

# **Ecosystem Services; our state of knowledge**

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### **Supporting**

- Nutrient Cycling
- Soil Formation
- Primary Production

### **Provisioning**

- Food
- Fresh water
- Fiber and fuel
- Genetic resources
- Medicines
- . . .

### **Regulating**

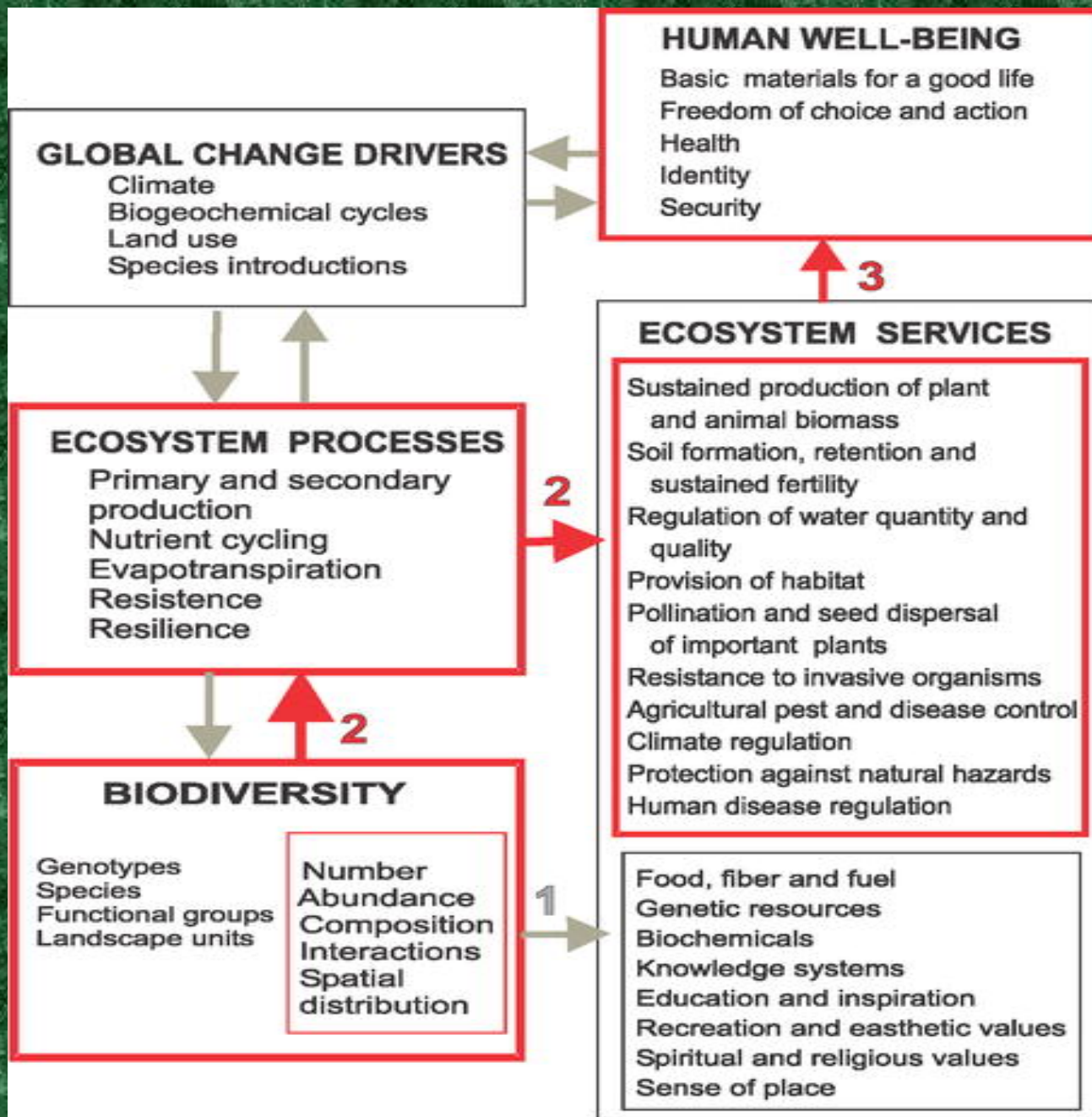
- Climate regulation
- Disease regulation
- Water regulation
- Pollination
- Soil stabilisation
- . . .

### **Cultural**

- Spiritual
- Religious
- Aesthetic
- Educational
- Scientific/Engineering
- . . .

Ecosystem Services

**Life on Earth: Biodiversity**

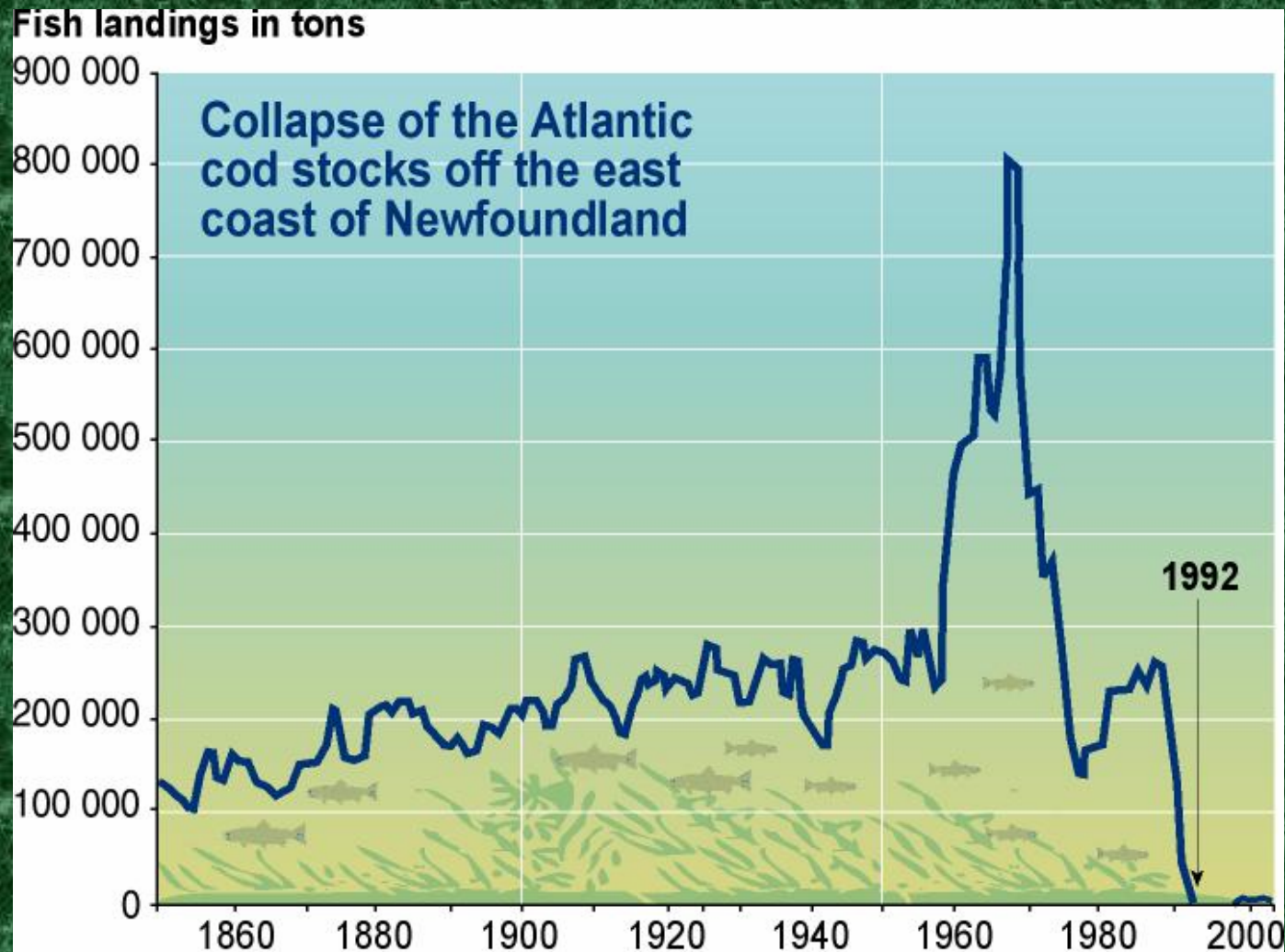


		Habitat change	Climate change	Invasive species	Over-exploitation	Pollution (nitrogen, phosphorus)
Forest	Boreal	↗	↑	↗	→	↑
	Temperate	↘	↑	↑	→	↑
	Tropical	↑	↑	↑	↗	↑
Dryland	Temperate grassland	↗	↑	→	→	↑
	Mediterranean	↗	↑	↑	→	↑
	Tropical grassland and savanna	↗	↑	↑	→	↑
	Desert	→	↑	→	→	↑
Inland water		↑	↑	↑	→	↑
Coastal		↗	↑	↗	↗	↑
Marine		↑	↑	→	↗	↑
Island		→	↑	→	→	↑
Mountain		→	↑	→	→	↑
Polar		↗	↑	→	↗	↑

# Scales add uncertainty

- Species numbers to reach equilibrium — 100-1,000 years
- Species composition to reach equilibrium — 10,000-1 million years
- Air temp to respond to rise in CO<sub>2</sub> — Up to 120-150 years
- Phosphorous concentrations to return to normal after applications halted — 10-300 years

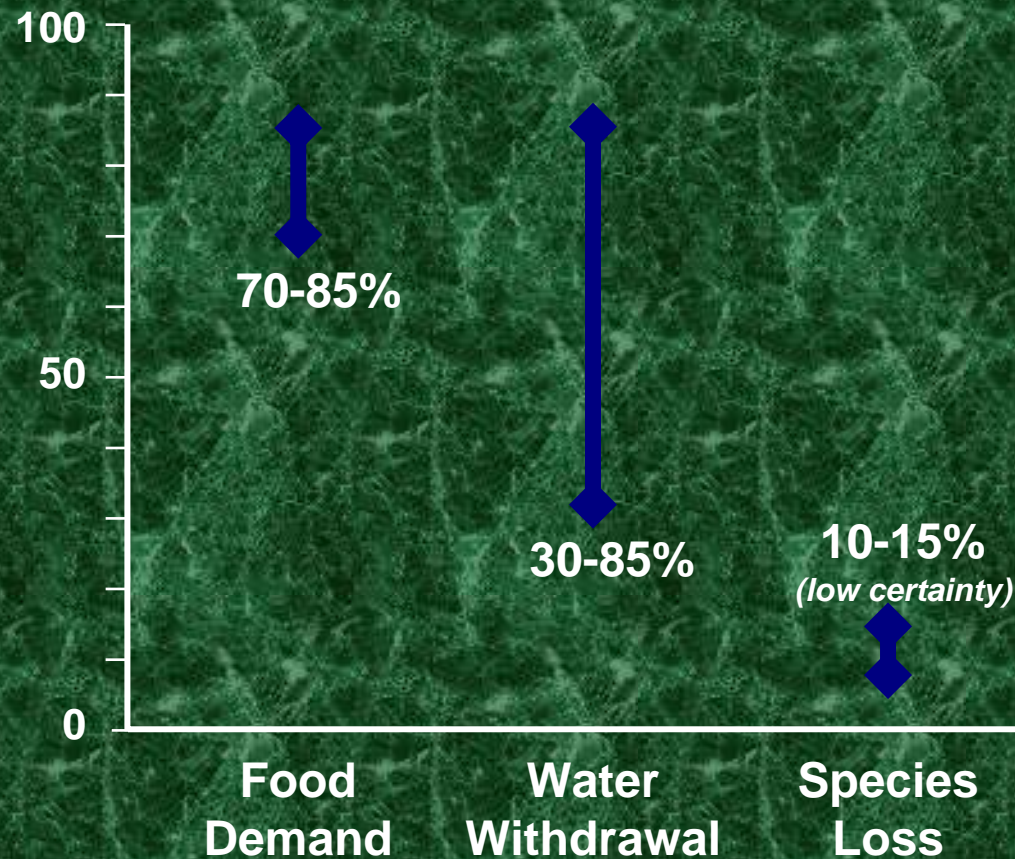
# Non-linear changes and thresholds



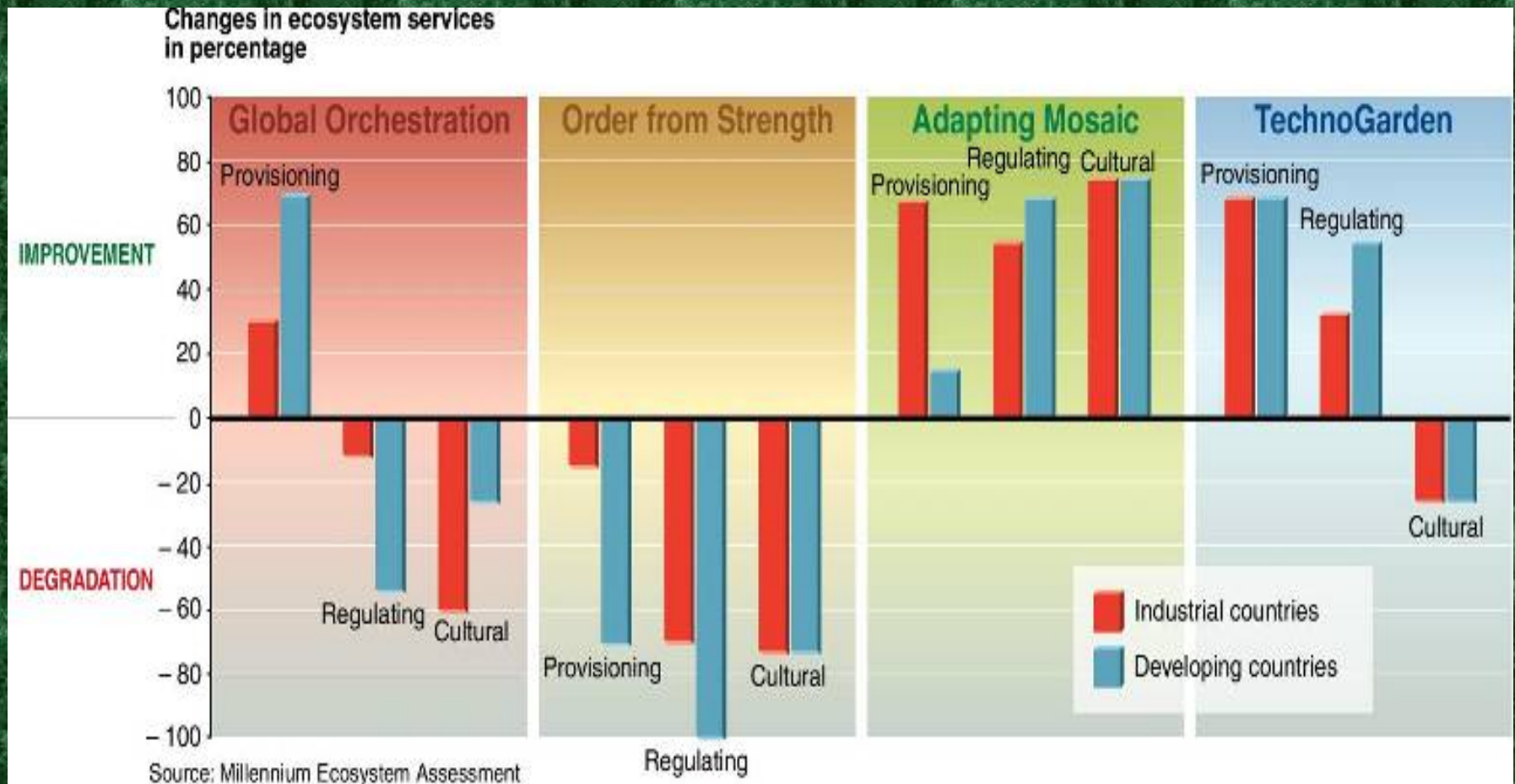
Source: Millennium Ecosystem Assessment

# Scenarios of change in ES

Percent Change by 2050



# We understand enough to make better decisions



# Key uncertainties remain

- Non-provisioning services
- Ecological processes affecting ES
- Dependency of populations on ES
- Some of the basics - eg species, wetlands, water
- Non-linear changes and thresholds
- Interactions between drivers of change
- Connections between spatial scales