


Understanding the cumulative impacts of coastal development on marine ecosystems:



Land-use change scenarios and Bayesian networks

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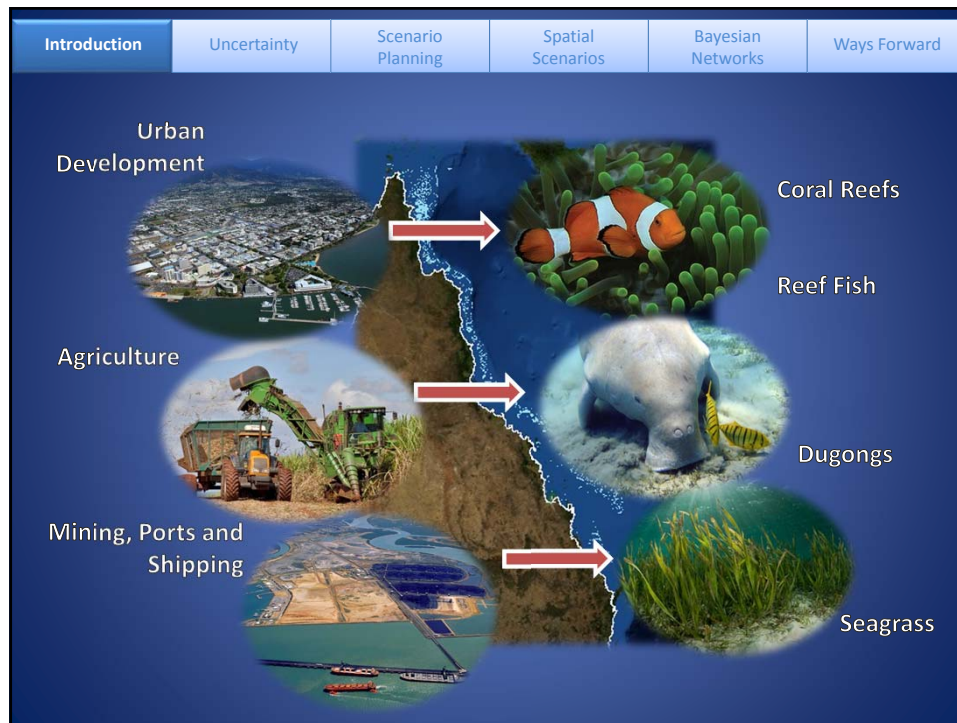
Introduction	Uncertainty	Scenario Planning	Spatial Scenarios	Bayesian Networks	Ways Forward
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Great Barrier Reef World Heritage Area

- Over 2000 km long
- Almost 3000 individual reefs
- Over 900 islands
- Abundance of wildlife





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"We acknowledge with concerns the range of threats facing this exceptional example of Outstanding Universal Value"

UNESCO World Heritage Committee, 2014

Great Barrier Reef World Heritage Area

IN DANGER?

"The major cause for the reef degradation is not only a consequence of extreme weather conditions and climate change as Australian Government documents seem to imply, but also due to human causes and interference"

UNESCO World Heritage Committee, 2014

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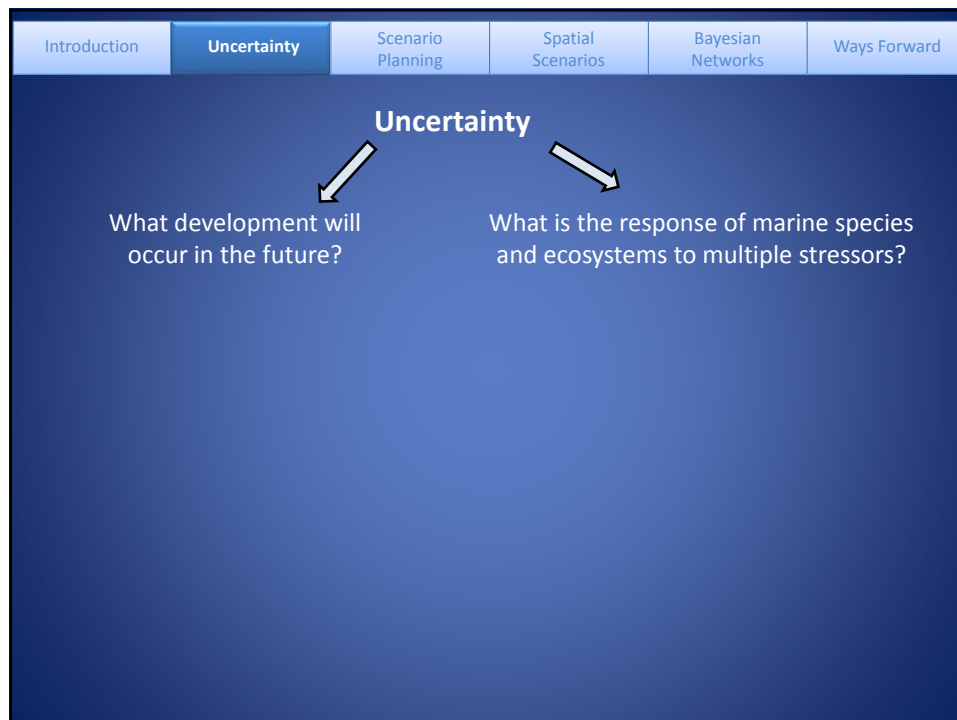


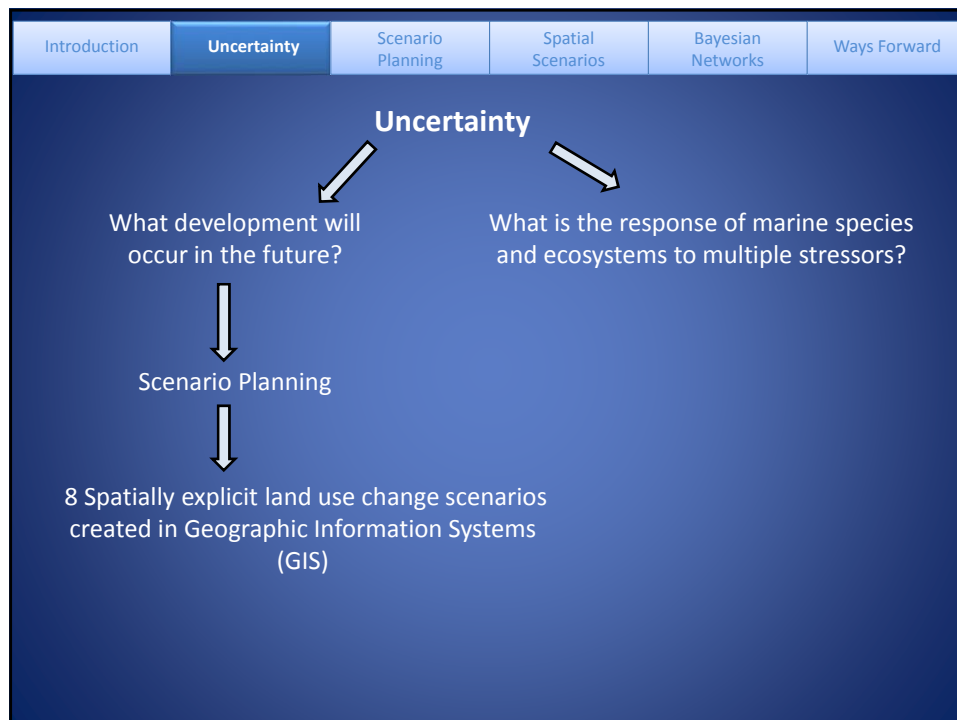
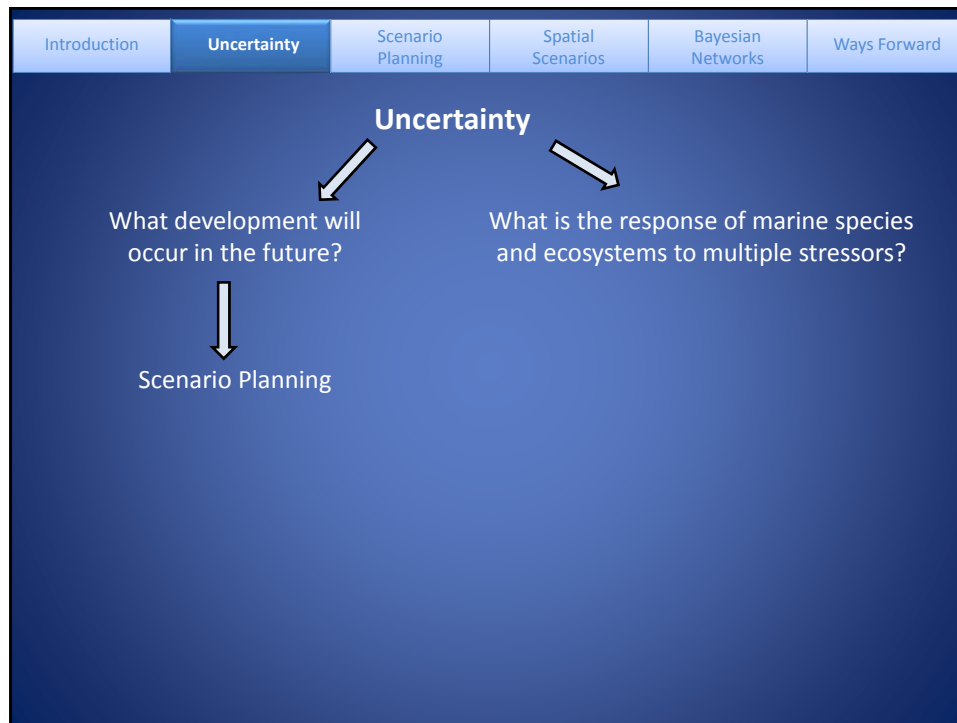
“Quantitative understanding of cause-and-effect relationships, both now and under a range of future scenarios, will greatly improve understanding of impacts and their cumulative effects — this currently constitutes a major information gap...”

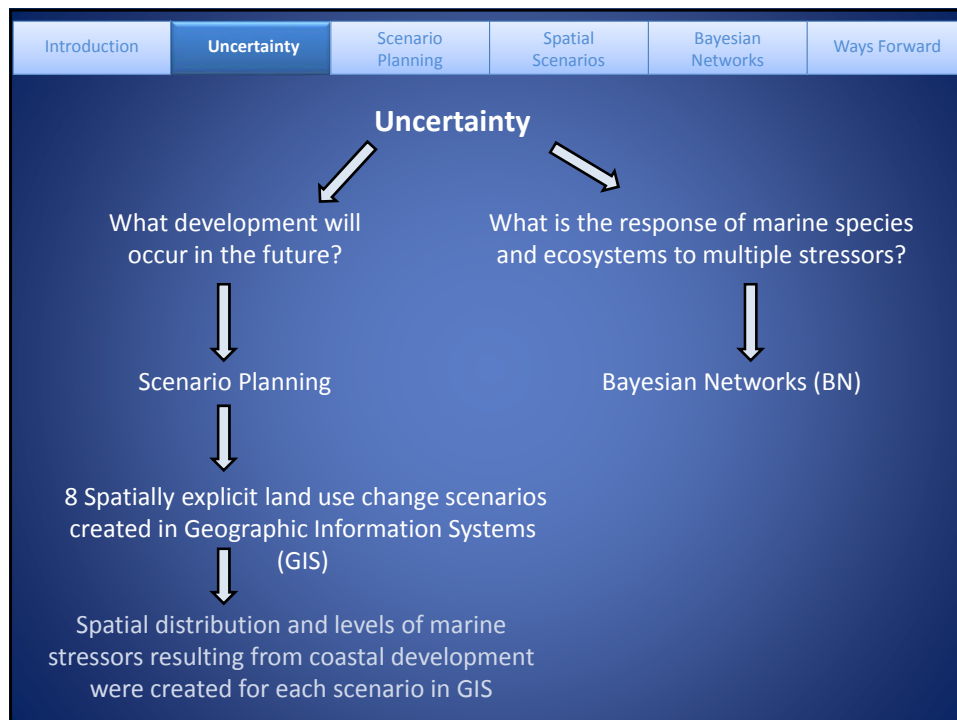
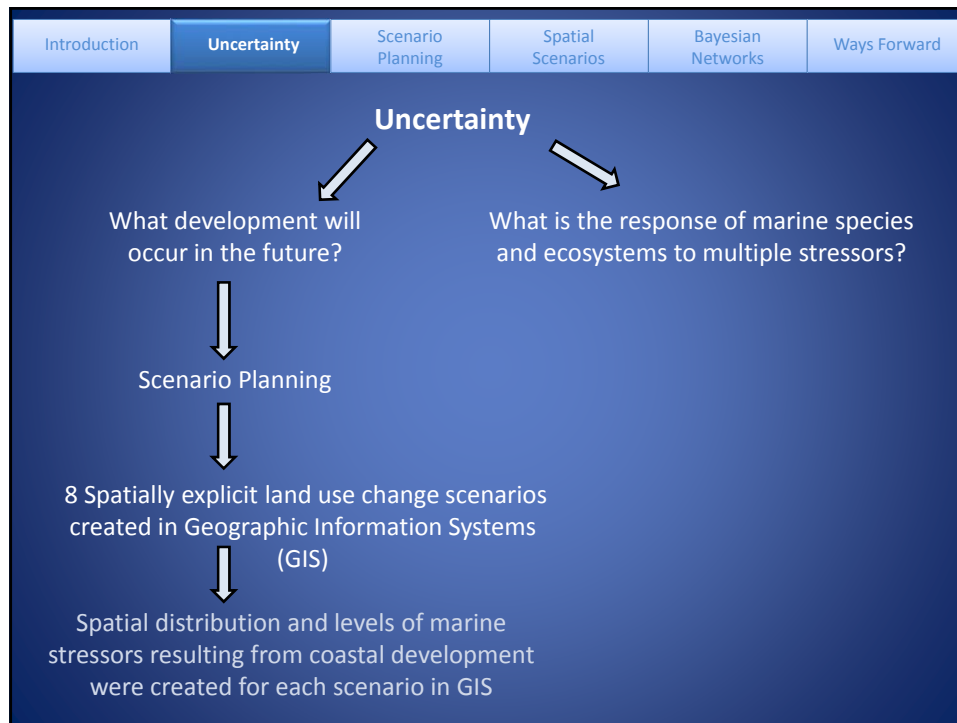
Great Barrier Reef Region Strategic Assessment Report 2014
Great Barrier Reef Marine Park Authority

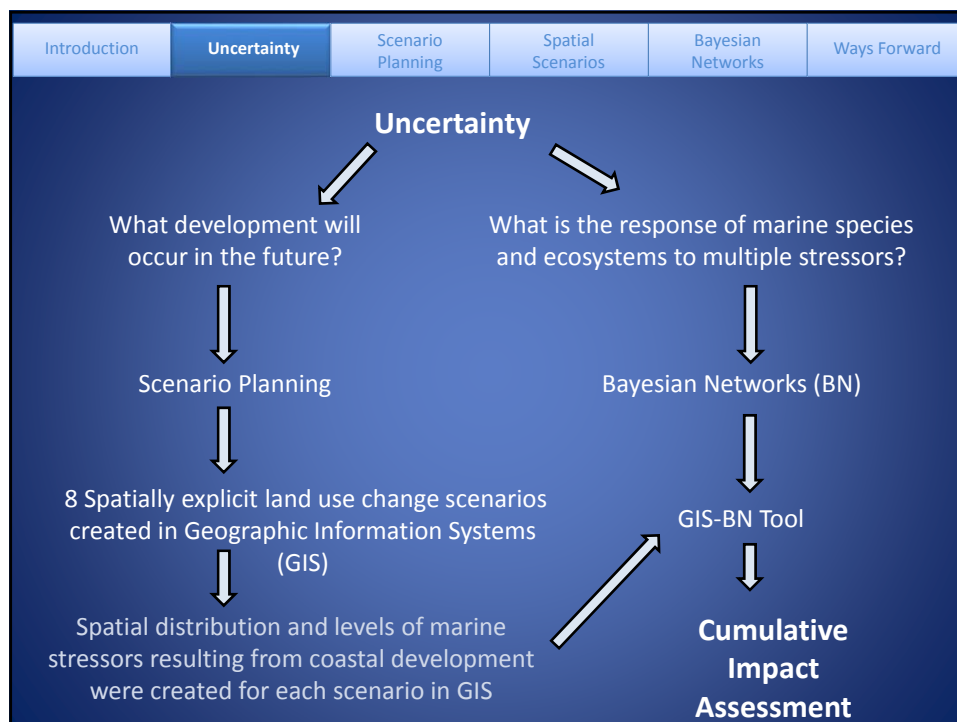
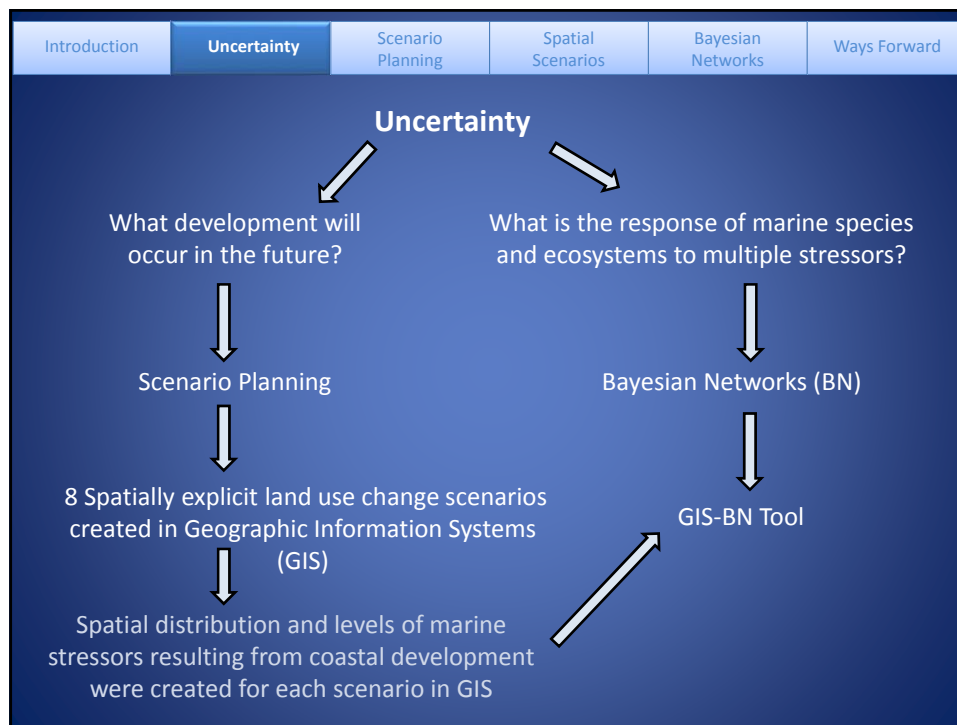


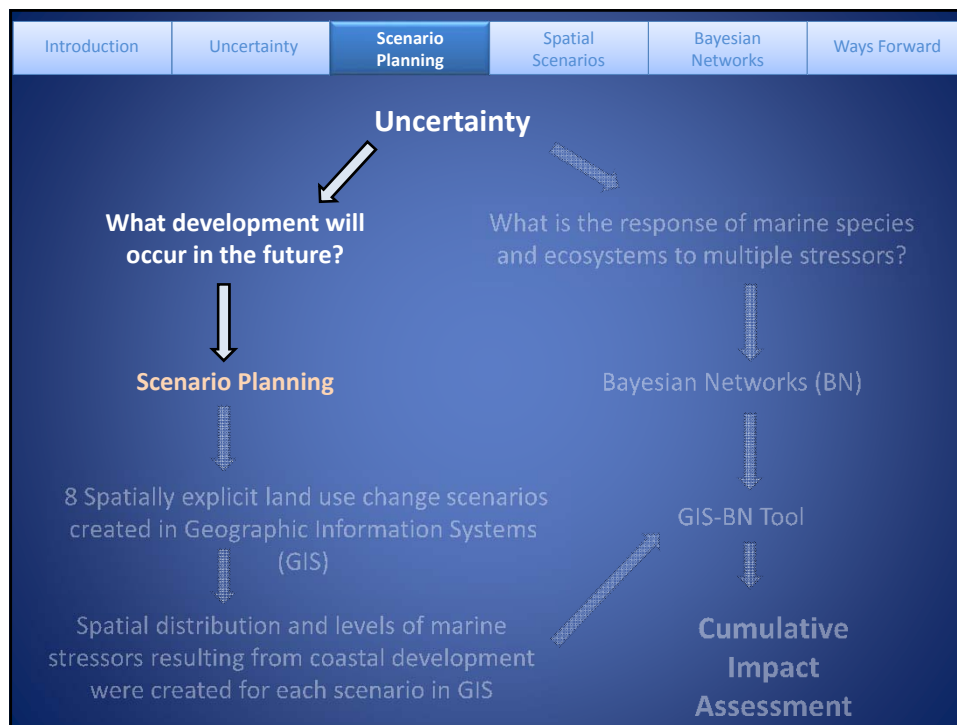










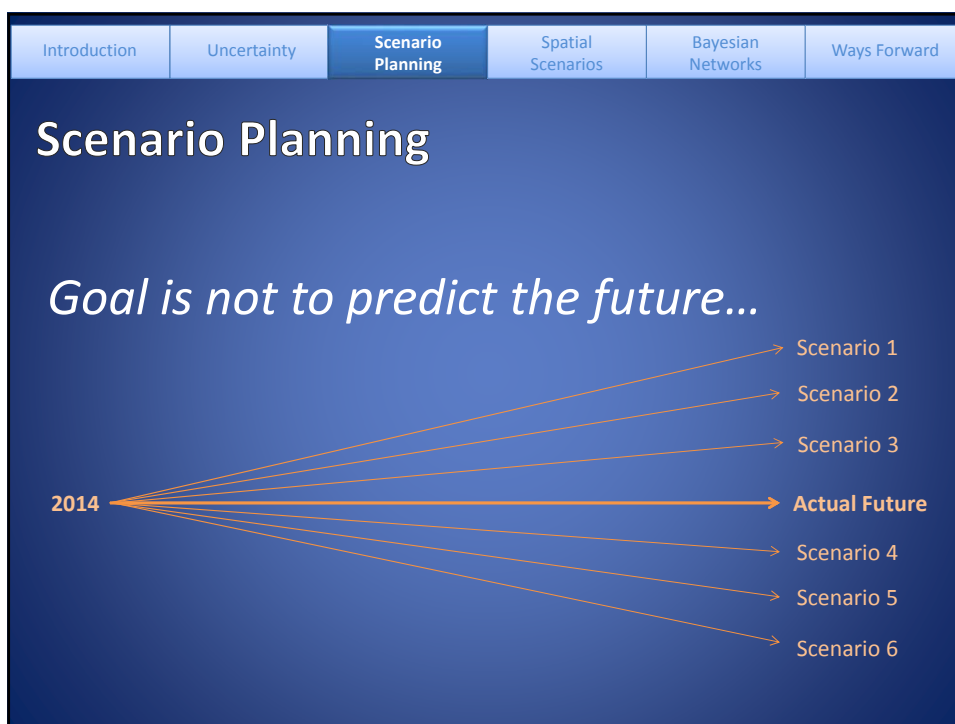


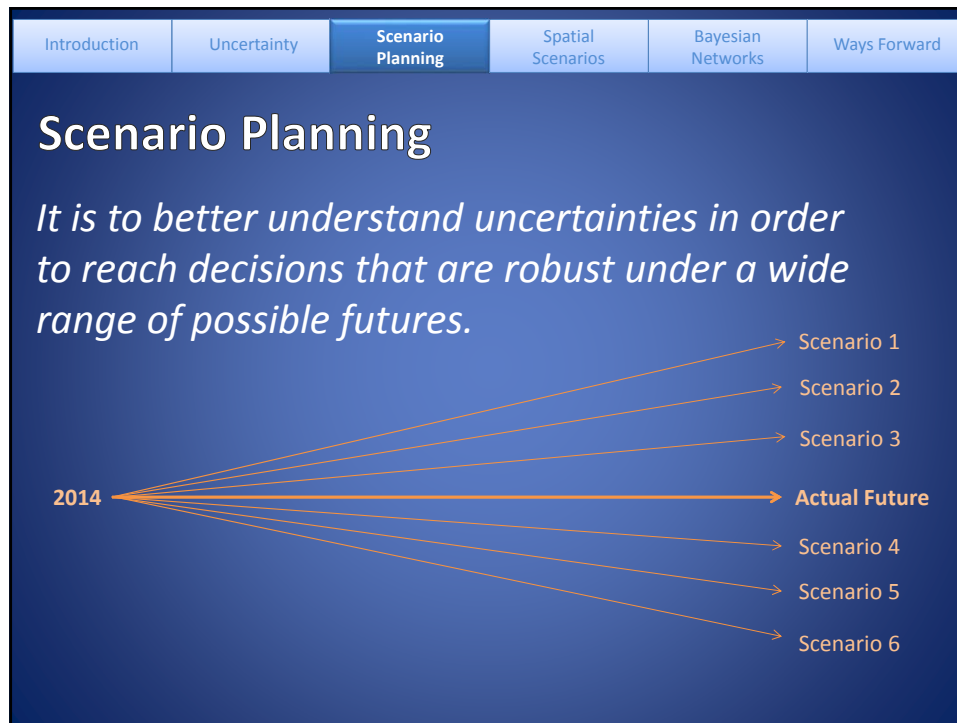
Scenario Planning

Considering possible **complex** and **uncertain** scenarios

Scenarios consider important uncertainties such as the **economy, population, development** and **governance**

The slide also features a navigation bar at the top with the following tabs: Introduction, Uncertainty, **Scenario Planning** (active), Spatial Scenarios, Bayesian Networks, and Ways Forward.





Introduction Uncertainty **Scenario Planning** Spatial Scenarios Bayesian Networks Ways Forward

4 Scenario Streams

- Food and Minerals
- Tourism
- Green
- Business as Usual

5 Drivers of Change

- Demand for environmental services
- Foreign demand for food and minerals
- Preference for coastal lifestyle
- Innovation and technological advances
- Foreign demand for tourism

2 Types of Governance

- Strong
- Weak

SCENARIO STREAMS

Stream	Legend	Scenario
FOOD AND MINERALS	High	Export management
	Low	Red tape cutting
TOURISM	High	Tourist heaven
	Low	Way for resorts
GREEN	High	Eco-revolution
	Low	Green washing
BUSINESS AS USUAL	High	A twist on the trend
	Low	As we go

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8 Scenarios

Scenario Stream	Governance	Scenario
FOOD AND MINERALS	STRONG	Export management
	WEAK	Red tape cutting
TOURISM	STRONG	Tourist heaven
	WEAK	Way for resorts
GREEN	STRONG	Eco-revolution
	WEAK	Green washing
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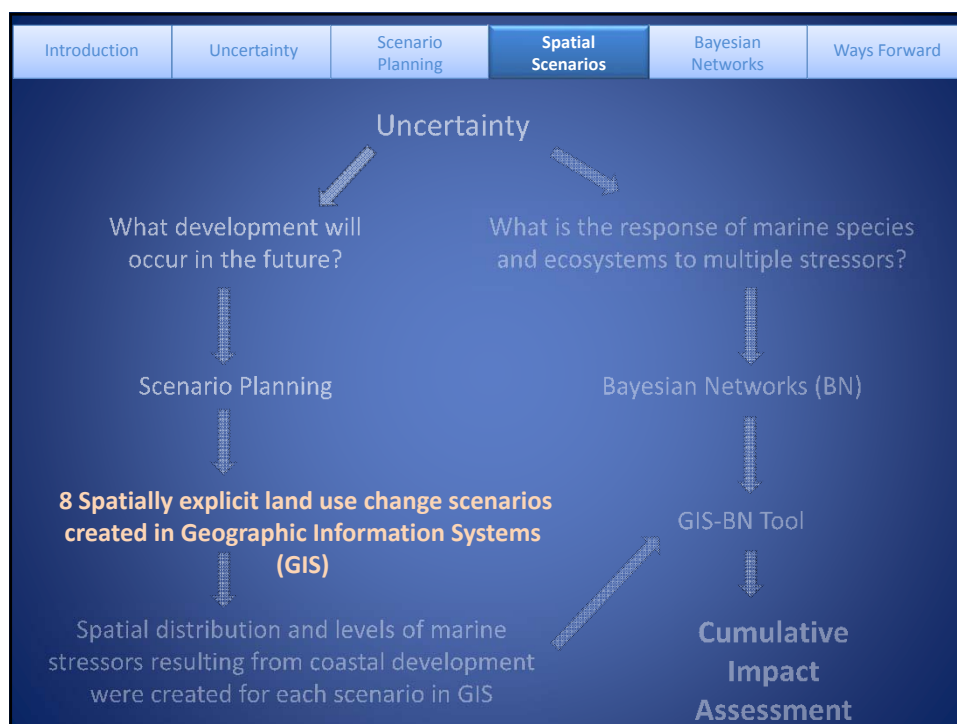
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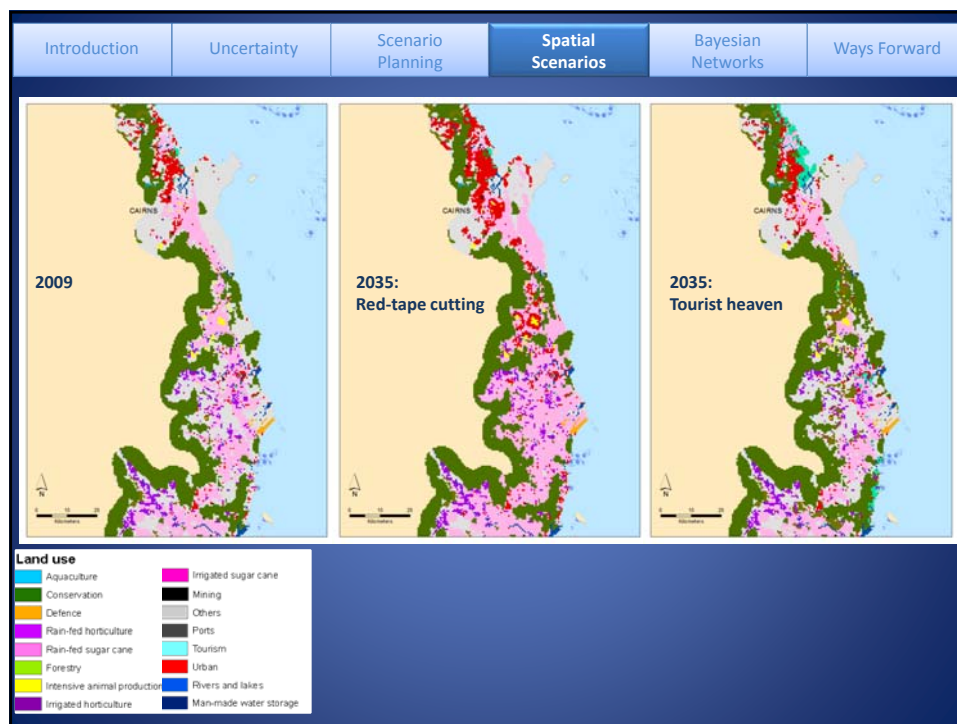
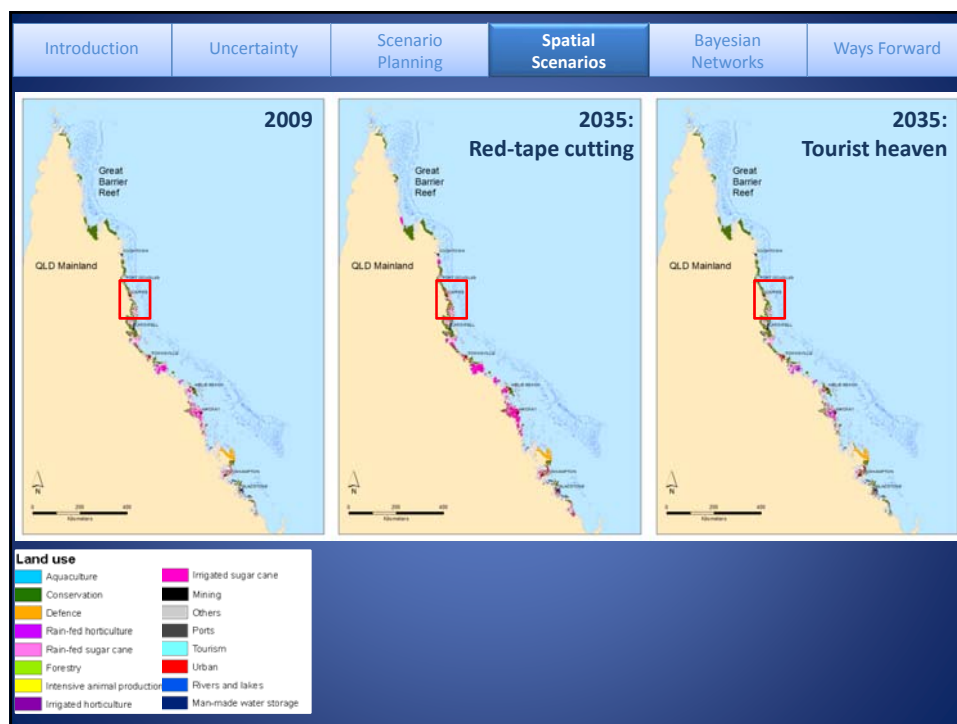
- Strong
- Weak

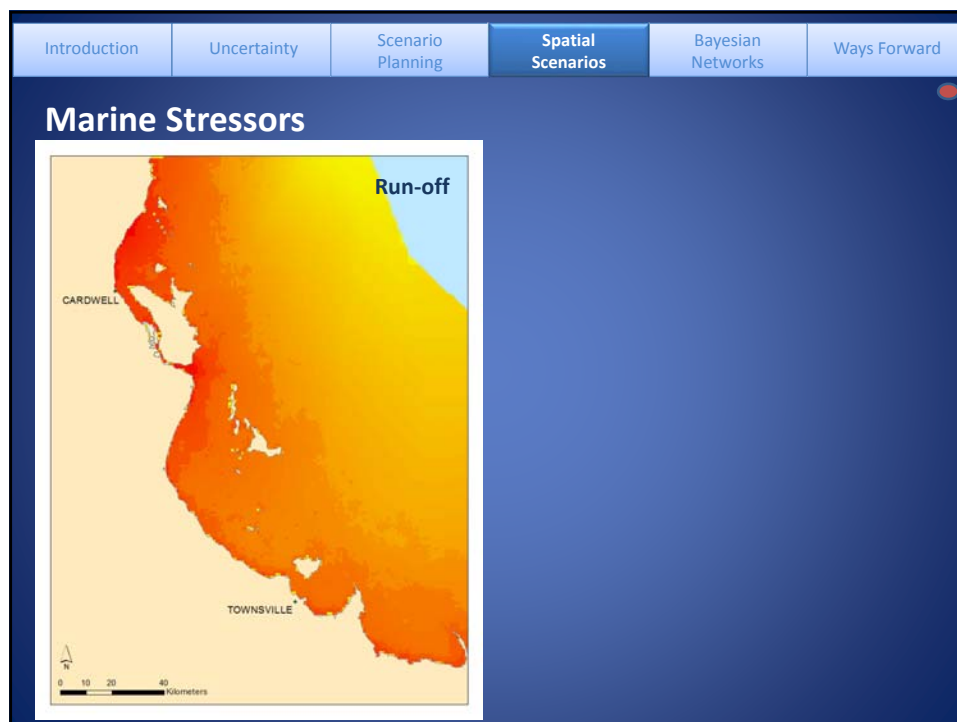
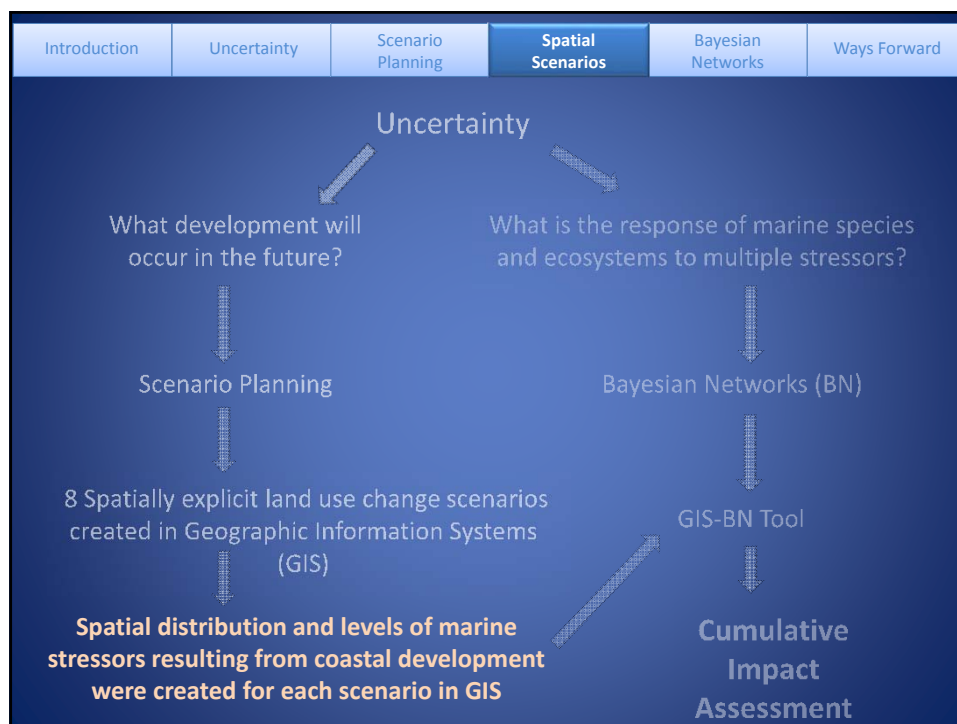
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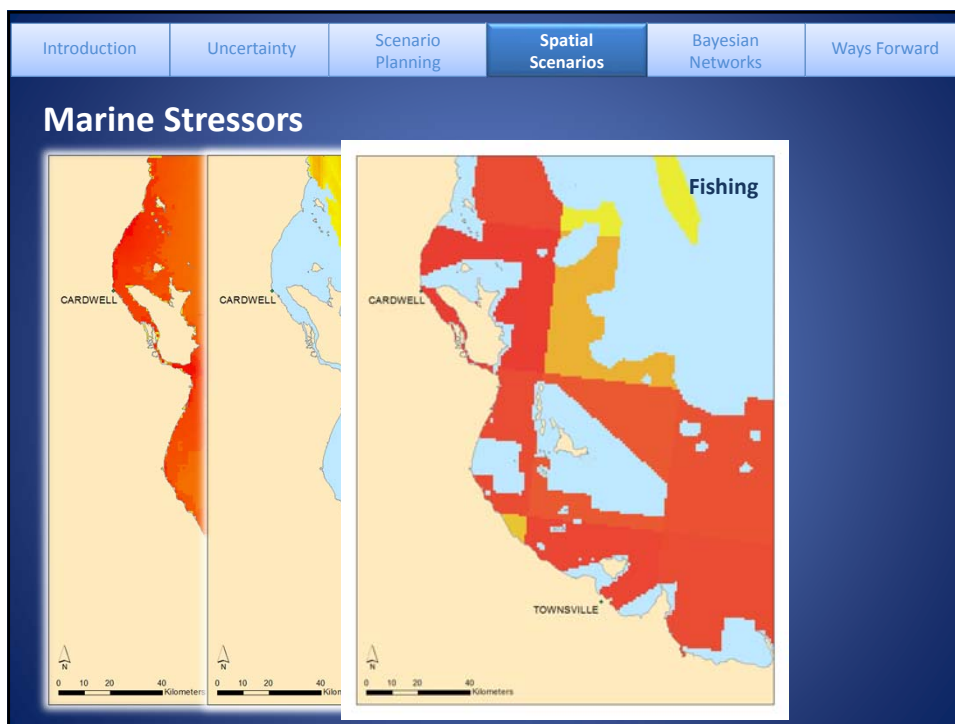
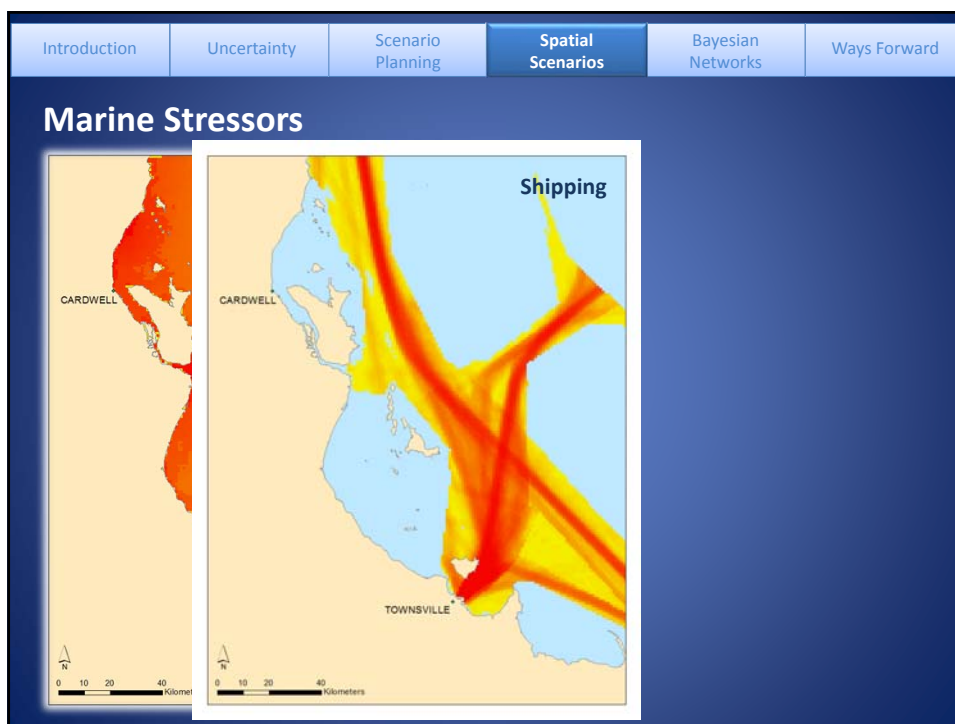
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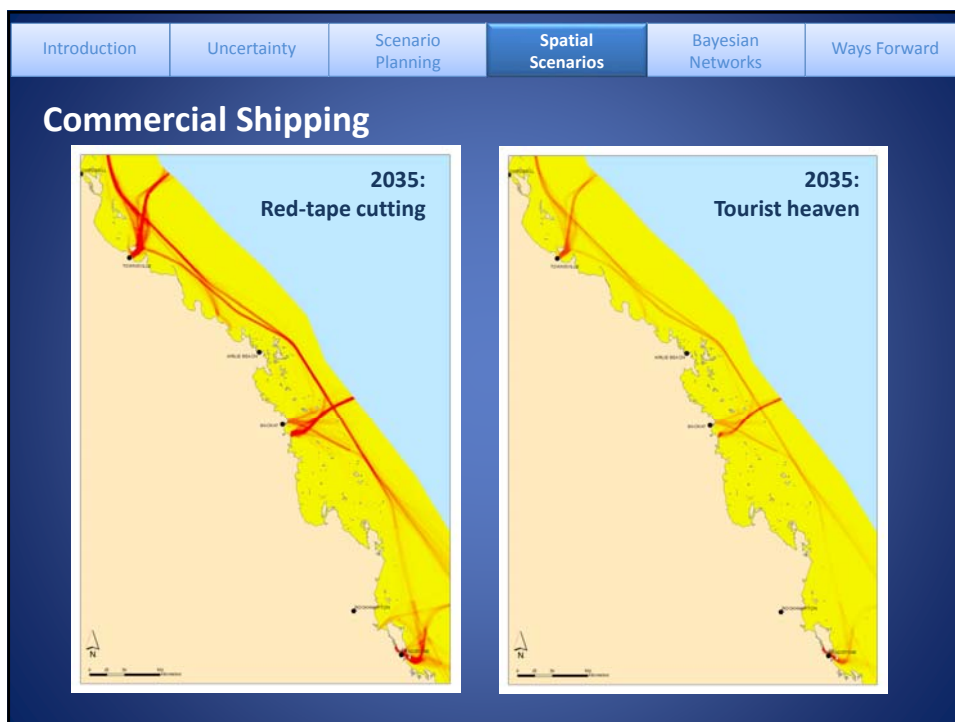
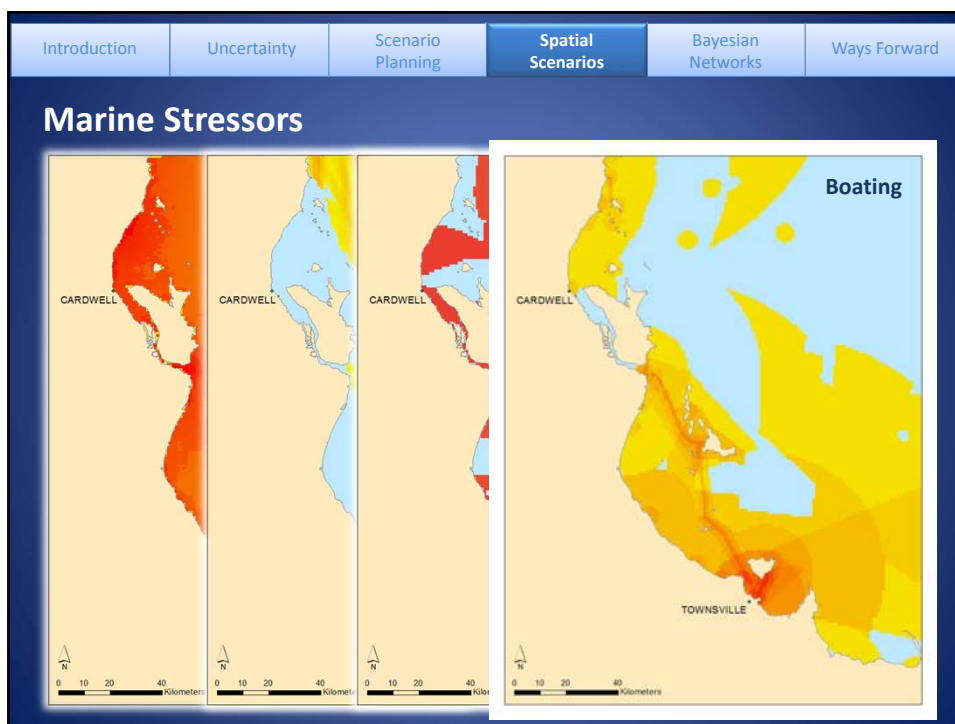
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2035					
RED-TAPE CUTTING			TOURIST HEAVEN		
High demand for food and minerals			High demand for tourism		
Weak governance			Strong governance		
Development is uncontrolled			Development is centralized		
Ports and shipping increase			Ports and shipping decrease		
Climate change is not considered			Climate change adaptation planning		
Low demand for environmental services			High demand for environmental services		
Mines and ports developed in Cape York			Cape York remains pristine		
Fisheries and agriculture are poorly managed			All food sources are sustainable		
					

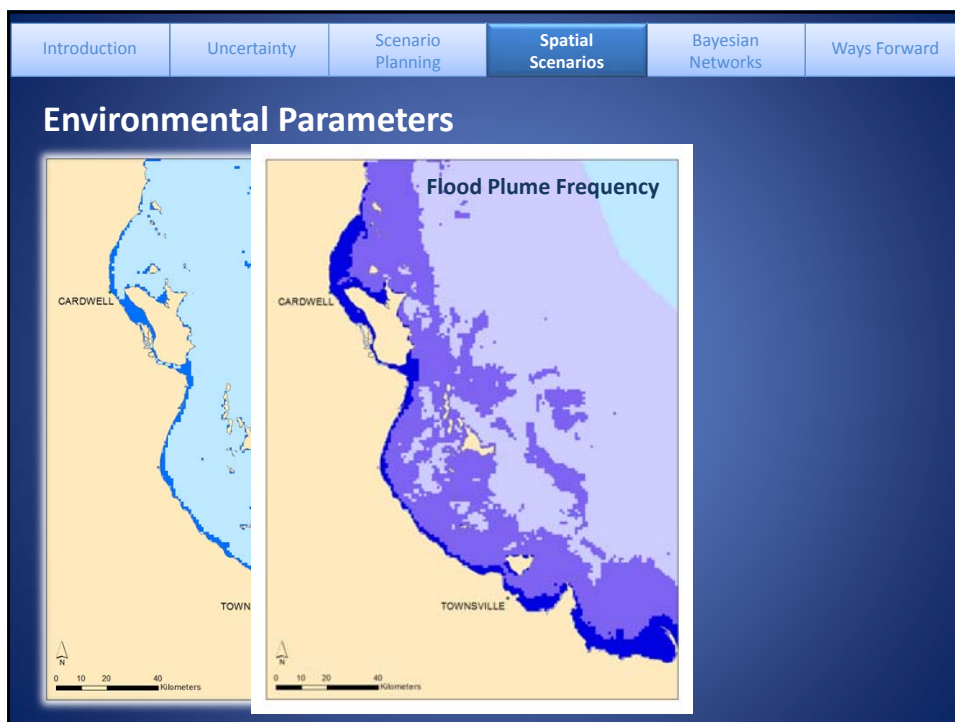
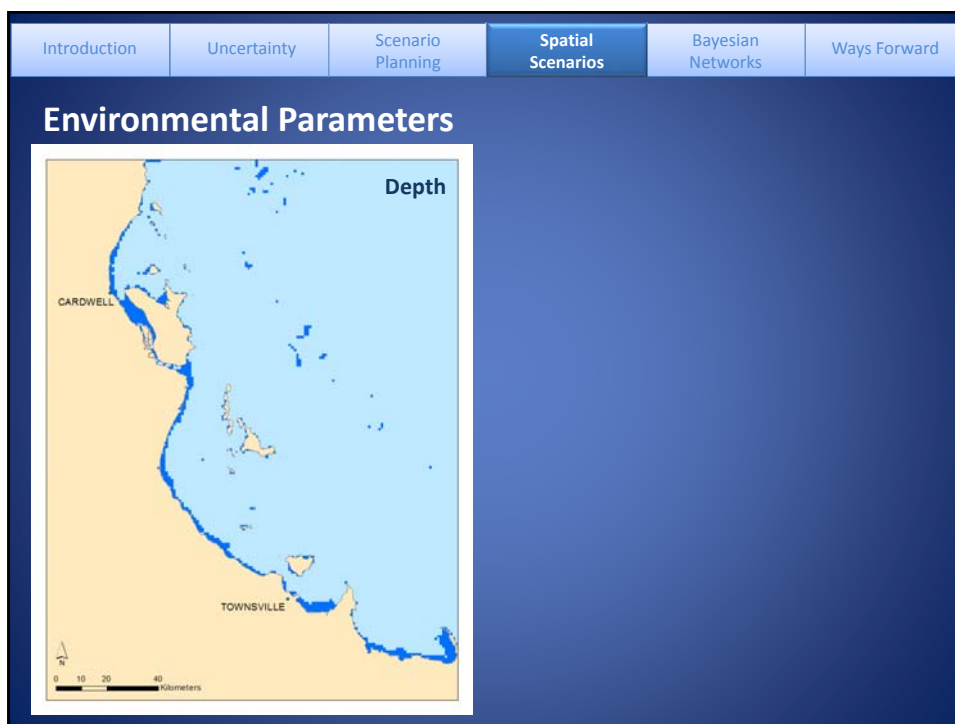


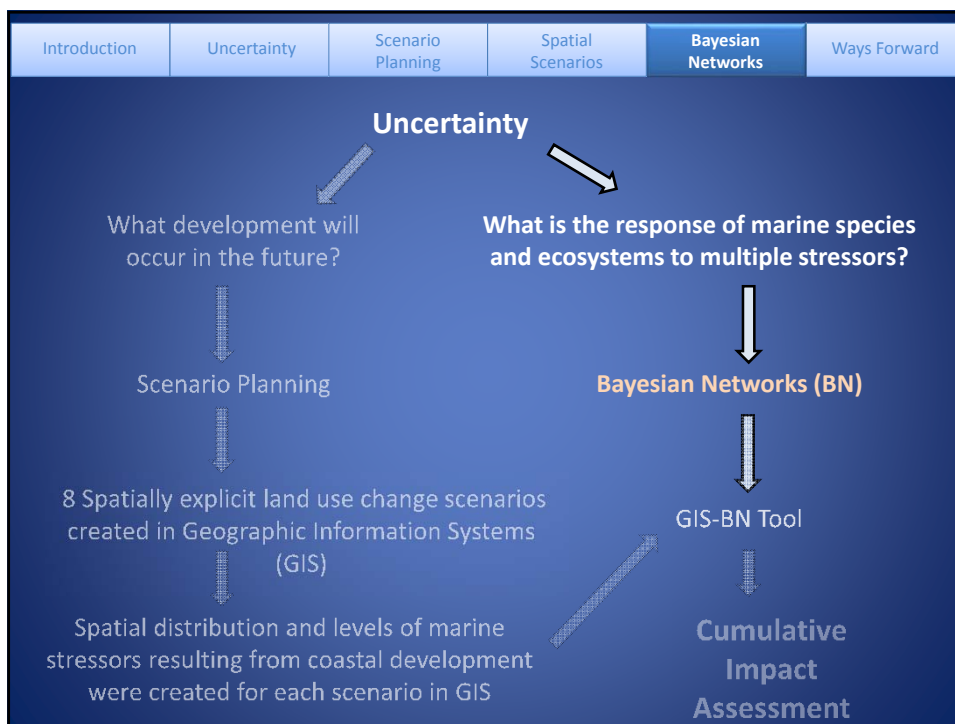
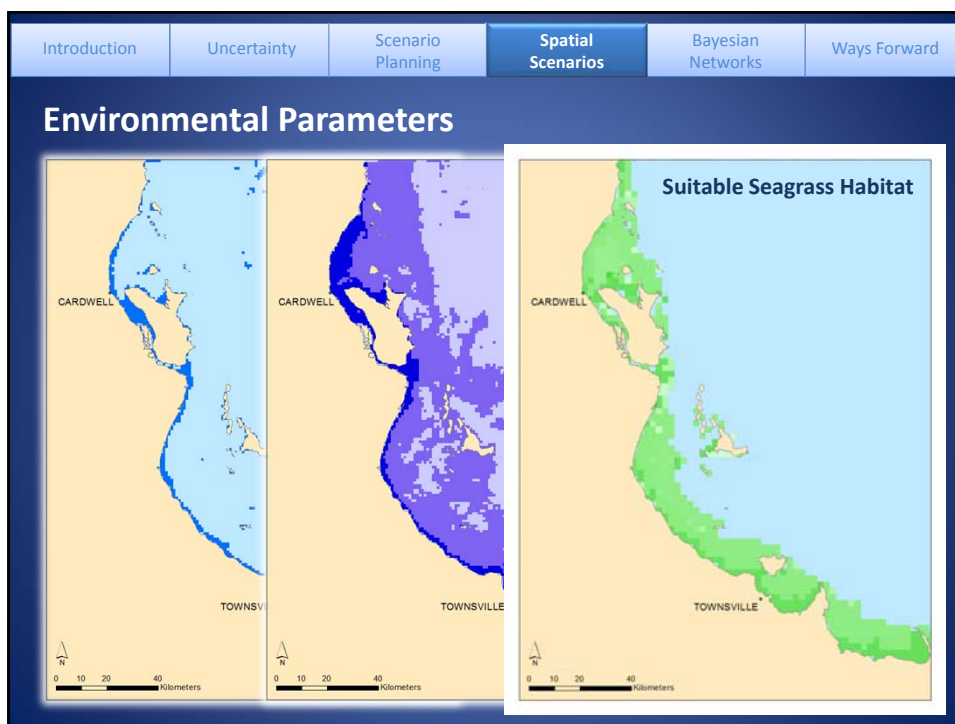


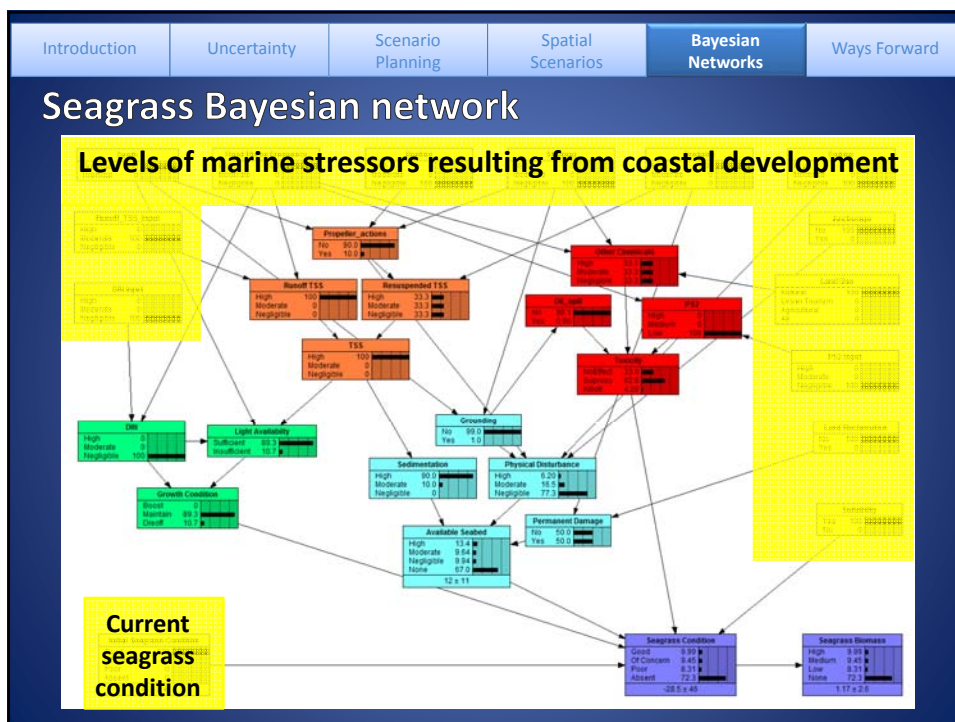
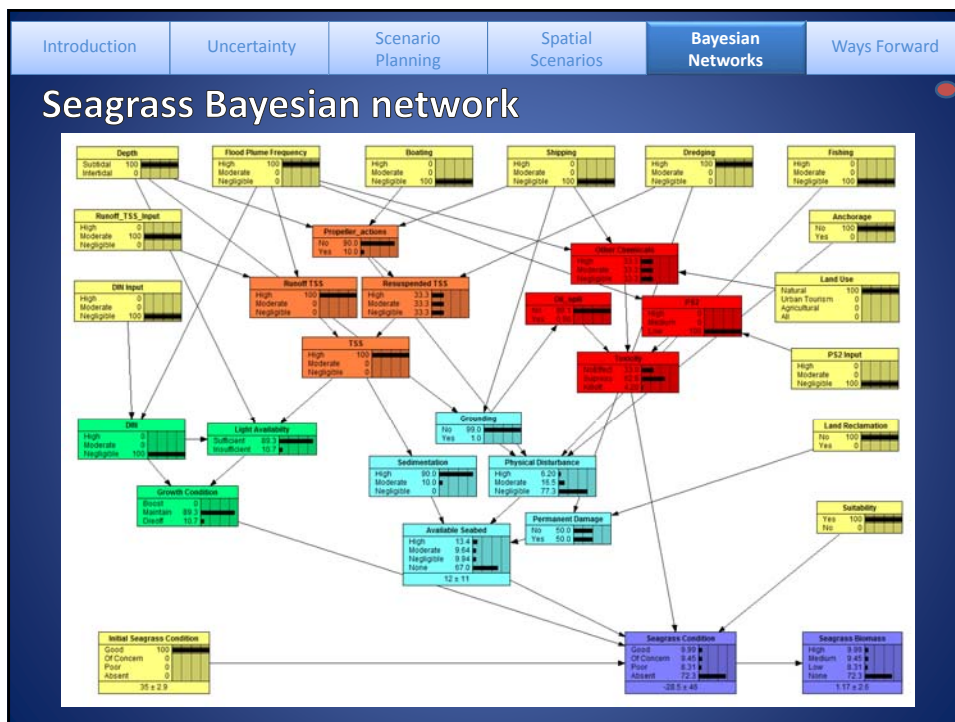


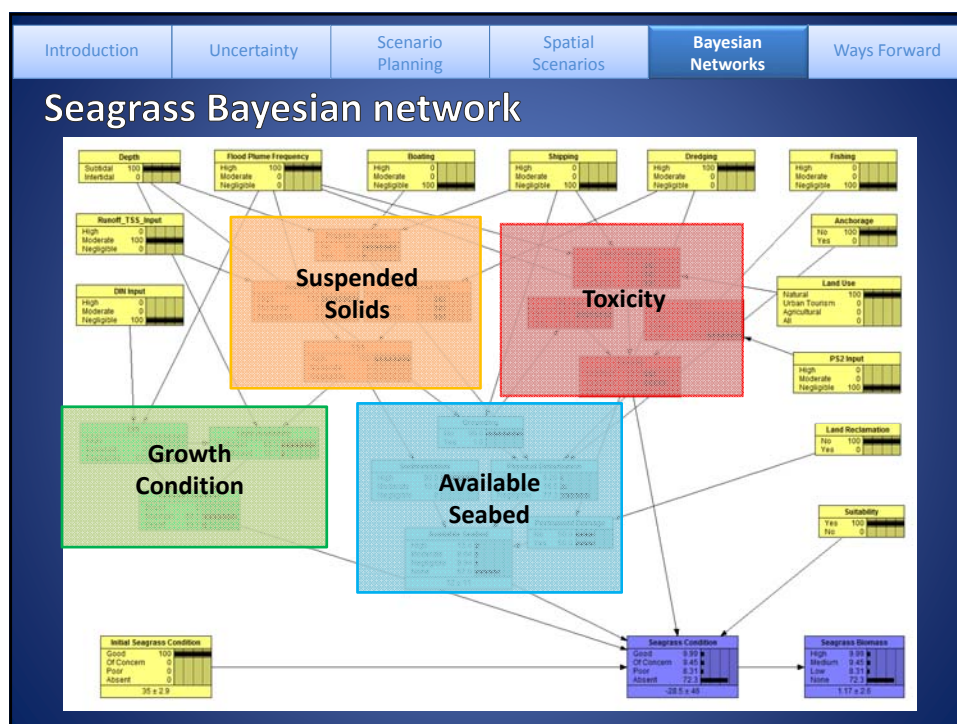
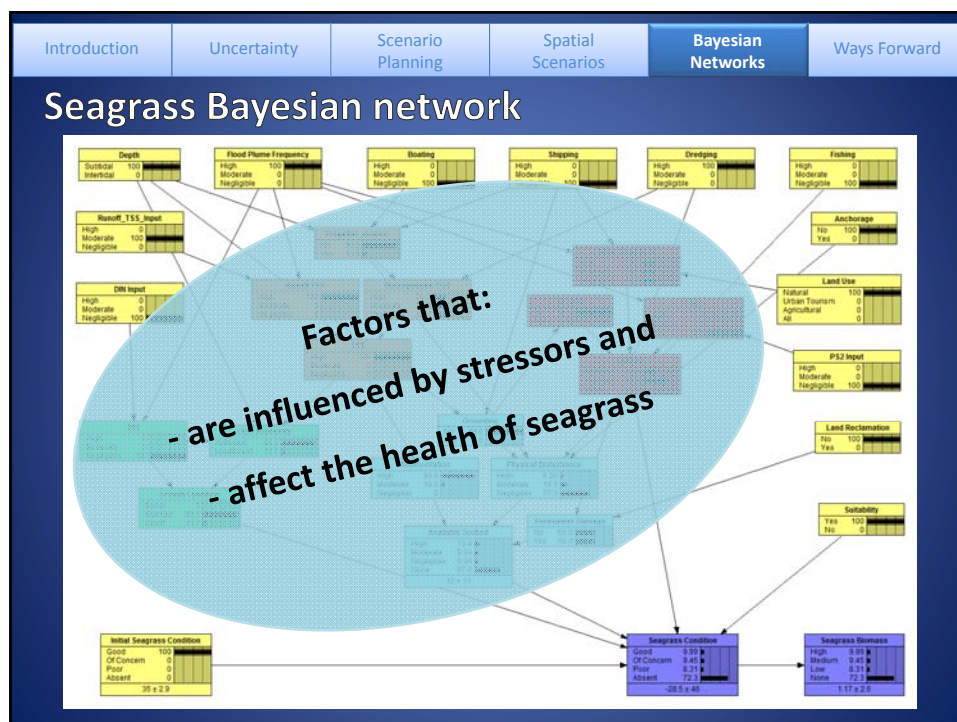


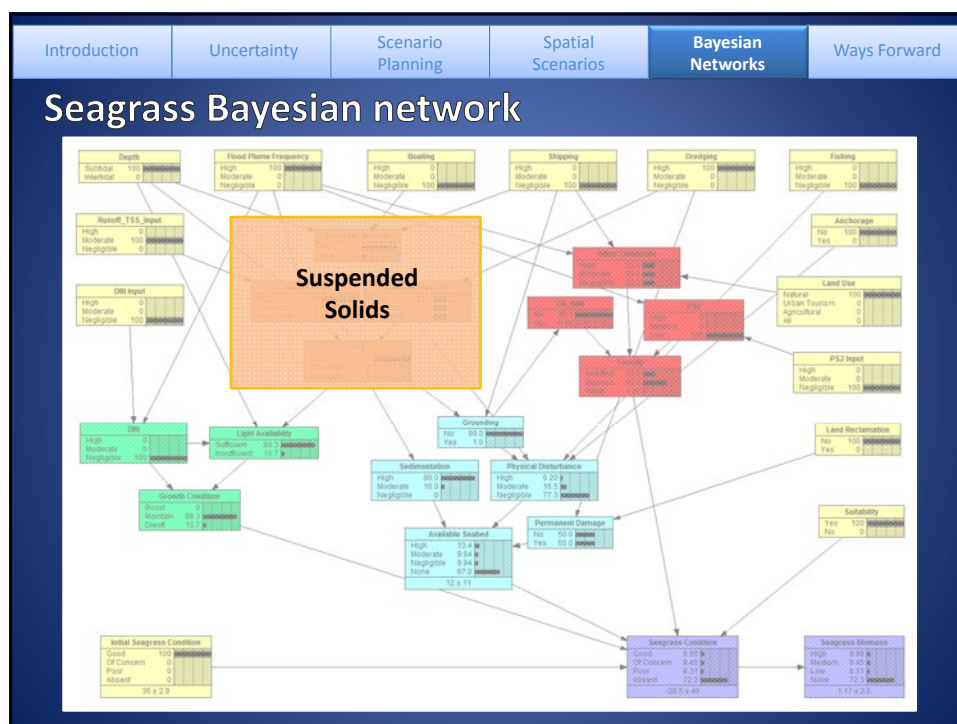
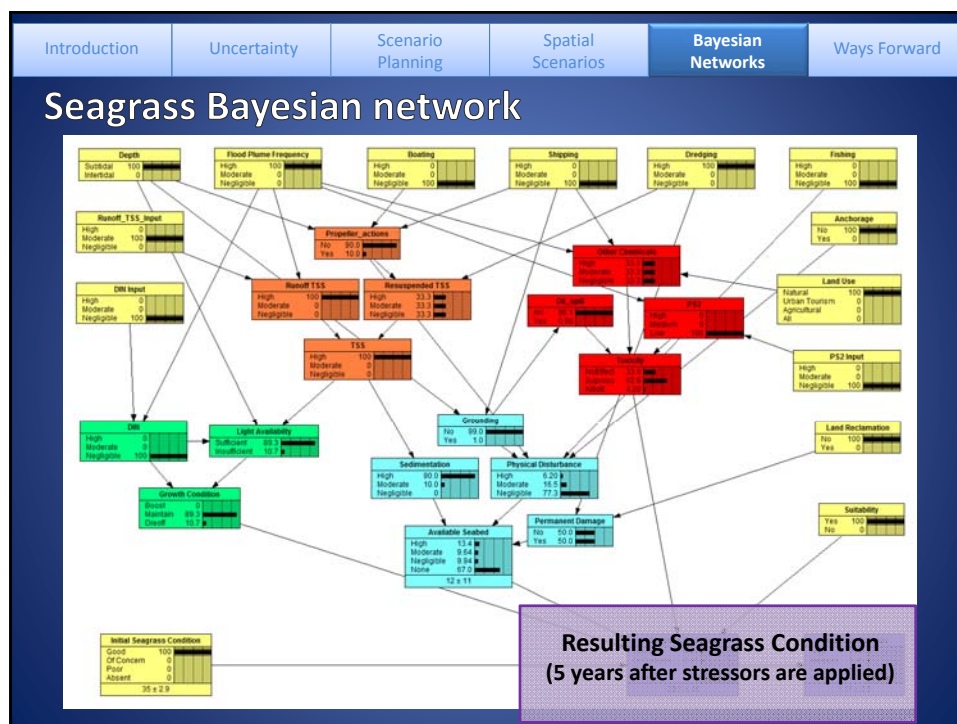


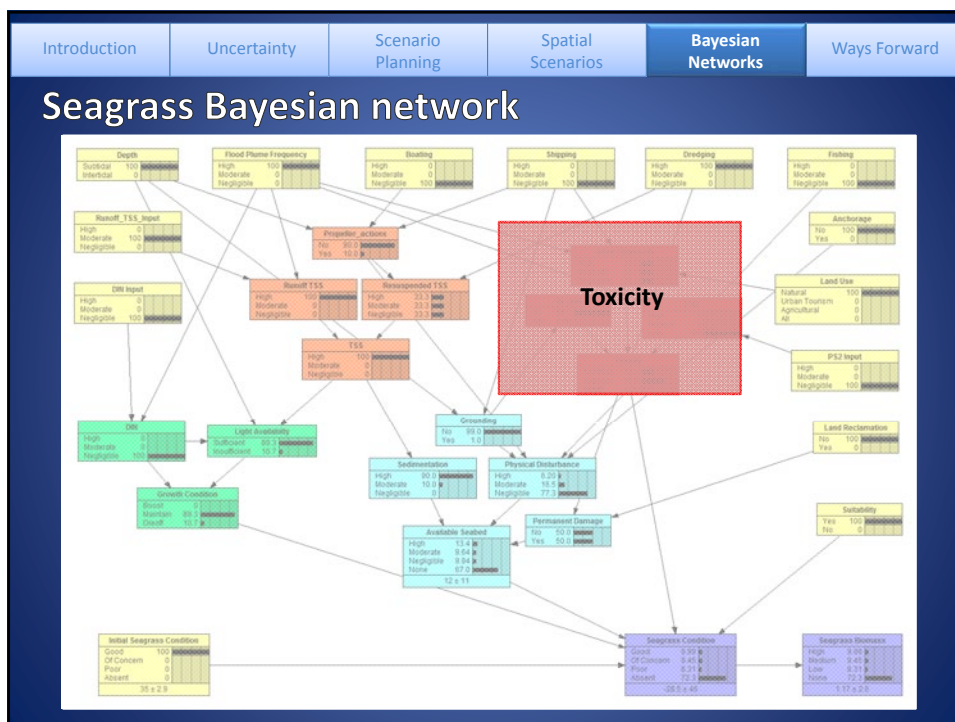
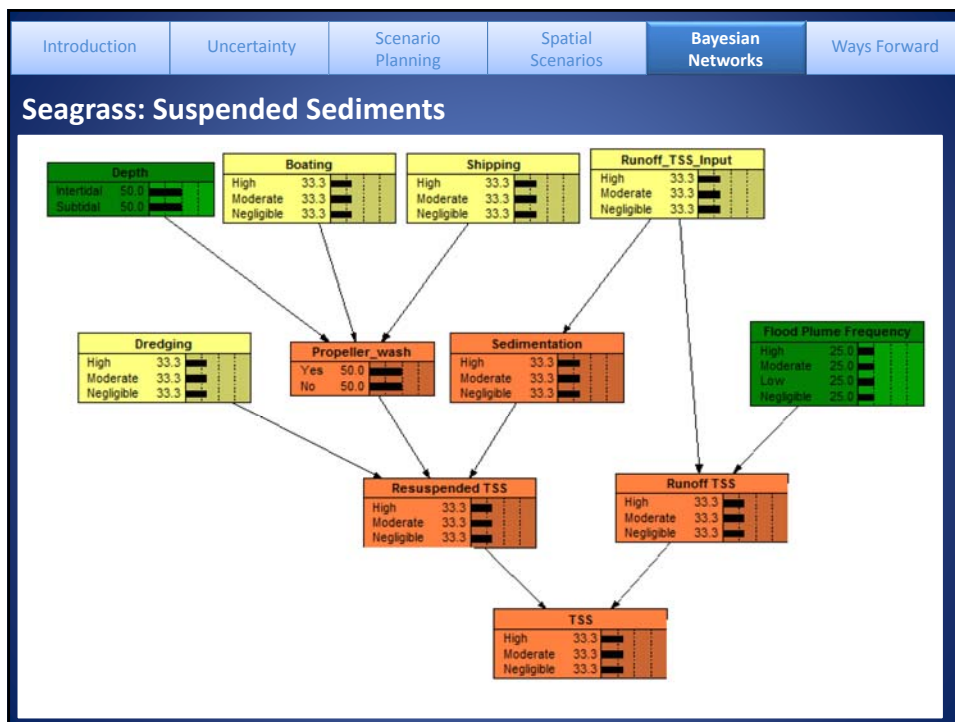


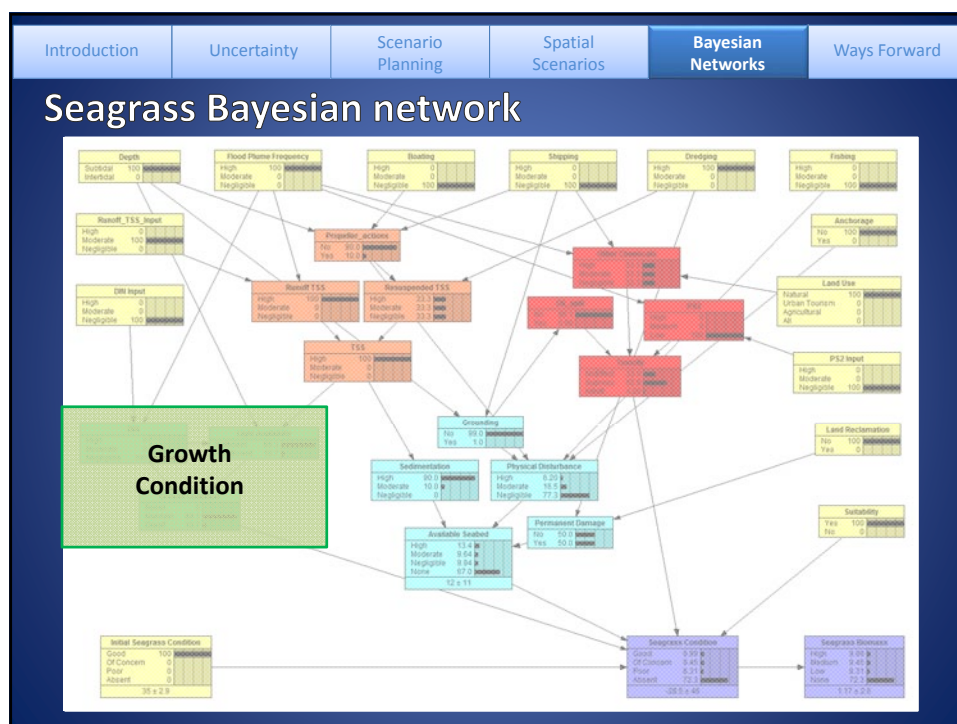
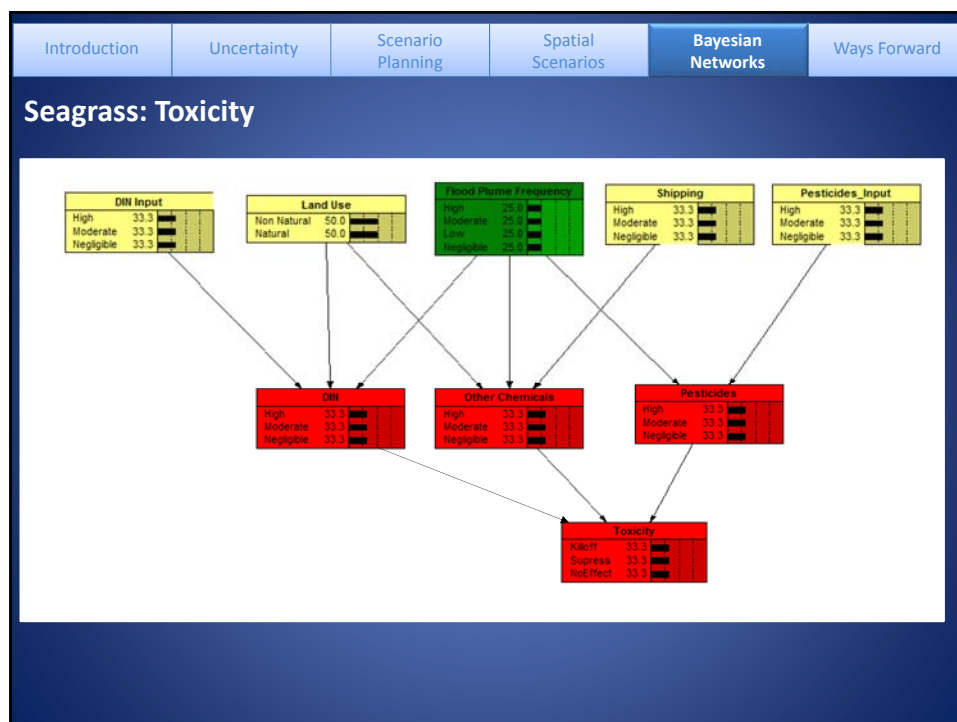


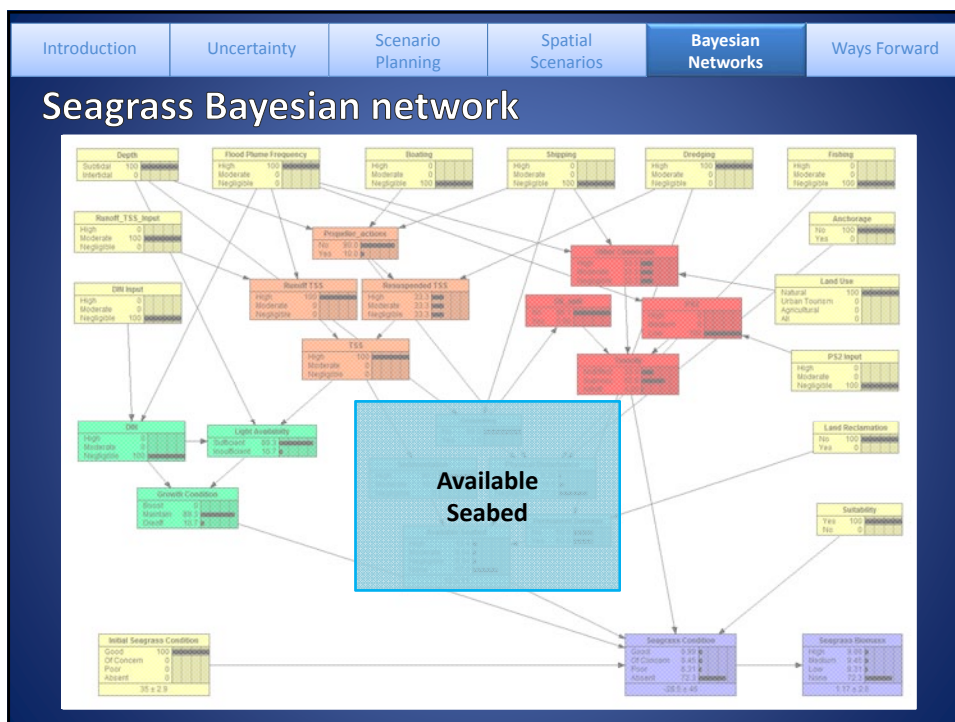
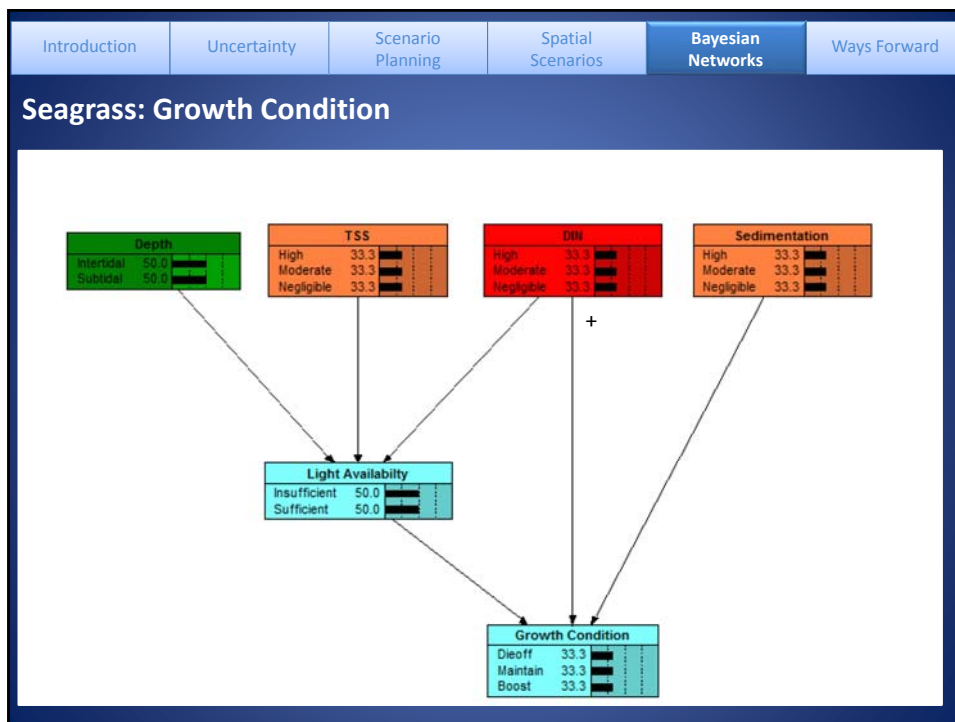


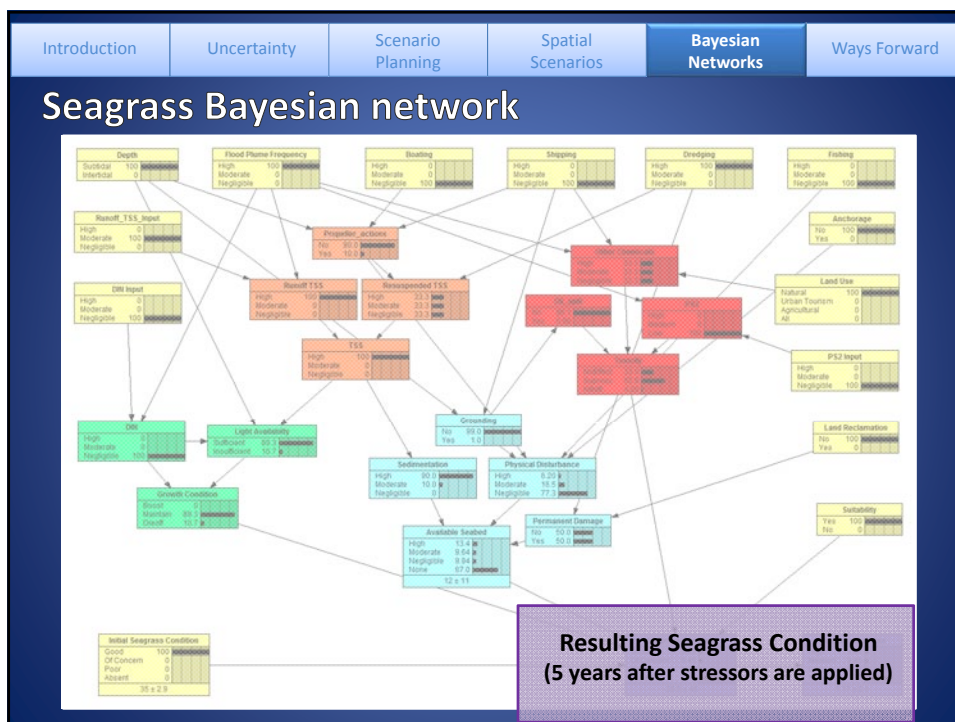
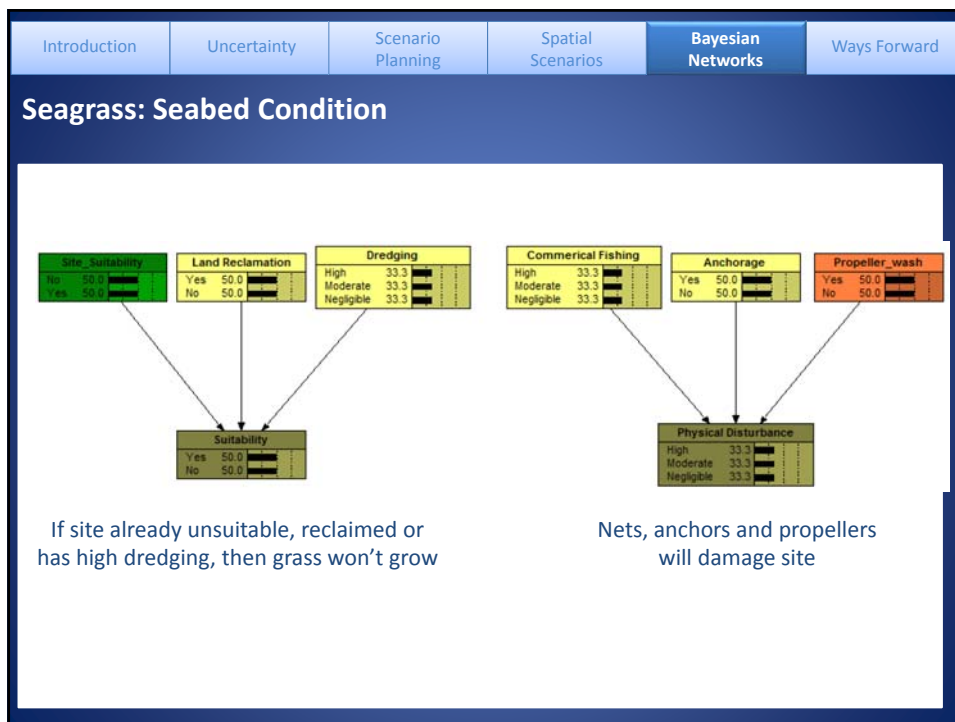


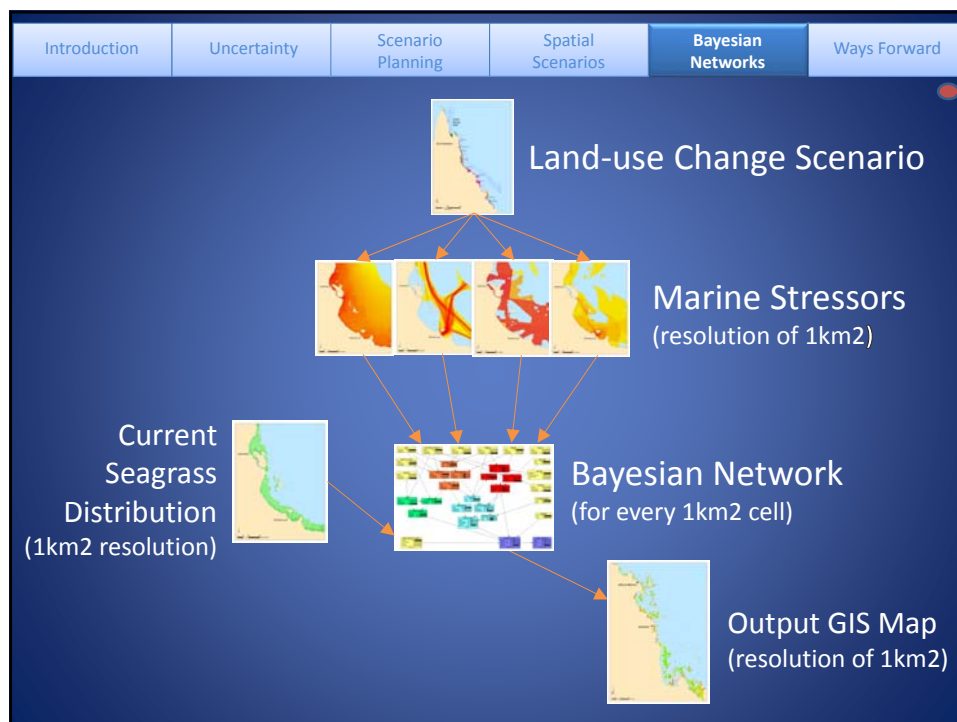
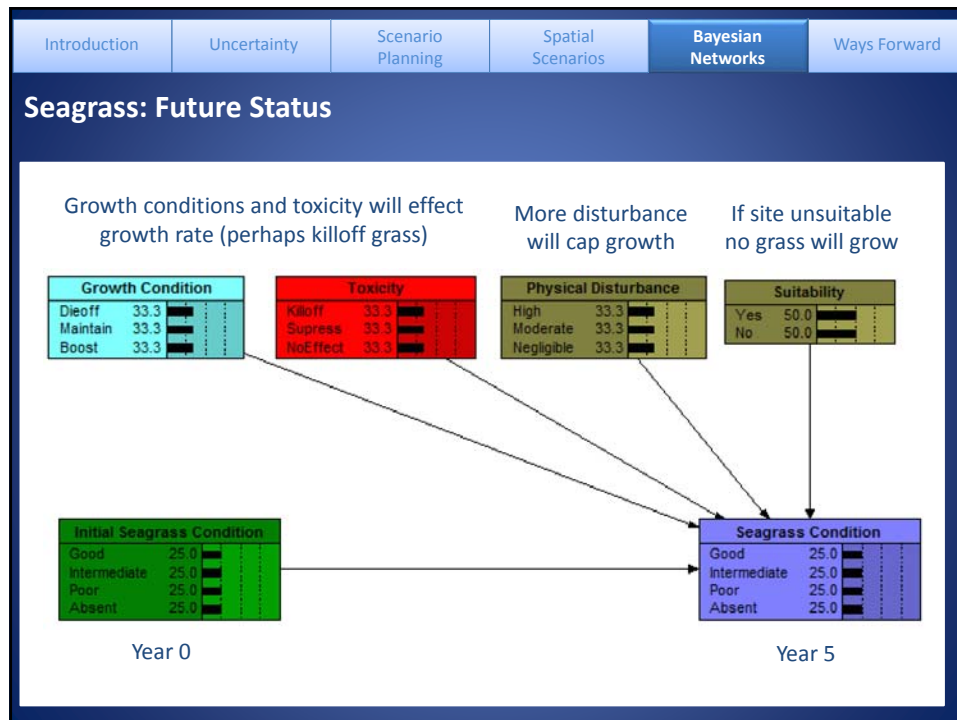


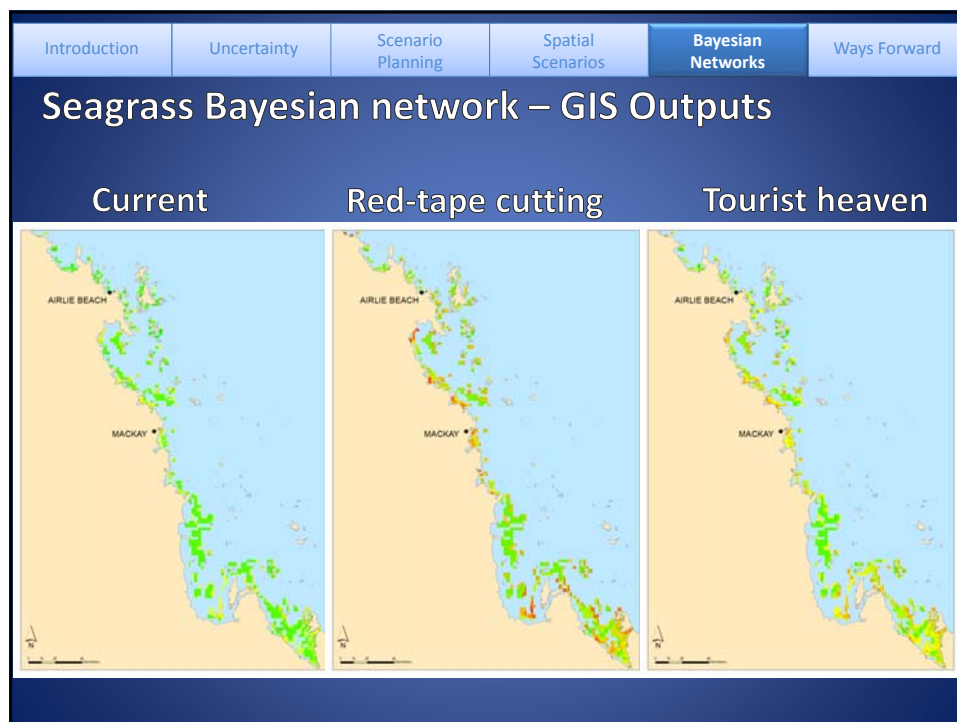
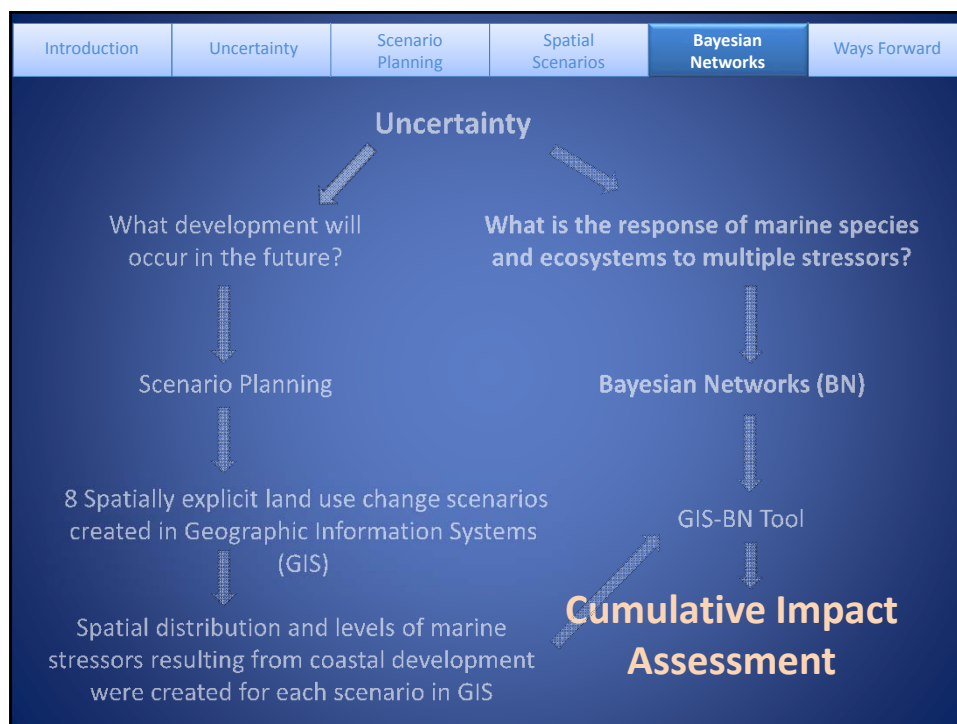


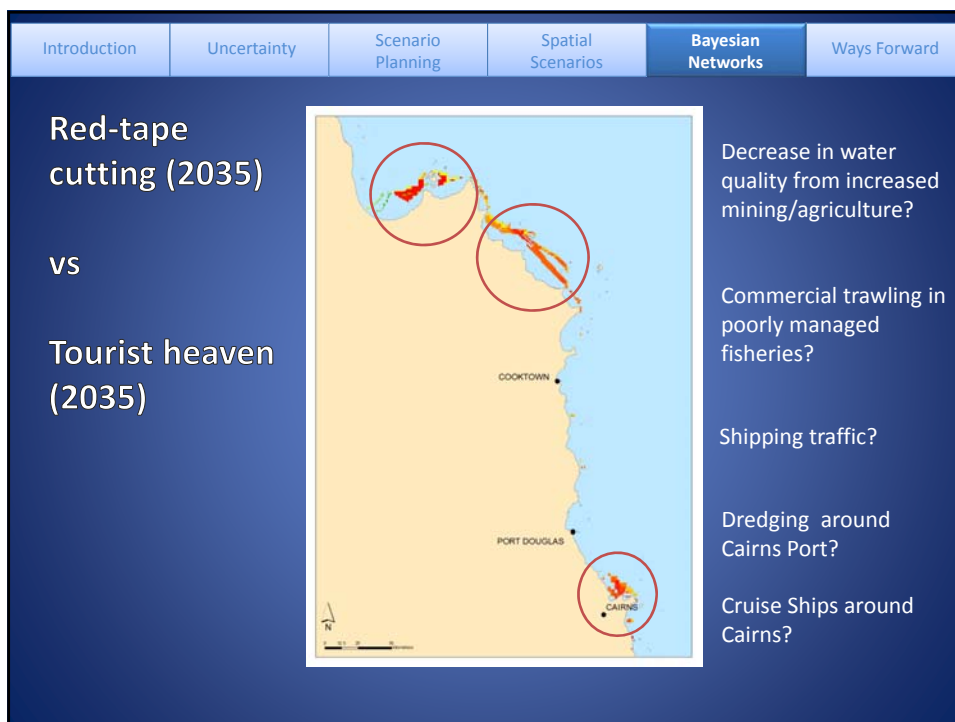


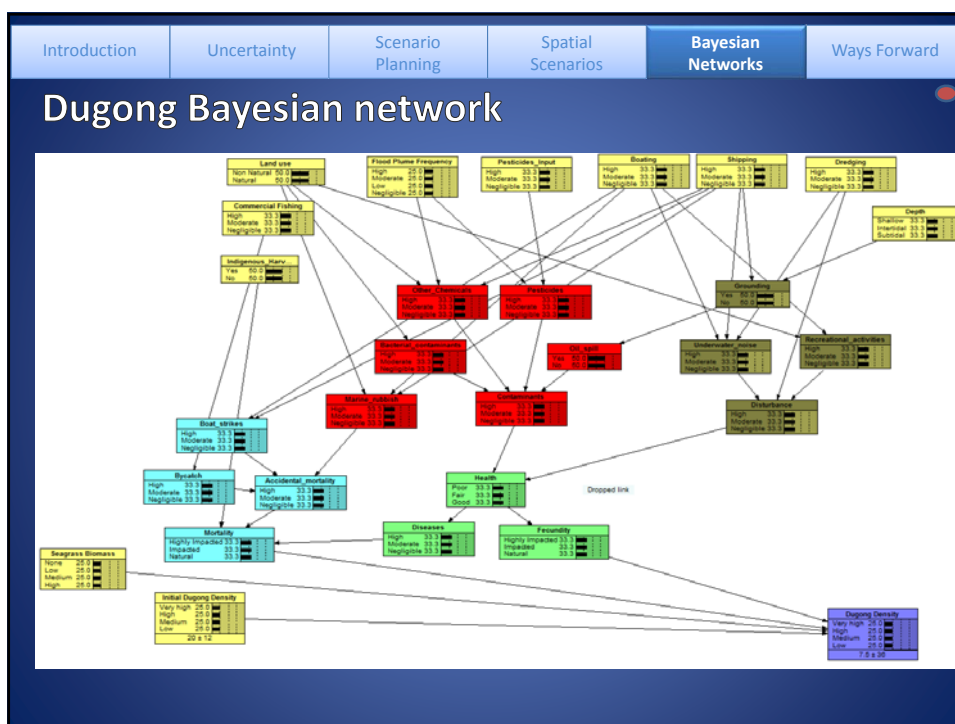
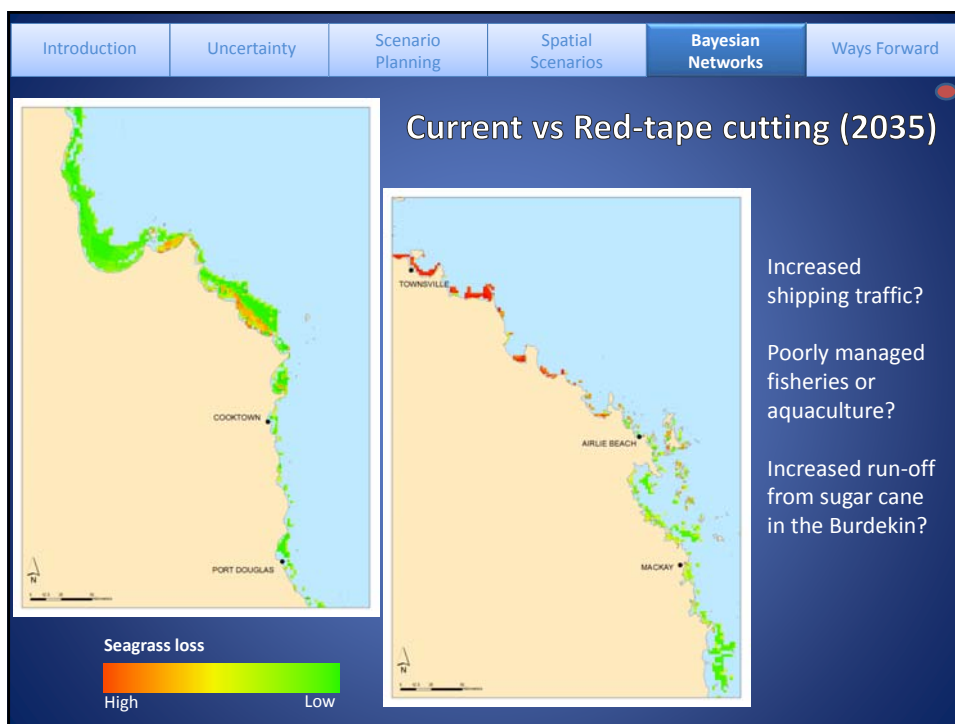


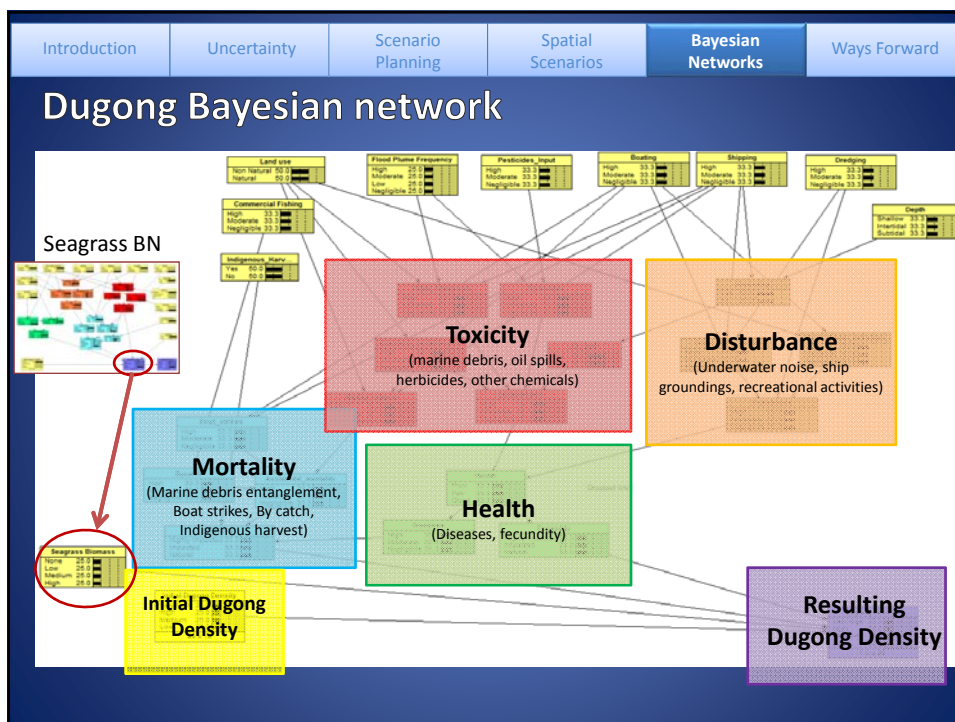
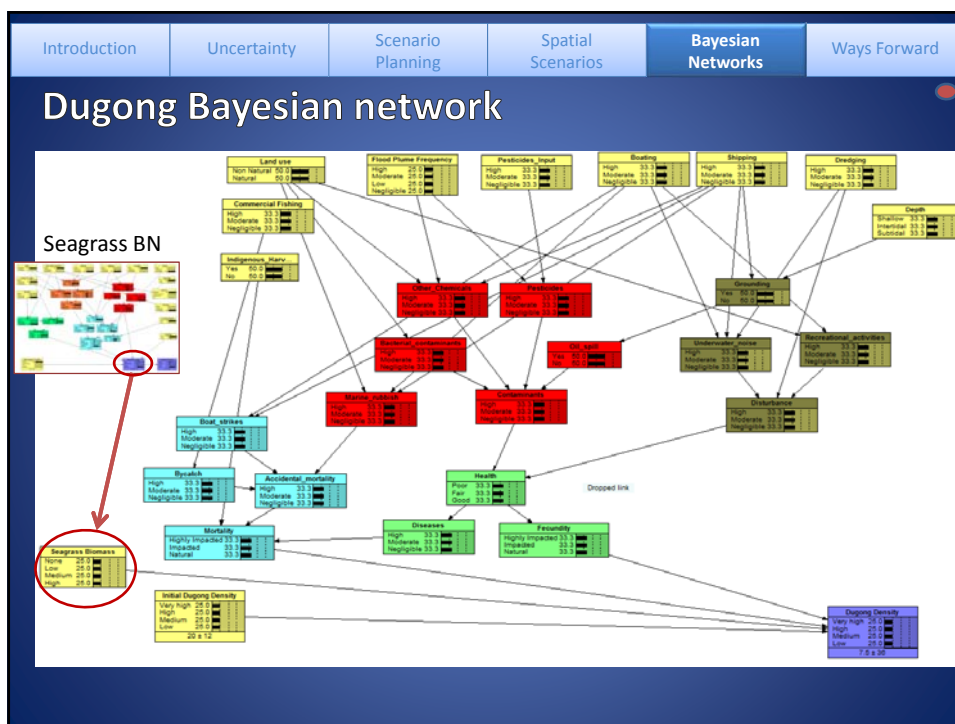












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Support for Decision Makers

- Understand **cumulative impacts** arising from a range of scenarios.
- Make **decisions** to avoid scenarios that have more severe impacts on the GBR.
- Protect **areas** threatened by a number of stressors in each scenario.
- Respond to future development with more **targeted and finely-tuned management**.


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Ways Forward

- Potential for Bayesian Networks to be developed for a range of **scenarios, species** and **ecosystems** at a variety of spatial scales, from whole-of-GBR to local areas across Australia.

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Ways Forward

- Potential for Bayesian Networks to be developed for a range of **scenarios**, **species** and **ecosystems** at a variety of spatial scales, from whole-of-GBR to local areas across Australia.
- By using the best available **data**, **models** and **expert advice**, the task of assessing cumulative impacts of coastal development on marine ecosystems can be **streamlined**, and made **explicit** and **consistent**.

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