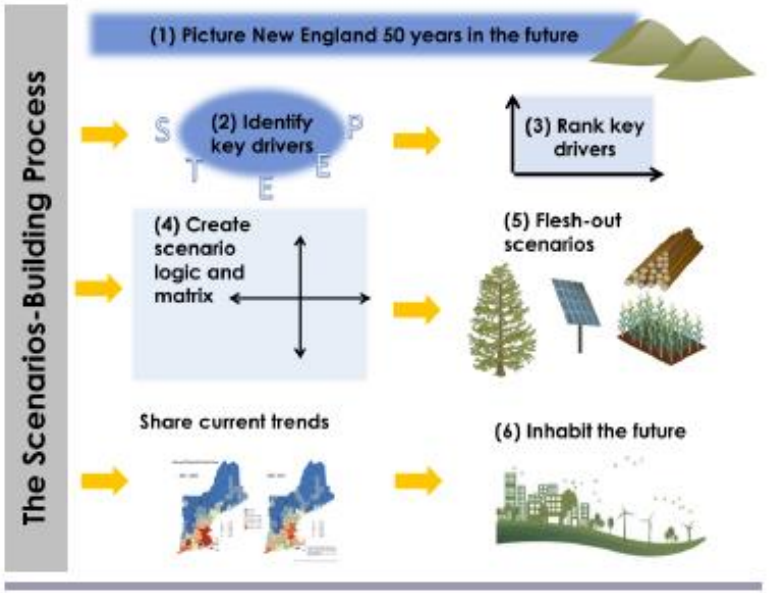
MODERATE ENGAGEMENT



Malinga et al. 2013

Participatory scenario planning

HIGH ENGAGEMENT



McBride et al. 2017

Formulating focal questions

New England Landscape Futures Project (McBride et al. 2017):

- How might the New England landscape change over 50 years?
- What are possible consequences for people and nature?
- What actions could help sustain important resources in the face of change?

Formulating focal questions

Minnesota 2050 (Johnson et al. 2012):

- How are we interacting with the landscape and natural resources in 2050, and how is the environment affecting our quality of life?

Formulating focal questions

Often questions pertain to:

- Climate change
- Ecosystem services
- Land use/land cover
- Water
- Energy

Identifying drivers

- Organizing frameworks
  - STEEP: Social, Technological, Economic, Environmental, Political
  - INSPECT: natural, social, political, economic, cultural, technological

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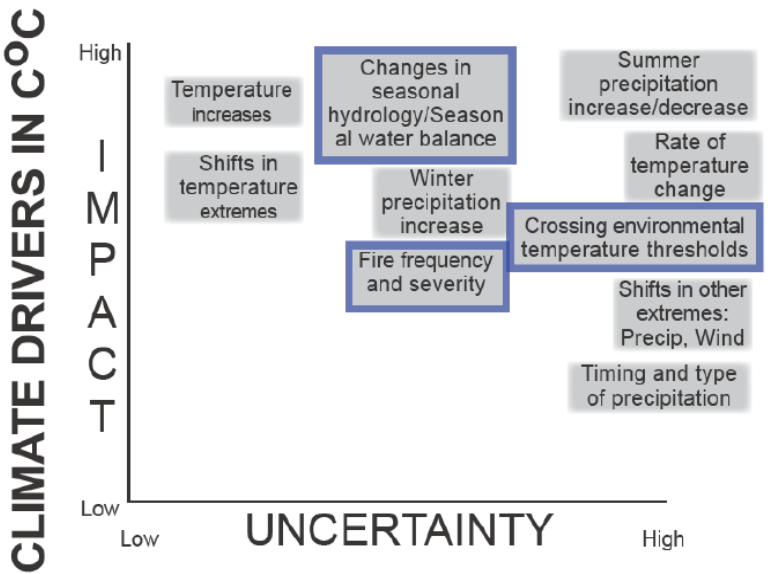
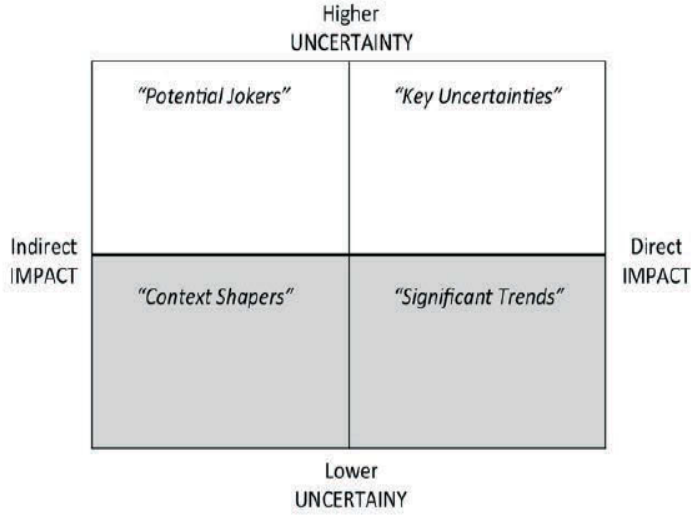
Identifying drivers

- Organizing frameworks
  - STEEP: Social, Technological, Economic, Environmental, Political
  - INSPECT: natural, social, political, economic, cultural, technological
- Can be expert-driven or inductive (e.g., based on stakeholder interviews/surveys)
- Select drivers with high impact and uncertainty

Identifying drivers





Rowland et al. 2014

Identifying drivers

Cross-impact analysis

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Score
T1		3	3	3	2	3	3	2	1	2	22
T2	0		3	0	3	0	2	0	1	2	11
T3	1	1		0	0	0	2	1	0	0	5
T4	2	2	3		3	2	3	1	1	2	19
T5	0	2	3	0		0	2	1	1	3	12
T6	2	1	3	1	1		1	0	1	2	12
T7	1	2	2	2	2	1		3	2	3	18
T8	2	3	3	1	1	0	3		1	2	16
T9	2	1	0	2	1	2	2	2		1	13
T10	3	3	3	3	3	0	2	2	1		20

Highest Score: T1, T4, T7, and T10

0 Independent 1 Dependent
2 Slight Impact 3 Strong Driver

Amer et al. 2013

Drivers and Impacts Table

Rocky Mountain Divide - Climate Change Driver Projections to 2050

Climate Variable	Trend	Relative Change by 2050	Projections for 2050s	Confidence	Uncertainty (H/M/L)	Consequence (H/M/L)	Source / Comments
Temperature (change from 1960-1990; x ± SD)	↑	Large	2.7 ± 0.7 C (4.9 ± 1.3 F) Warming greater in summer	Very likely	Trend: L Value: H		CMIP3 ensemble for 1 degree cell including RMNP*
Extreme high temperatures	↑	Large	1-in-20 year mean maximum temperature Likely to increases by 2-3 C (3.6 -5.4 F). 1-in-20 year maximum temperature events Likely to occur 1-in-2 to 1-in-4 years.	Likely	Trend: L Value: H		IPCC 2012
Mean precipitation (% change from 1960-1990; x ± 1 sd)	↔	Small	1 ± 7.2 %	About as likely as not	H		CMIP3 ensemble for 1 degree cell including RMNP*
Evaporation	↑	Moderate	Increase due to temperature; difficult to quantify	Likely	M		Evapotranspiration may increase 20-30% at higher elevations (BOR 2012)
Intense precipitation events	↑	Moderate	"Marked" increase in 24-hr precipitaton for 2040-2070 period. 50-70% increase in event maxima.	Likely	M		IPCC 2012; Mahoney et al. 2012
Snowfall (April 1 SWE)	↓	Moderate?	2050: -15 to -30%	Likely	M		Christensen & Lettenmaier 2006; BOR 2012; Gangopadhyay & Pruitt. 2011
Streamflow	↔	Small	No change to slight decrease	About as likely as not	H		BOR 2012; Evapotranspiration may increase 20-30% at higher elevations (BOR 2012: B57ff)
Drought	↑	Moderate?	Difficult to quantify. Likely result of higher temperatures, increased evaporation, and perhaps increased variation in precipitation.	Likely	H		IPCC 2012
Hail	↓	Large	Almost complete elimination of surface hail	Likely	M		Mahoney et al. 2012

Rowland et al. 2014

Policy Scenario Narrative	Policies
Status Quo: continue present day policies	• Determine urban/community growth boundaries in accord with present-day policy • Maintain current BPS, and allow more on eligible lots
Hold the Line: Policies resist environmental change to preserve existing infrastructure and human activities	• Determine U/CGB in accord with present-day policy • Maintain current BPS, and allow more on eligible lots • Add beach nourishment where beach access in front of BPS is lost • Construct new building/development only on lots eligible for BPS construction • Construct new buildings above FEMA Base Flood Elevation, plus 3 ft. and in safest site of each lot
ReAlign: Policies shift development to suit the changing environment	• Determine U/CGB in accord with present-day policy, but prevent new development in coastal hazard zones • Prohibit construction of BPS on additional properties, but maintain previously constructed BPS • Construct new buildings above FEMA BFE, plus additional 3 ft. and in safest site of each lot • Remove buildings impacted repeatedly by coastal hazards in the hazard zone, and establish conservation easements • Inventory lots outside coastal hazard zone and re-zone to permit future higher density development in U/CGB
Laissez-Faire: Current policies relaxed so development trumps protection of coastal resources, public rights, creational use, beach access, and scenic views	• Permit increased proportion of development outside U/CGB • Eliminate BPS construction requirements
Hybrid: Policies are in accord with expressed preferences of Tillamook County stakeholders, and which involve shifting development to suit changing environment	• Determine U/CGB in accord with present-day policy, but with development restrictions in coastal hazard zones • Prohibit construction of BPS on additional properties, but maintain previously constructed BPS • Construct new buildings above FEMA BFE, plus additional 3 ft. and in safest site of each lot • Remove buildings impacted repeatedly by coastal hazards in the hazard zone, and establish conservation easements • Inventory lots outside coastal hazard zones and re-zone to permit future higher density development in U/CGB • Require movement of buildings frequently impacted by coastal hazards to location above FEMA BFE, plus additional 3 ft. and in safest site of each lot. If building again impacted by coastal hazards, remove it from the hazard zone and establish easements.

Mills et al. 2018

Scenario logics

"Scenario logic provides order to a range of potentially divergent issues, and in doing so allows comparison across different narratives"
(Rounsevell and Metzger 2010)

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Trying to create marked divergence between scenarios, and challenge preconceptions about the future

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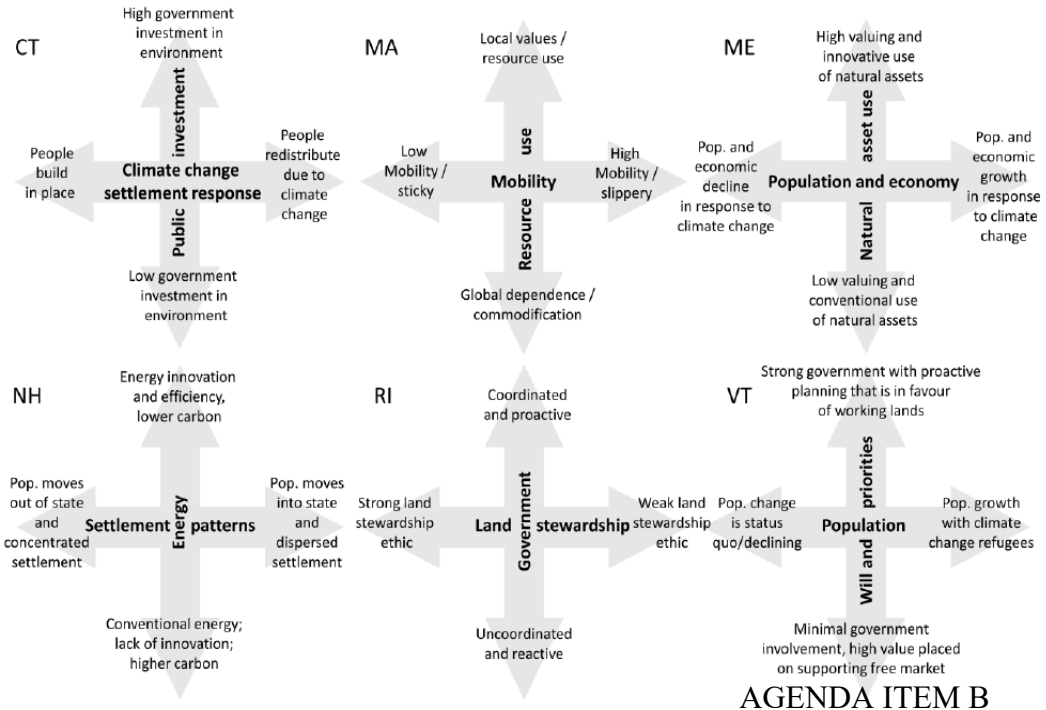
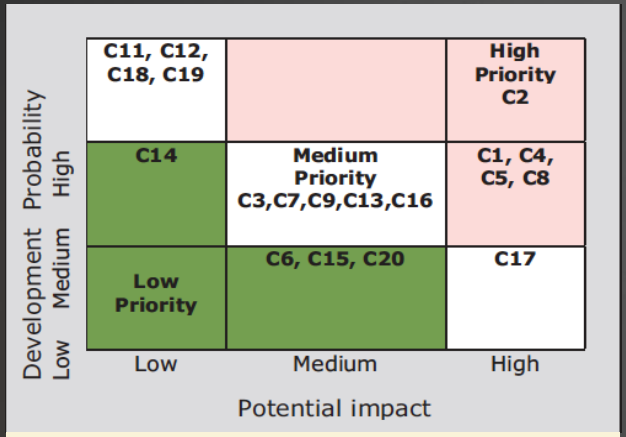
Trying to create marked divergence between scenarios, and challenge preconceptions about the future

2 x 2 Matrix



McBride et al. 2017

Scenario logics



Wilson matrix

Morphological analysis

Variations	C 1 Economic growth	C 2 Growing energy demand	C 4 Increasing cost of energy	C 5 Design innovations	C 8 Favoring government policies
Variation A	1A: economic growth in country	2A: Increased energy demand	4A: Increase in energy cost	5A: Design innovations in wind turbine	8A: Favoring policies for wind by the government
Variation B	1B: No economic growth	2B: No increase in energy demand	4B: energy cost remains stable	5B: No design innovations takes place	8B: Favoring policies are not adopted

Input Vector 2
1B-2B-4B-5B-8A

Input Vector3
1B-2A-4A-5A-8B

InputVector 1
1A-2A-4B-5B-8B

Amer et al. 2013

Scenario logics

Driver	Better/more	Don't know	Worse/less
Access to new agricultural techniques	100%	-	-
Health	50%	34%	16%
Local governance	63%	25%	12%
Access to higher education	100%	-	-
Work ethics/family values	38%	50%	12%
National economy	75%	22%	3%
Infrastructure	88%	9%	3%
Access to credit and savings opportunities	84%	13%	3%
Collective action	69%	31%	-
Climate	9%	57%	34%

Enfors et al. 2008

Scenario logics

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Enfors et al. 2008

Scenario logics

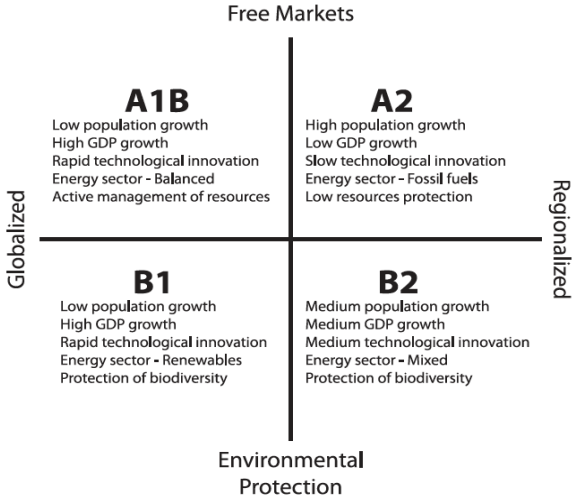
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Local governance	Worse	Worse	Better	Undefined
National economy	Better	Undefined	Undefined	Better
Climate	Better	Worse	Worse	More variable
Health	Undefined	Undefined	Better	Better
Work ethics/family values	Worse	Undefined	Better	Worse

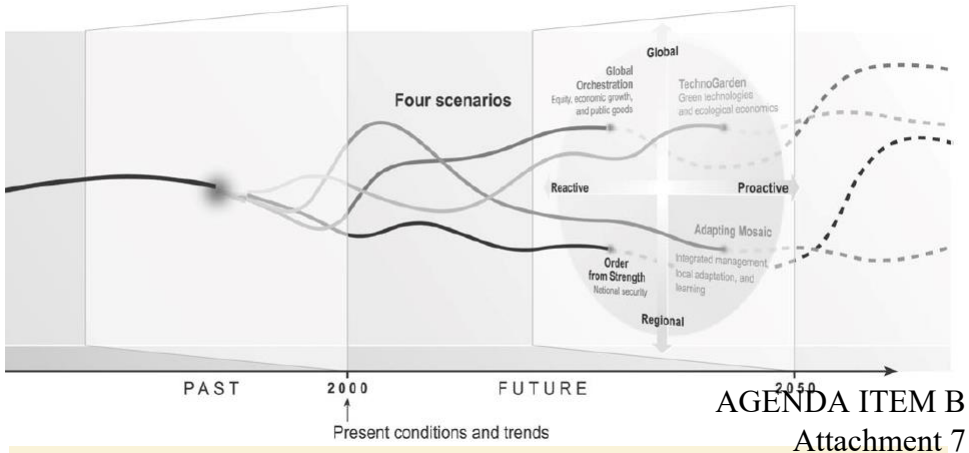
Enfors et al. 2008

Scenario logics

Downscaling “off the shelf” scenarios

IPCC Special Report on Emission Scenarios





Millennium Ecosystem Assessment

Evaluating scenarios

Are the scenario storylines:

- Relevant
- Consistent
- Legitimate
- Plausible
- Understandable/memorable
- Distinctive
- Scientifically credible
- Comprehensive
- Challenging
- Participatory

Using scenarios

What are effects on important resources/values/interests in the future?

What are the tradeoffs?

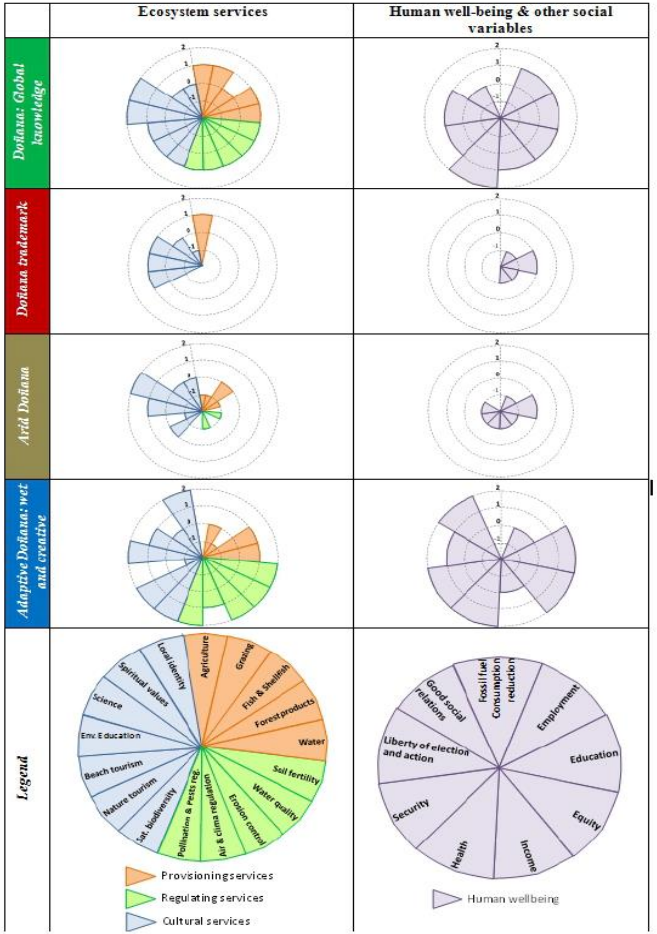
- Ecosystem services
- Biodiversity
- Water
- Socio-economic
- Timber
- Vulnerability/resilience

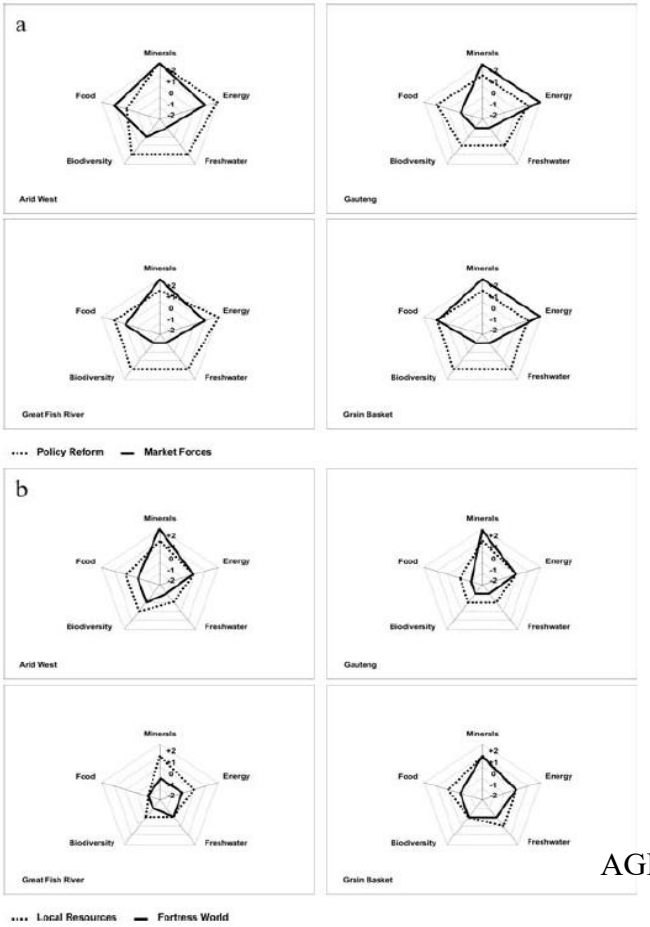
Ecosystem service	Scenario 1 Equal Environment			Scenario 2 Diverging Climate			Scenario 3 Adaptive Collaboration			Total score
	Subsistence agriculture	Commercial agriculture	Nature reserves	Subsistence agriculture	Commercial agriculture	Nature reserves	Subsistence agriculture	Commercial agriculture	Nature reserves	
Biodiversity	++	++	0	-	-	+	+	0	0	8
Crops	++	-	NA	+/o	+	NA	-	-	NA	7
Cultural ID	+	-	+	-	-/0	0	+	0	+	7
Tourism	0	+	++	0	0	+	++	+	0	7
Water QT	+	+	0	+	0	+	-	-	-	7
Carbon	++	+	0	0/+	0	+	-/0	0	0	6
Erosion	++	+	0	0	0	+	-	0	0	5
Livestock	+	0	NA	-	+	NA	--	0	NA	5
Water QL	-	+	0	0	-	0	-	0	0	4
Pest control	+	+	NA	0	-	NA	0	0	NA	3
Nutrients	++	0	0	0	-	0	0	0	0	3
Pollination	+	+	NA	0	-	NA	0	0	NA	3
Wild foods	-	NA	NA	0	NA	NA	+	NA	NA	2
Biofuel	0	0	NA	0	+	NA	0	0	NA	1
Other material	0	NA	NA	0	NA	NA	+	NA	NA	1
Spiritual	0	0	NA	0	0	NA	+	0	NA	1

Malinga et al. 2013

Factors	Convulsive Change	Knowledge is King	Big is Beautiful
Water availability	Decrease	Strong increase	Decrease
Land degradation	Strong increase	Largely controlled	Increase
Migration	Strong increase	Very strong increase	Very strong increase
Economic stability	Strong decrease	Relatively high	Very strong decrease
Actors			
Government (EU)	Relatively small	Expansion of EU	Supra-national power
Businesses	Green	Strong influence	Powerful, but later damage
NGOs	More important	Organized, powerful	Small role
Scientists	Small influence	Key actor	Stagnant
Sectors			
Agriculture	Severely weakened	Strong but divided	Collapse, no recovery
Tourism (number)	Slight decrease	Very strong increase	Strong decrease
Forest (fires)	Controlled increase	Slight increase	Uncontrollable
Civic	Generally healthy	Healthy but divided	Unhealthy and divided

Kok et al. 2006

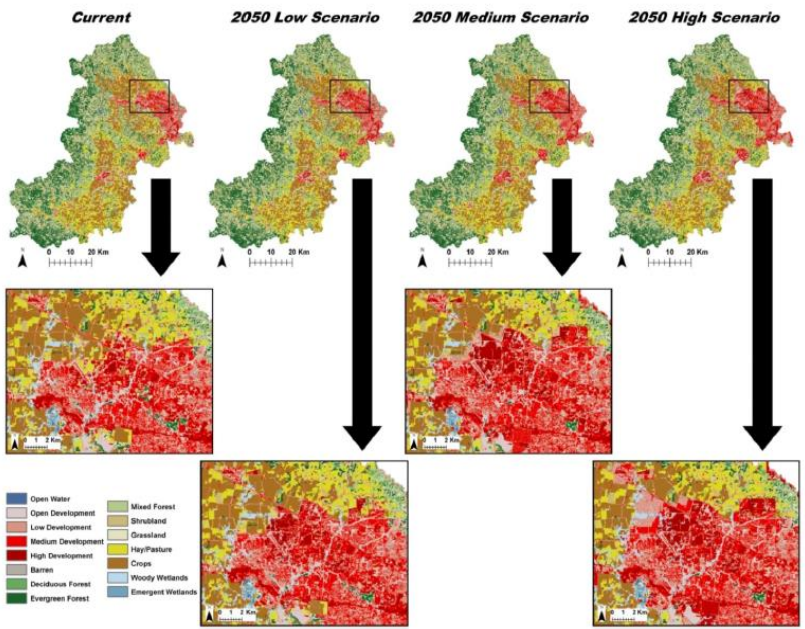




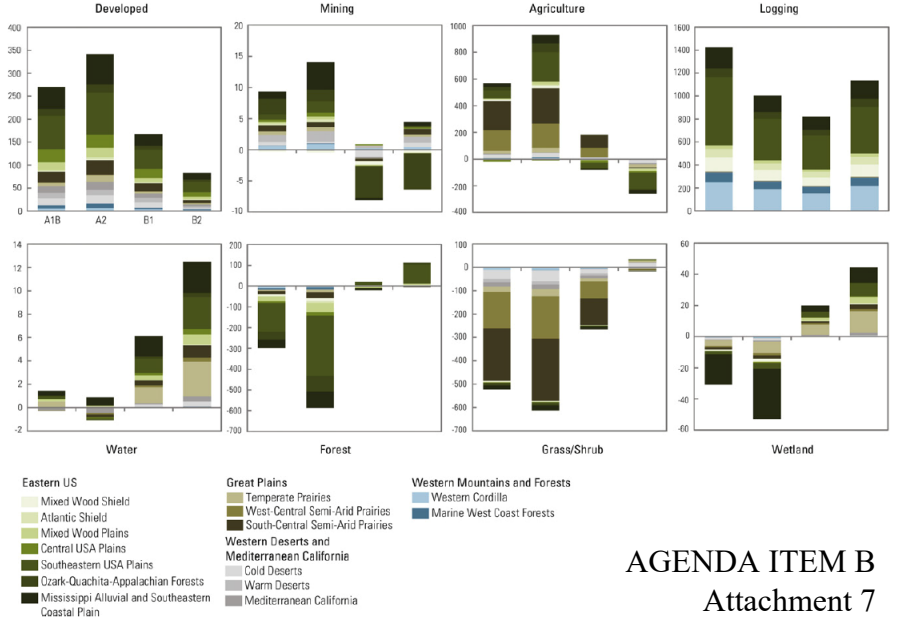
Palomo et al. 2011

Bohensky et al. 2006

Quantifying



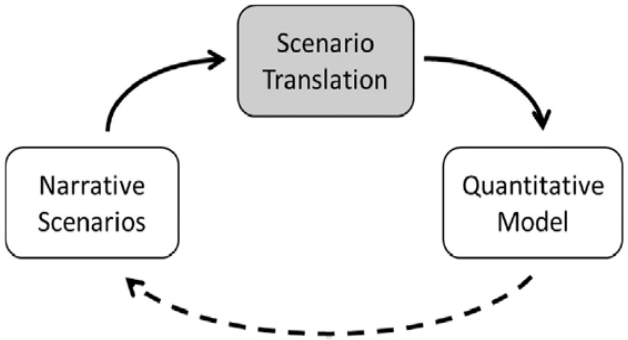
Hoyer and Change 2014



Sleeter et al. 2012

Quantifying

"Story and simulation" approach



Mallampalli et al. 2016

Quantifying

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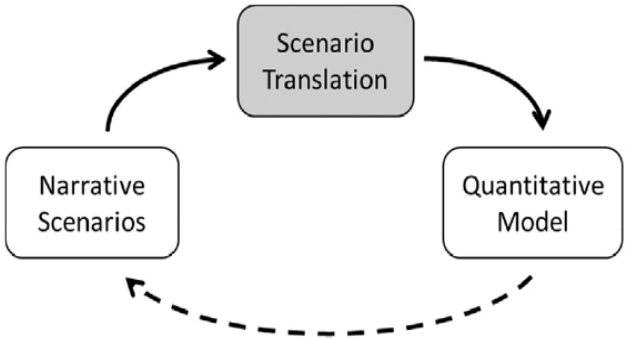

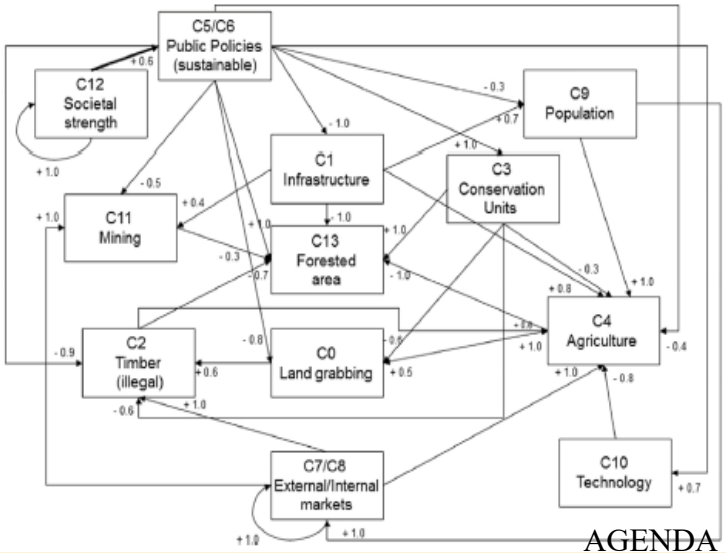

Fuzzy cognitive maps

Mallampalli et al. 2016

Quantifying

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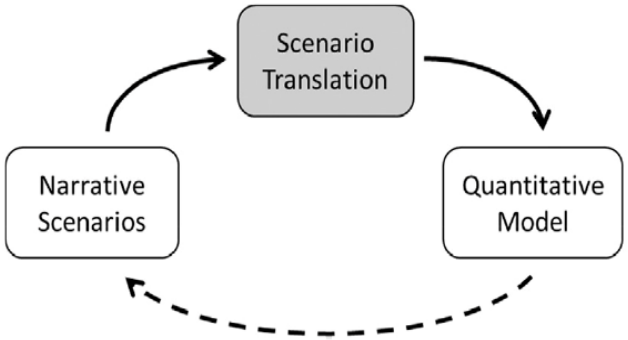
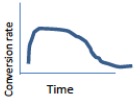


Land use	How Much?	Where?	What kind?	Why?
Forest to Development 	More initially and decreasing through time. Maybe rates of conversion similar to now when averaged over 50 yrs. 	Adjacent to already developed areas Not in riparian areas, on good ag soils, or ecologically important areas	Residential – mostly compact housing Commercial – to support larger population Very little energy b/c it is mixed with developed land	Large influx of people but strict regs. about where they settle
Forest to Agriculture 	Minimal	Little bits scattered around	Limited land Associated with homestead scale agriculture	New ag uses currently open areas Existing ag land is used more intensively
Timber Harvesting 	100% of annual growth on managed timberlands	Most of state's forestland is managed timberland (maybe 90%) or ~60% of state land base	Cutting a lot of "energy wood" to increase the proportion of high value timber	Need for energy wood, building materials, and more valuable wood drive a lot more logging – carefully planned
Conservation 	~1/2 of land is protected from development	Everywhere outside designated growth zones	Mostly working land easements At least 10% ecological reserves	States and towns aggressively protect resource lands thru conservation easements, public ownership etc.

McBride et al. 2017

Quantifying

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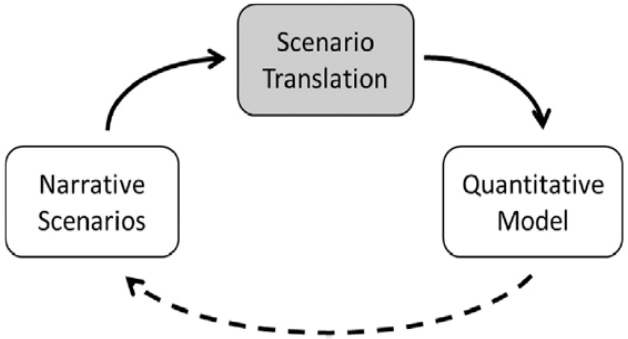

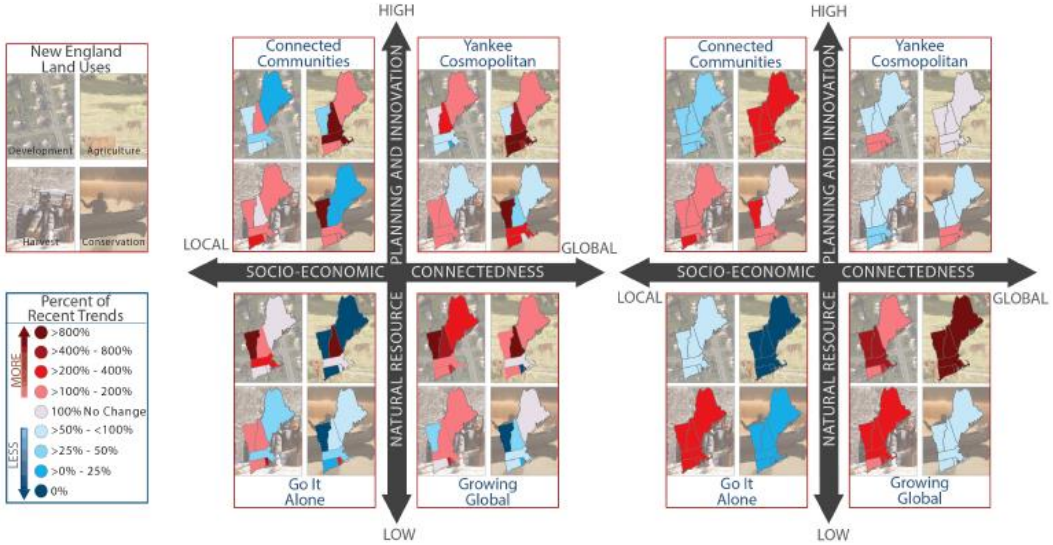

McBride et al. 2017

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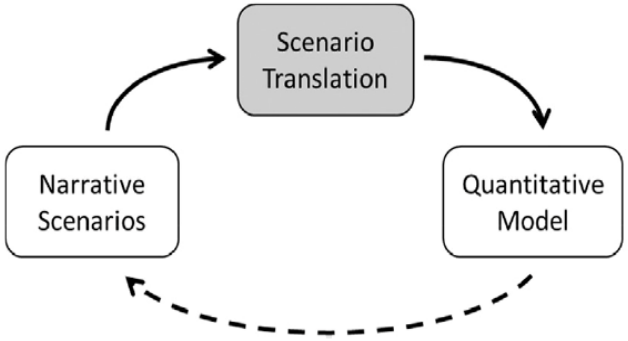

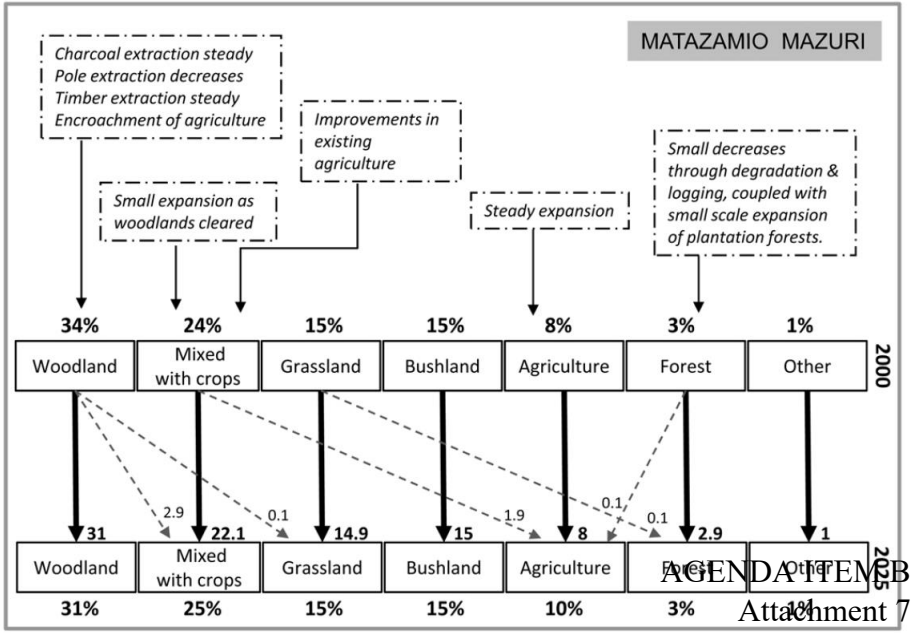

Swetnam et al. 2011

Quantifying

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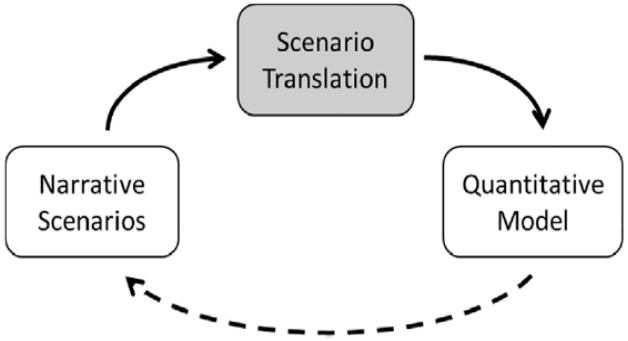

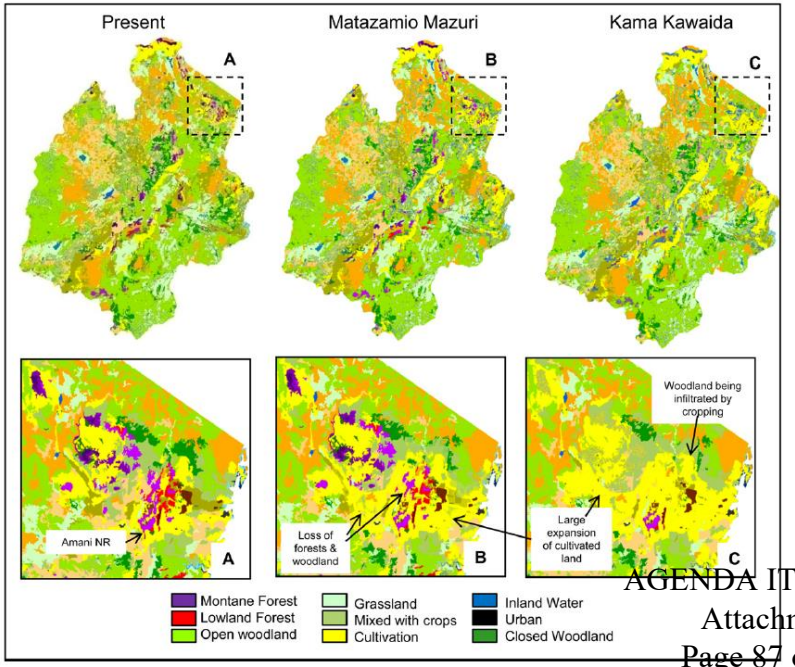

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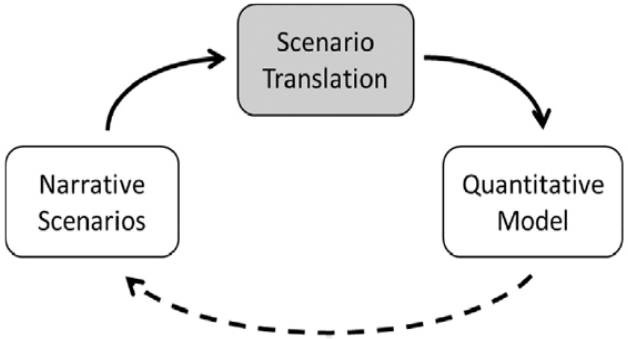
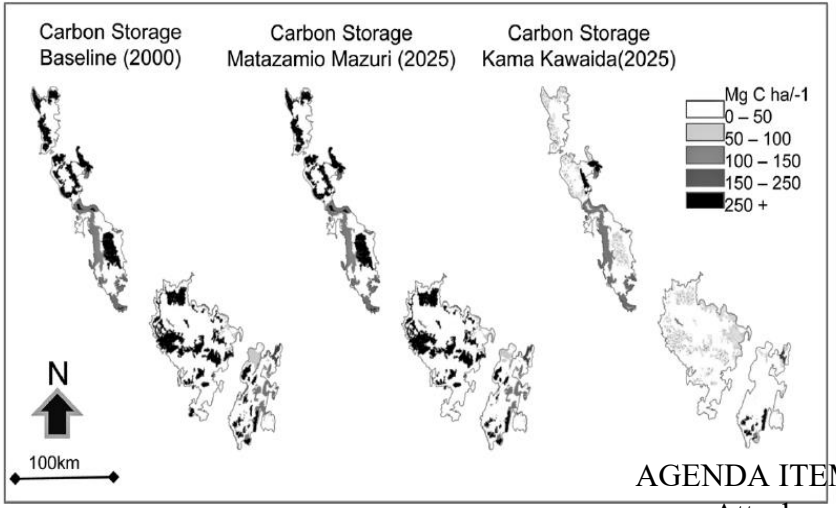




Swetnam et al. 2011

Using scenarios to inform management

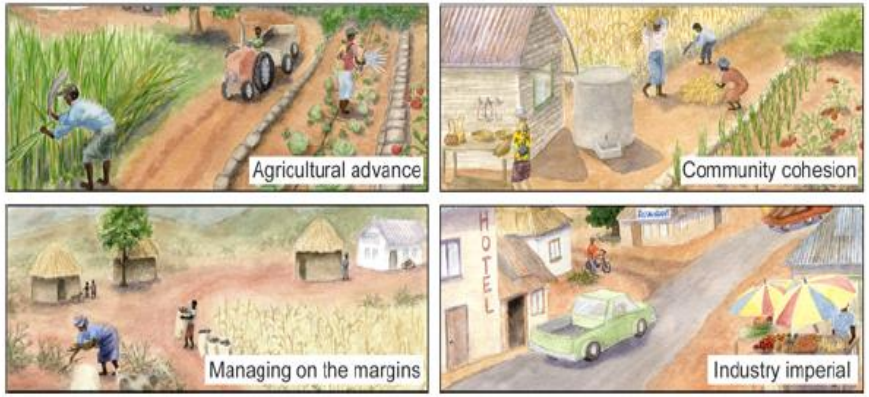
- How appropriate are existing or proposed actions in light of multiple futures?
  - Robust actions will be beneficial across a range of futures

Using scenarios to inform management

- How appropriate are existing or proposed actions in light of multiple futures?
  - Robust actions will be beneficial across a range of futures
- What are key unknowns?
  - Identify indicators of change and future decision points
  - Establish monitoring protocols
  - Highlight and address critical research gaps

Communication and outreach

- Build awareness and understanding
- Identify desirable elements of different futures and back-cast how to get there
- Incorporate stakeholder feedback in an iterative process



Enfors et al. 2008

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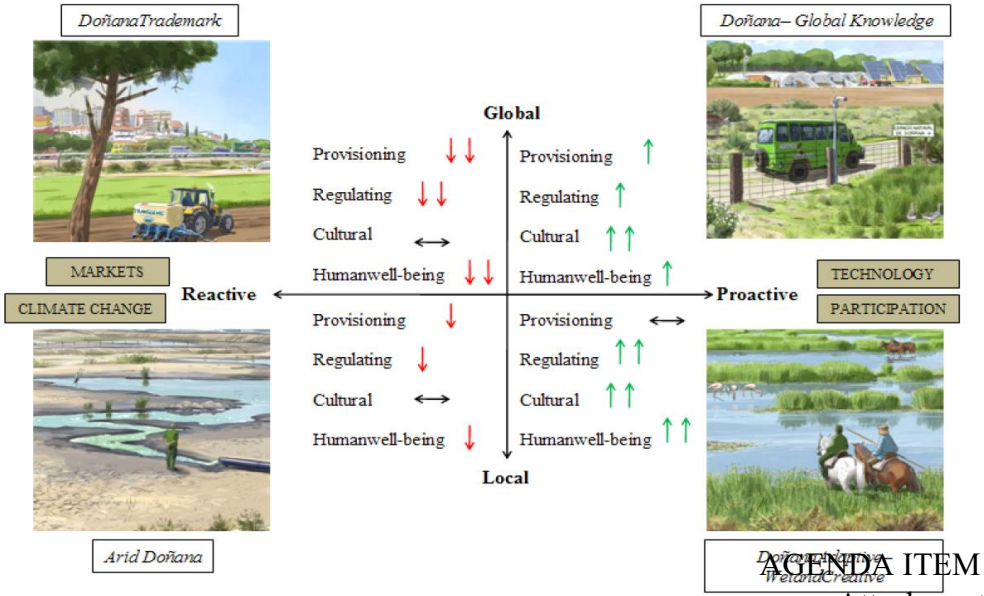

Palomo et al. 2011

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Tress and Tress 2003

Communication and outreach

"When processes are less well understood, as is the case for social processes and policy implications, interpretation and judgment become increasingly important. Here, set paradigms and ideologies have an influence and personal values and beliefs that affect scenario outcomes should be made explicit, especially where scenario storylines are used to inform policy." (Rounsevell and Metzger 2010)

Scenario exercise 1: envisioning plausible futures for Oregon's state forests

- Pose question and define scope
- Identify drivers using STEEP analysis (social, technological, environmental, economic, political)
- Choose two key drivers with high impact and uncertainty
- 2x2 matrix
- Divide into two groups. Each group sketches out scenario from one of the quadrants. Pay attention to value judgments!

Dimensions of variability	Today's Focus
Purpose	Exploratory
Motivation	Get a feel for scenario planning
Focus	Process
Inclusion of norms	Descriptive
Approach	Qualitative
Information source	Mixed
Uncertainty	Mixed
Focal scales	Single
Links between scales	NA
Storylines	Multiple
Starting point of story	Present (if time)
End point of story	Future snapshot
Drivers	Mixed
Dynamics	Simple
Stakeholders	No participation
Outreach	None

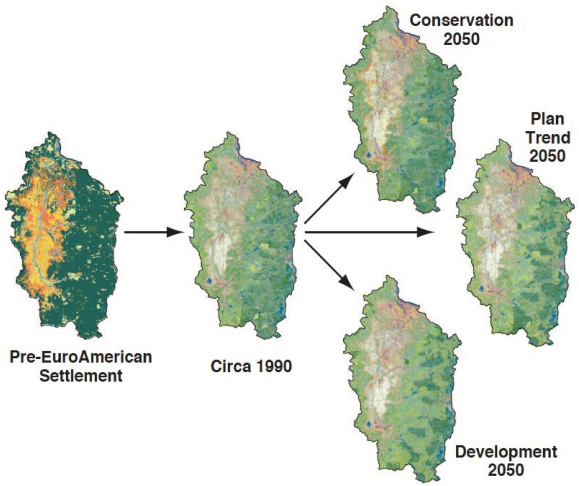
Scenario exercise 2: decisions and tradeoffs

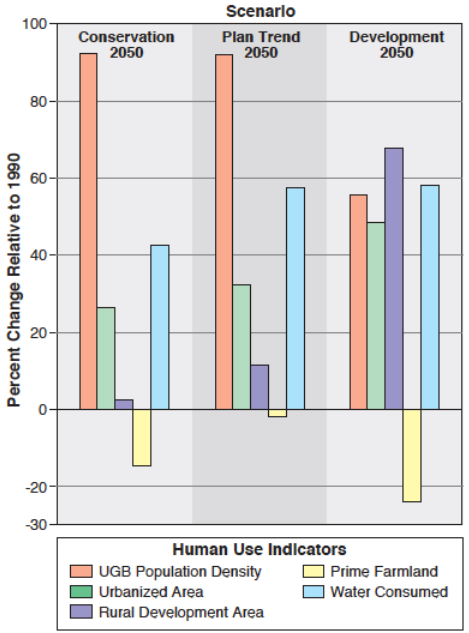
- Identify key values and tradeoffs
  - Industrial forest
  - Non-industrial private forest
  - Tribal
  - Urban
  - Agriculture
  - Environmental NGO
  - University (research)

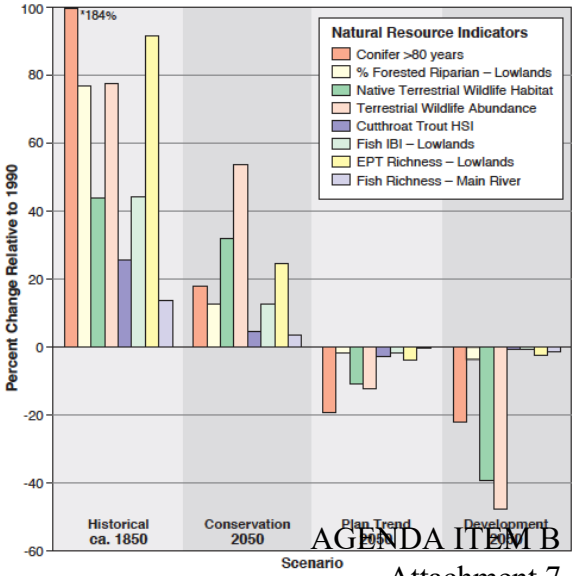
Value	Plan Trend	Development	Conservation
X	↑↑	↓	↓↓
Y	↑	↑	↑
Z	↓	↑	↑
…			

- Discuss short-term management strategies in light of tradeoffs

Scenario exercise 2: decisions and tradeoffs







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