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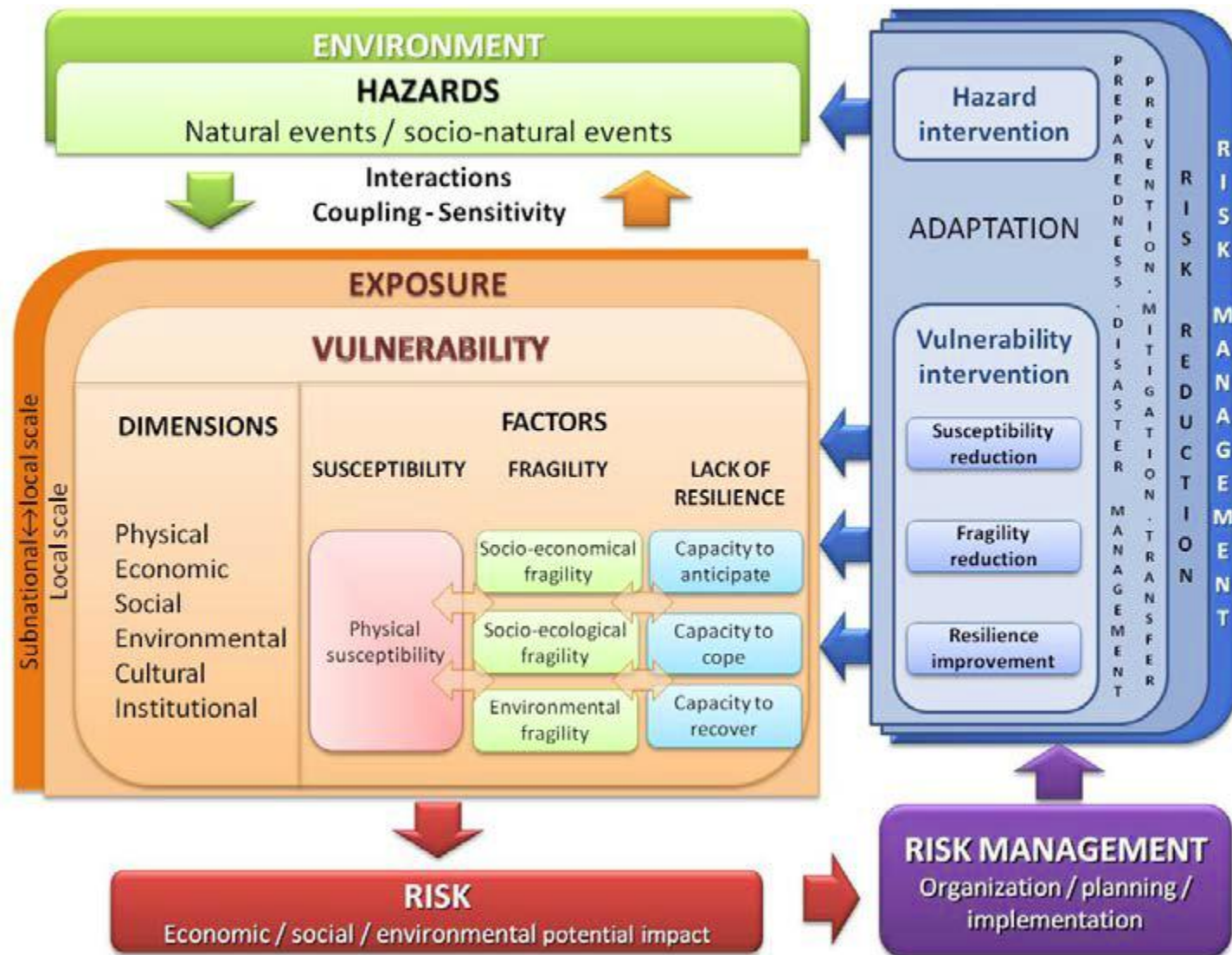
## **Risk and Sustainable Forest Management – the potential for use of criteria and indicator frameworks to manage natural hazards**

Dr Tim Payn, Convenor, Montréal Process Technical Advisory Committee



# Outline

- Natural Disasters and the role of Criteria And Indicators (C&I)
- Criteria and Indicators and Sustainable Forest Management
- Applicability of the Montreal Process C&I set
- Conclusions



Theoretical framework for a holistic approach to disaster risk assessment and management – from Cardona and Carreno 2011, Journal of Integrated Disaster Risk Management

# Disaster Indicators

- Wide literature
- Often composite
- Quite high level – national and international scale

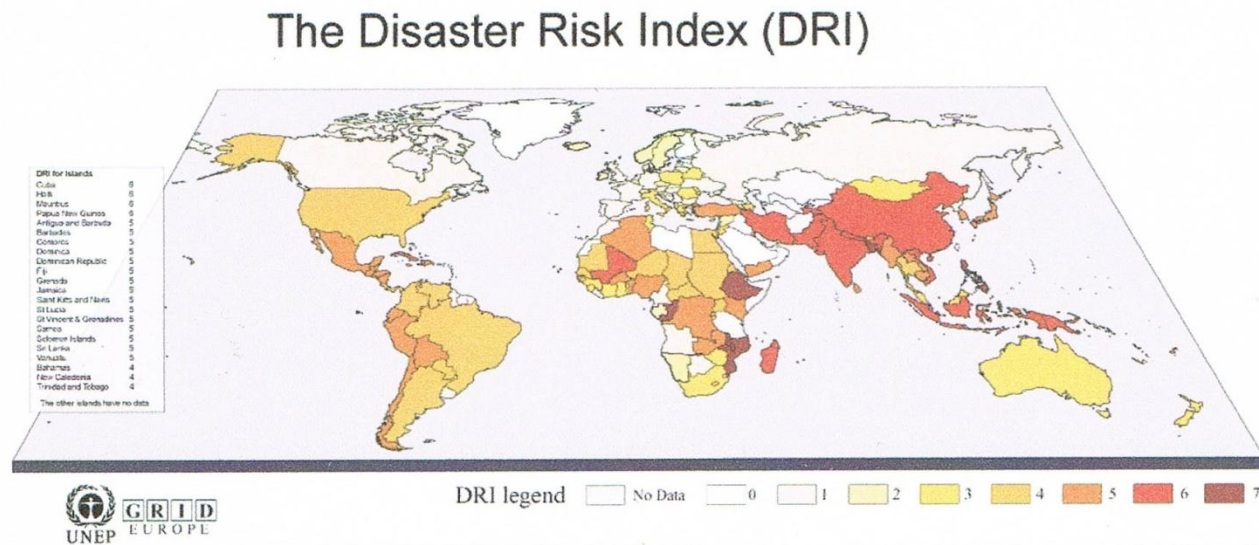
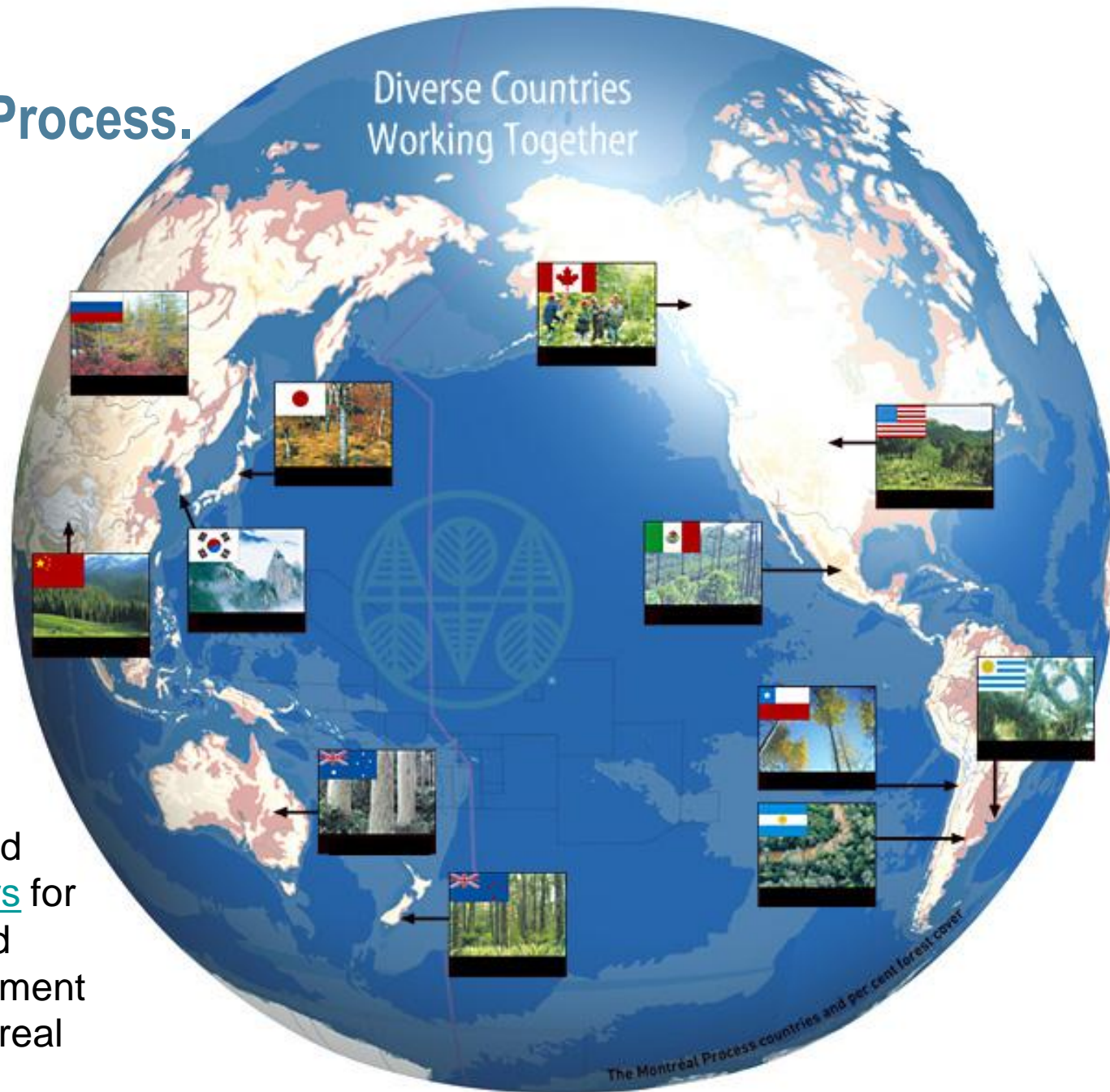


Fig. 1 Spatial distribution of DRI classes (0=no mortality risk to 7=highest mortality risk), source: Peduzzi et al. 2009:1157.

# The Montréal Process.



Developing and implementing internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests.



# Criteria & Indicators for Sustainable Forest Management

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- **Criterion** = Category of conditions by which to assess SFM
  - Maintenance of productive capacity of forest ecosystems
- **Indicator** = Measure of an aspect of the criterion
  - Area of forest land and net area of forest land available for timber production
  - Area and growing stock of plantations of native and exotic species
- C&I are value neutral

# MPC&I – relevant ‘within forest’ indicators

## Criterion 1: Conservation of biological diversity

### 1.1. Ecosystem Diversity

1.1.a Area and percent of forest by forest ecosystem stage, age class, and for tree species

1.1.b Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage

1.1.c Fragmentation of forests

### 1.2. Species Diversity

1.2.a Number of native forest-associated species

1.2.b Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment

1.2.c Status of on site and off site efforts focused on conservation of species diversity

### 1.3. Genetic Diversity

1.3.a Number and geographic distribution of forest-associated species at risk of losing genetic variation and locally adapted genotypes

1.3.b Population levels of selected representative forest-associated species to describe genetic diversity

1.3.c Status of on site and off site efforts focused on conservation of genetic diversity

## Criterion 2: Maintenance of productive capacity of forest ecosystems

2.a Area and percent of forest land and net area of forest land available for wood production

2.b Total growing stock and annual increment of both merchantable and non-merchantable tree species in forests available for wood production

2.c Area, percent, and growing stock of plantations of native and exotic species

2.d Annual harvest of wood products by volume and as a percentage of net growth or sustained yield

2.e Annual harvest of non-wood forest products

3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive alien species) beyond reference conditions

3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions

3.c Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions

## Criterion 4: Conservation and maintenance of soil and water resources

### 4.1 Protective function

4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources

### 4.2 Soil

4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources

4.2.b Area and percent of forest land with significant soil degradation

### 4.3 Water

4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources

4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions

## Criterion 5: Maintenance of

3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive alien species) beyond reference conditions

energy

## Criterion 6: Enhancer multiple

3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions

## 6.1 Product

6.1.a Value and volume of wood and wood products production, including primary and secondary processing

6.1.b Value of wood products

6.1.c Revenue from environmental products

6.1.d Consumption of wood products in

6.1.e Total and per capita consumption of non-wood forest products

6.1.f Value and volume in round wood equivalent imports

6.1.g Value of non-wood products

6.1.h Exports of wood products production, and imports as a share of wood and wood products consumption

6.1.i Pro

6.1.j Pro

6.1.k Pro

6.1.l Pro

6.1.m Pro

6.1.n Pro

6.1.o Pro

## 6.2 Investment in the forest sector

Value of capital investment and annual expenditure in forest management, wood and non-wood product industries, forest-based recreational services, recreation and tourism

2.b Annual investment and expenditure in forest-related research, extension and development, and education

## community

6.3.a Resilience of forest-dependent communities

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6.3.k Resilience of forest-dependent communities

6.3.l Resilience of forest-dependent communities

6.3.m Resilience of forest-dependent communities

## Criterion 7: Legal, institutional and economic frameworks for forest conservation and sustainable management

7.1.a Legislation and policies supporting the sustainable management of forests

7.1.b Cross sectoral policy and programme coordination

7.2.a Taxation and other economic strategies that affect sustainable management of forests

7.2.b Clarity and security of land and resource tenure and property rights

7.2.c Enforcement of laws related to forests

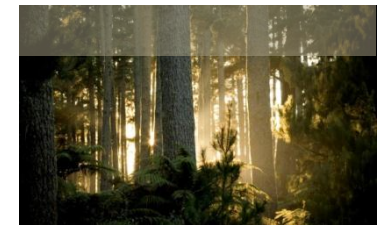
7.3.a Programmes, services and other resources supporting the sustainable management of forests

7.3.b Development and application of research and technologies for the sustainable management of forests

7.3.c Partnerships to promote the sustainable management of forests

7.3.d Public participation and conflict resolution in forest-related decision making

7.3.e Monitoring, assessment and reporting on progress towards sustainable management of forests



# MPC&I – indicators of community impacts

## Criterion 1: Conservation of biological diversity

### 1.1. Ecosystem Diversity

1.1.a Area and percent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure

1.1.b Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage

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### 1.2. Species Diversity

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2.d Annual harvest of wood products by volume and as a percentage of net growth or sustained yield

2.e Annual harvest of non-wood forest products

## Criterion 3: Maintenance of forest ecosystem health and vitality

3.a Area and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive alien species) beyond reference conditions

3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions

## Criterion 4: Conservation and maintenance of soil and water resources

### 4.1 Protective function

4.1.a Area and percent of forest with designation or land management focus is the protection of soil or water resources

### 4.2 Soil

4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources

4.2.b Area and percent of forest land with significant soil degradation

### 4.3 Water

4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources

4.3.b Area and percent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions

## Criterion 5: Maintenance of forest contribution to global carbon cycles

5.a Total forest ecosystem carbon pools and fluxes

5.b Total forest product carbon pools and fluxes

5.c Avoided fossil fuel carbon emissions by using forest biomass for energy

## Criterion 6: Maintenance and enhancement of long term

### 6.3.c Resilience of forest-dependent communities

### 6.1 Production and consumption

6.1.a Revenue from forest based environmental services

6.1.b Revenue from forest based environmental services

6.1.c Revenue from forest based environmental services

6.1.d Value and volume in round wood equivalents of exports and imports of wood products

6.1.e Value of exports and imports of non-wood forest products

6.1.f Exports as a share of wood and wood products production, and imports as a share of wood and wood products consumption

6.1.g Recovery or recycling of forest products as a percent of total forest products consumption



## 6.2 Investment in the forest sector

6.2.a Value of capital investment and annual expenditure in forest management, wood and non-wood forest product in environmental and

6.2.b Annual investment and expenditure in forest-related research, extension and development, and education

## 6.3 Employment and community needs

6.3.a Employment in the forest sector

6.3.b Average wage rates, annual wage income and annual injury rates in major forest employment categories

6.3.c Resilience of forest-dependent communities

6.3.d Area and percent of forests used for subsistence purposes

6.3.e Distribution of revenues derived from forest management

## 6.4 Recreation and tourism

6.4.a Area and percent of forests available and/or managed for public recreation and tourism

6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available

## 6.5 Cultural, social and spiritual needs and values

6.5.a Area and percent of forests managed primarily to protect the range of cultural, social and spiritual needs and values

6.5.b The importance of forests to people



## Criterion 7: Legal, institutional and economic frameworks for forest conservation and management

7.1.a Policies and policies sustainable management of forests

7.1.b Cross sectoral policy and programme coordination

7.2.a Taxation and other economic strategies that affect sustainable management of forests

7.3.a Clarity and security of land and resource tenure and property rights

7.3.b Enforcement of laws related to forests

7.4.a Programmes, services and other

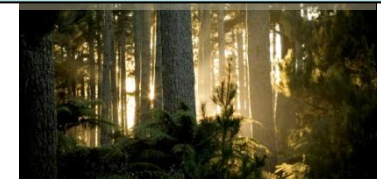
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7.5.b Public participation and conflict resolution in forest-related decision making

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# MPC&I Indicators supporting disaster response

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## Criterion 5: Maintenance of forest contribution to global carbon cycles

5.a Total forest ecosystem carbon pools and fluxes

5.b Total forest product carbon pools and fluxes

5.c Avoided fossil fuel carbon emissions by using forest biomass for energy

## Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits

### 6.1 Production and consumption

6.1.a Value and volume of wood and non-wood products production, including primary and secondary processing

6.1.b Value of non-wood forest products produced or collected

6.1.c Revenue from forest based environmental services

6.1.d Total and *per capita* consumption of wood and wood products in round wood equivalents

6.1.e Total and *per capita* consumption of non-wood forest products

6.1.f Value and volume in round wood equivalents of exports and imports of wood products

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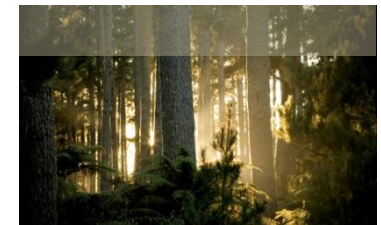
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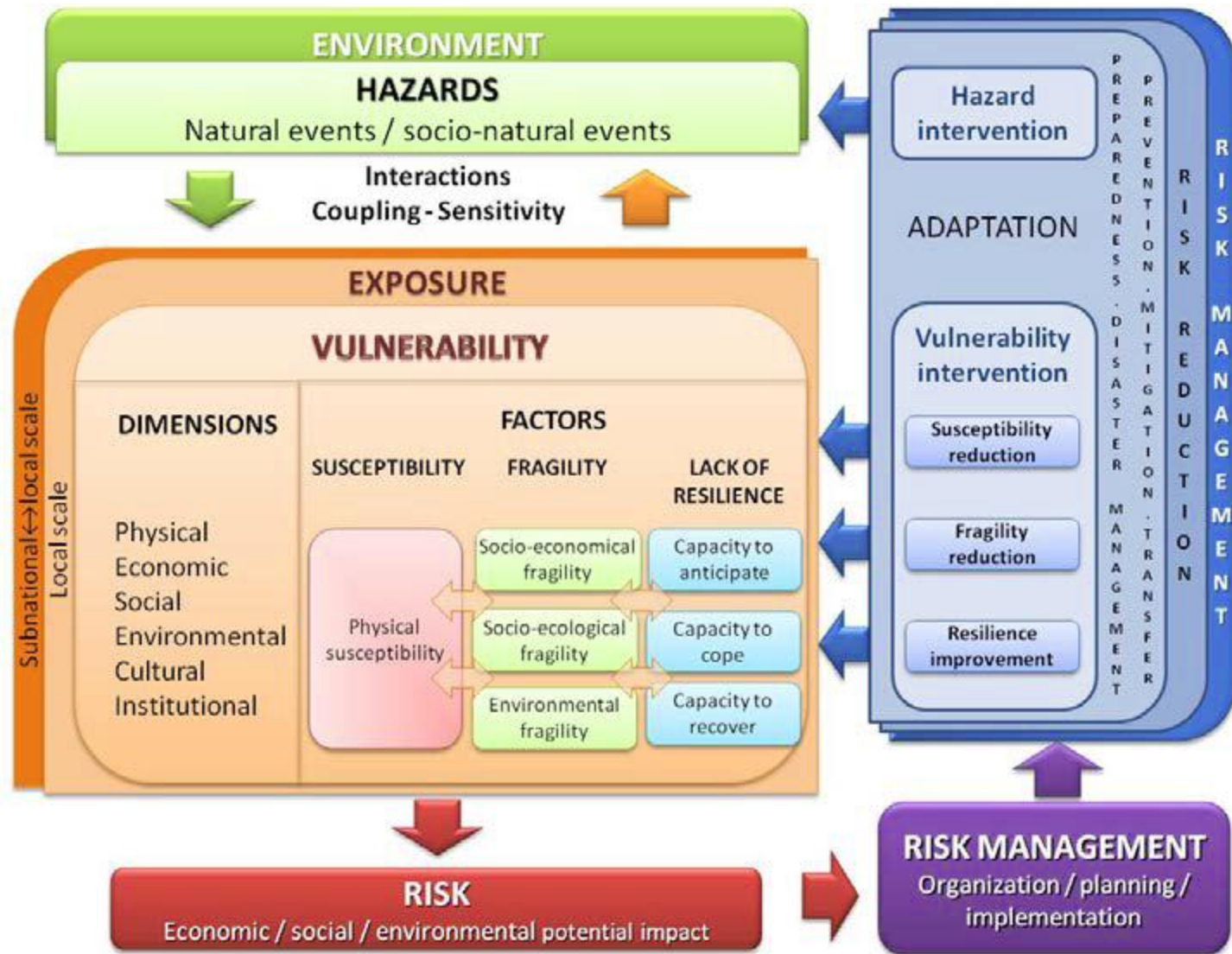
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# Usefulness of C&I frameworks

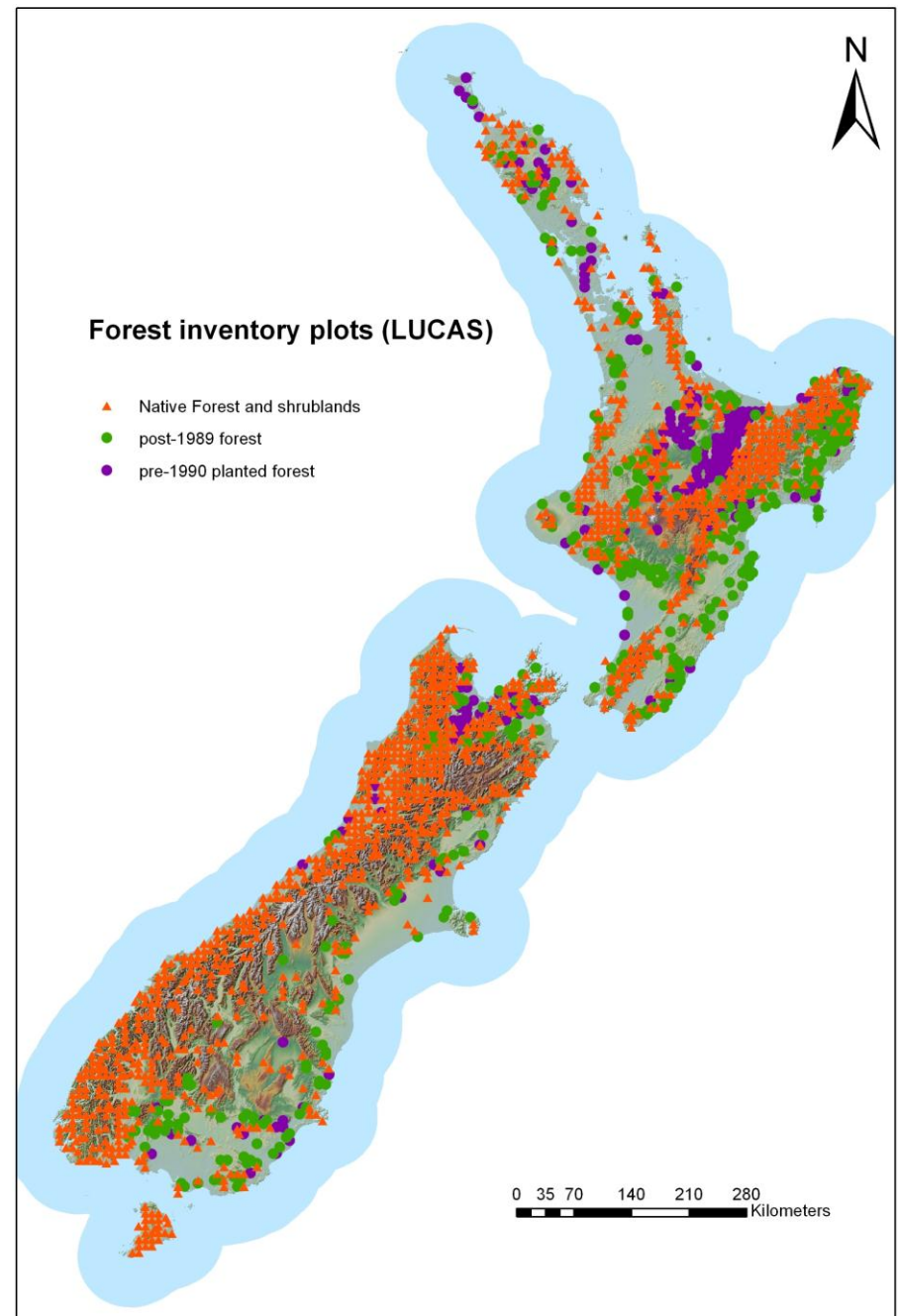
- Existing frameworks provide base data and information on 'state' and 'trends'
- Short and medium term biotic and abiotic risks are covered, longer frequency hazards such as earthquakes and volcanoes are not
- The base data can then be used to develop risk management and response frameworks
- Information can be used to better manage forests and also to develop response strategies for wider societies using forests and forest products



**C&I reporting – underpinning forest information for hazard management**

# Conclusions

- Forest information is crucial for risk management both of forests and for wider society
- Information can be used to explore risk scenarios and develop responses
- National long term monitoring networks are extremely valuable for defining risks and also developing mitigation strategies



# Thank You

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