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Biodiversity, Ecosystem Services and Adaptation

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Biodiversity and Climate Change

- Biodiversity- different life form, their variety and variability at all levels
- Adaptation is comprised of activities that reduce a system's (human and natural) vulnerability to climate change
- Biodiversity is determined by
 1. Mean climate and climate variability
 2. Productivity of site
 3. Original stock of biodiversity
 4. Spatial heterogeneity of habitats
 5. The intensity and interdependency of biotic interactions (competition, predation, mutualism and symbolism)
- Past changes in the global climate resulted in major shifts in species ranges and marked reorganisation of biological communities, landscapes and biomes

Scale of Change

- *20% of the world's coral reefs were lost and more than 20% degraded*
- *35% of mangrove area has been lost in the last several decades*



Linkages of CC, Adaptation and Biodiversity

- Every year, 3.2 Gt of atmospheric C is built up (release minus assimilation by terrestrial and oceanic ecosystems)
- Ecosystems approach helps the scope of adaptation and its impact on biodiversity
- Land use change can significantly influence the reduction of GHGs through avoiding deforestation, conserving carbon pool substitution of fossil fuels etc.
- Bioenergy, hydropower are useful responses for enhancing and strengthening biodiversity and climate change

Resilient ecosystems are more likely to adapt to climate change and climate variability

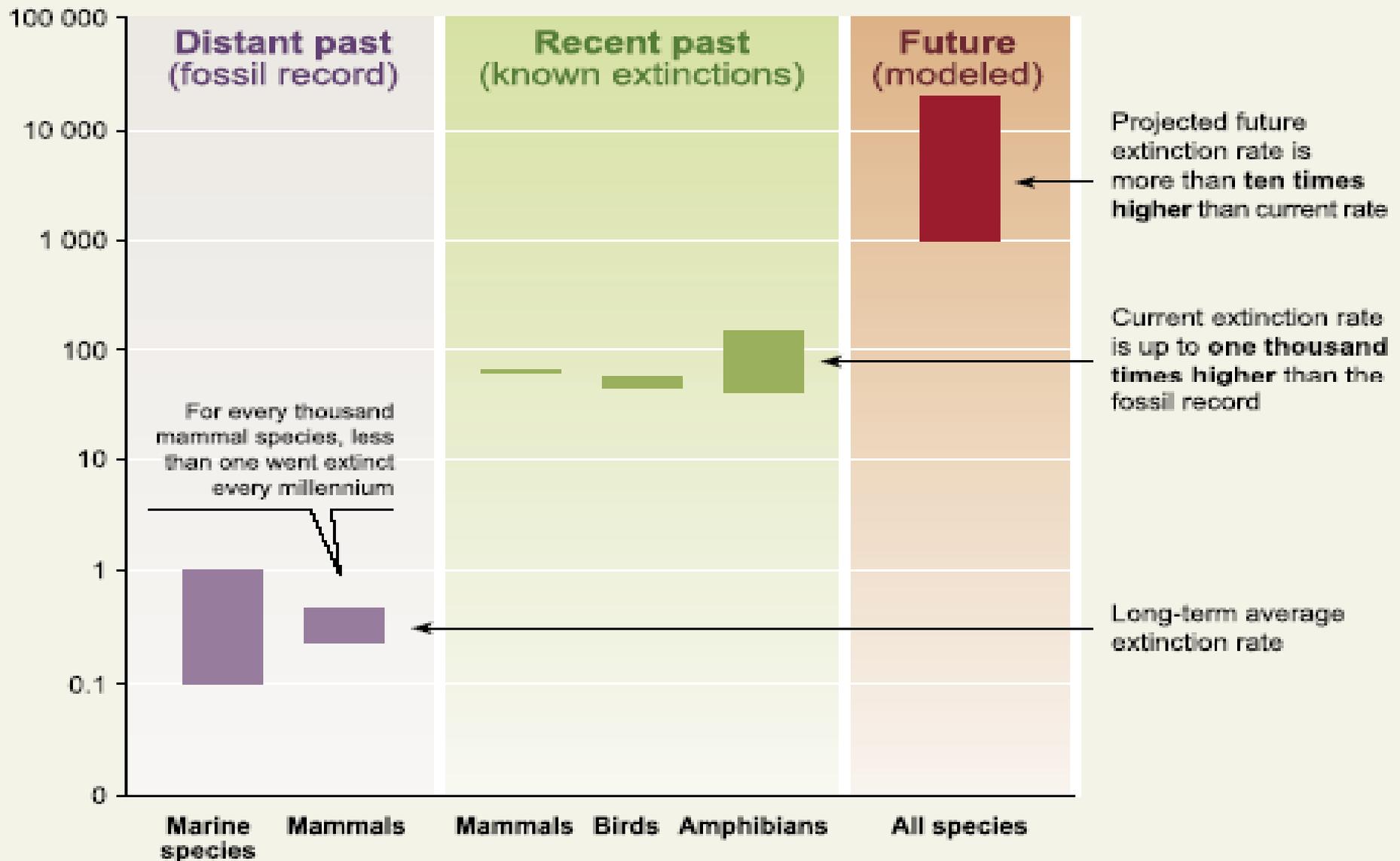
Projected change in climate during the 21st century will occur faster than in at least the past 10,000 years (change in exotic species, IAS etc)

Some ecosystems are particularly vulnerable to climate change e.g. coral reefs and mangroves etc.

Changes in Biodiversity at ecosystem and landscape scale will further change the climate!

WHAT IS THE PROBLEM?

Extinctions per thousand species per millennium



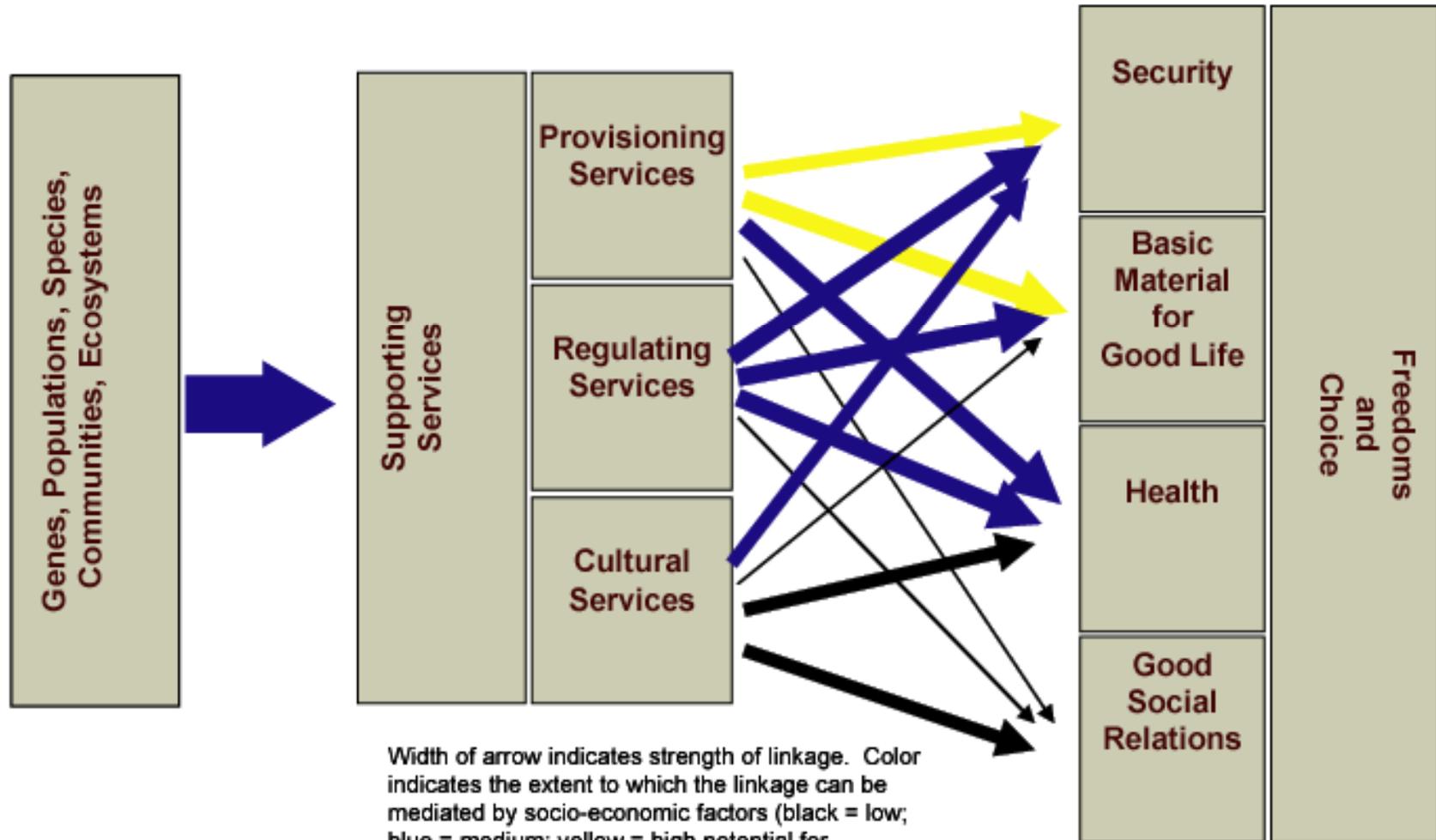
Source: Millennium Ecosystem Assessment

Linkages among Biodiversity, Ecosystem services, and Human Well-Being

Biodiversity

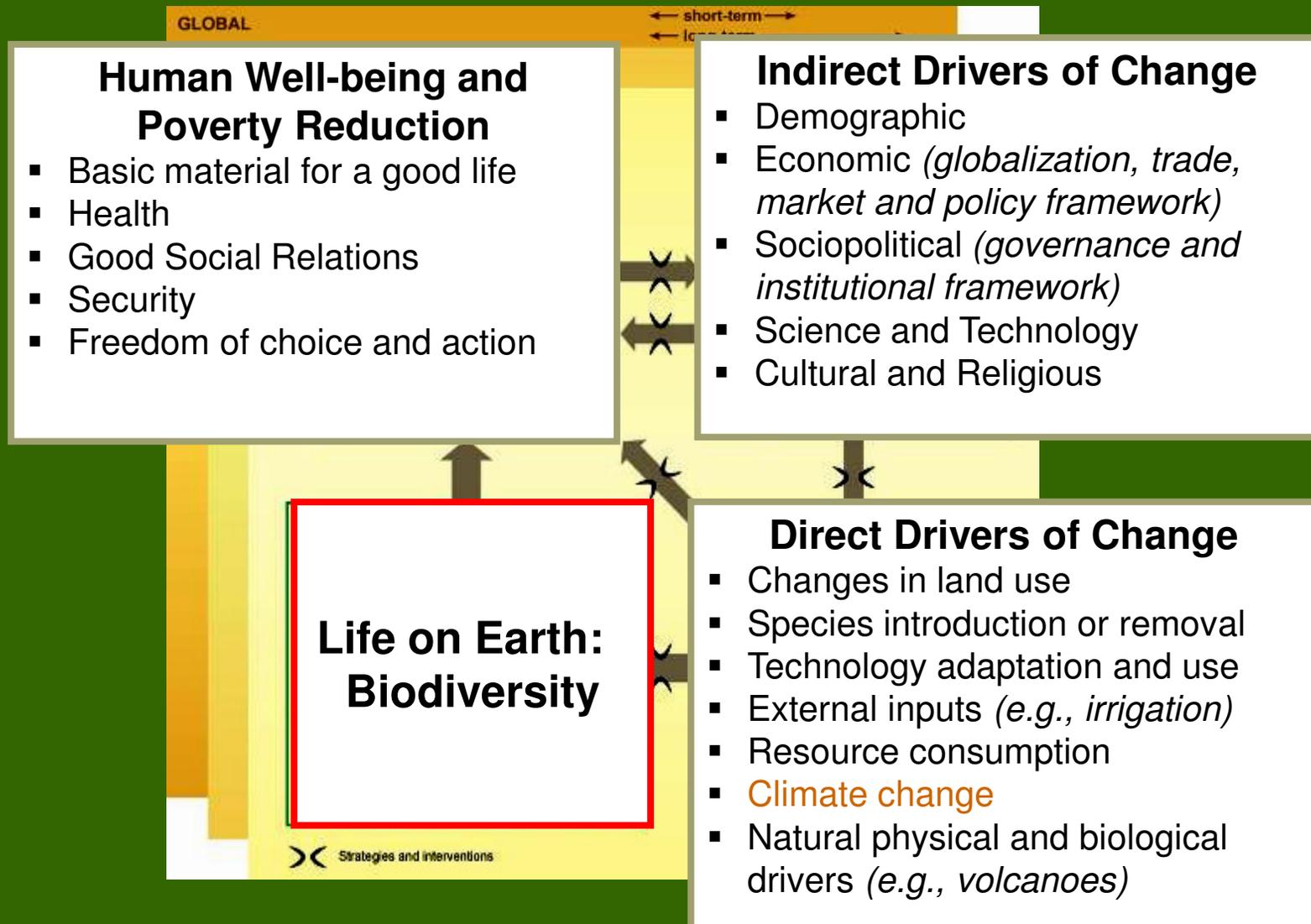
Ecosystem Services

Constituents of Well-being



Width of arrow indicates strength of linkage. Color indicates the extent to which the linkage can be mediated by socio-economic factors (black = low; blue = medium; yellow = high potential for mediation by socio-economic factors)

Generic Links (e.g. MA)



WHAT ARE THE MAIN CAUSES?

		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		↗	↑	→	↗	↑

Driver's impact on biodiversity over the last century

Low 
 Moderate 
 High 
 Very high 

Driver's current trends

Decreasing impact 
 Continuing impact 
 Increasing impact 
 Very rapid increase of the impact 

Source: Millennium Ecosystem Assessment

Degradation and unsustainable use of ecosystem services

- Approximately 60% (15 out of 24) of the ecosystem services evaluated in this assessment are being degraded or used unsustainably

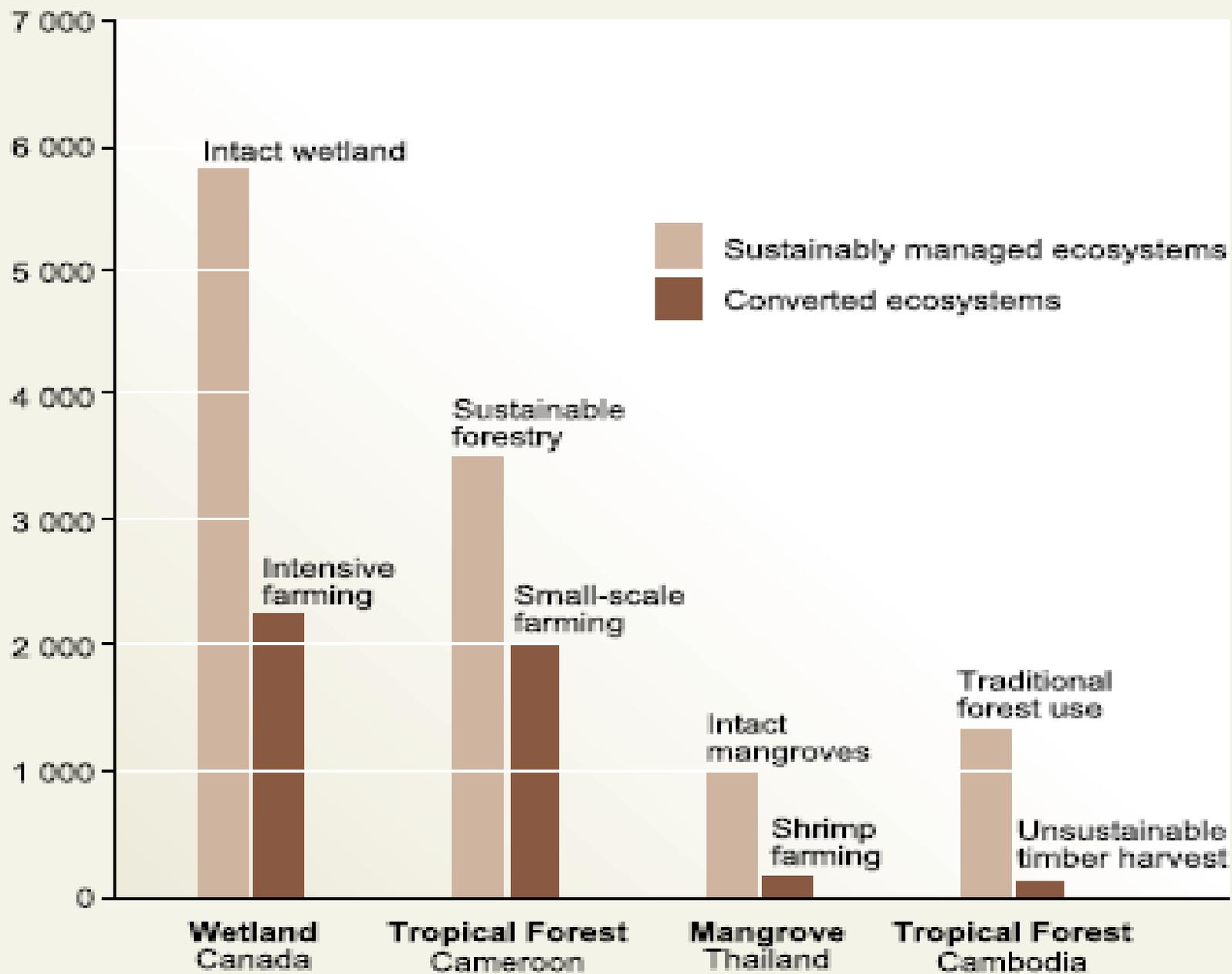
Degraded

Capture fisheries
Wild foods
Wood fuel
Genetic resources
Biochemicals
Fresh Water
Air quality regulation
Regional and local climate regulation
Erosion regulation
Water purification
Pest regulation
Pollination
Natural Hazard regulation
Spiritual and religious values
Aesthetic values

Enhanced

Crops
Livestock
Aquaculture
Carbon sequestration (in last 50 yrs)

Net present value in dollars per hectare



Source: Millennium Ecosystem Assessment

WHY ARE WE LOSING BIODIVERSITY WHEN IT IS SO VALUABLE?

Many of the costs of changes in biodiversity have historically not been factored into decision-making.

Many costs associated with changes in biodiversity may be slow to become apparent, may be apparent only at some distance from where biodiversity was changed, or may involve thresholds or changes in stability that are difficult to measure.

Because some ecosystem services are more difficult to value, many decisions continue to be made in the absence of a detailed analysis of the full costs, risks, and benefits.

Unprecedented additional efforts would be required to achieve, by 2010, a significant reduction in the rate of biodiversity loss at all levels

- Biodiversity will continue to decline this century
- With appropriate responses:
 - it is possible to achieve by 2010 a reduction of the rate of biodiversity loss for certain components, or for certain indicators
 - Several of the sub-targets can be met

Some possible actions?

There are many examples where conservation and sustainable use of biodiversity does work. BUT

More progress in reducing biodiversity loss can be achieved through:

- Better integration into broader development and poverty reduction strategies and greater coherence and synergies among sectoral responses
- more systematic consideration of trade-offs among ecosystem services
- More equitable and fair access to and sharing of ecosystem services

WHY IS BIODIVERSITY LOSS A PROBLEM?

- It has dire consequences for many critical constituents of well-being including material wealth, security, health, social relations and the freedom of choice and action.

Biodiversity ⇒ Ecosystem Functioning ⇒ Ecosystem Services ⇒ Human Well-being

- There is no doubt many people have benefited over the last century from the conversion of natural ecosystems to human-dominated ecosystems and the exploitation of biodiversity. At the same time, however, these losses in biodiversity and changes in ecosystem services have caused others to experience declining well-being, with poverty in some social groups being exacerbated.

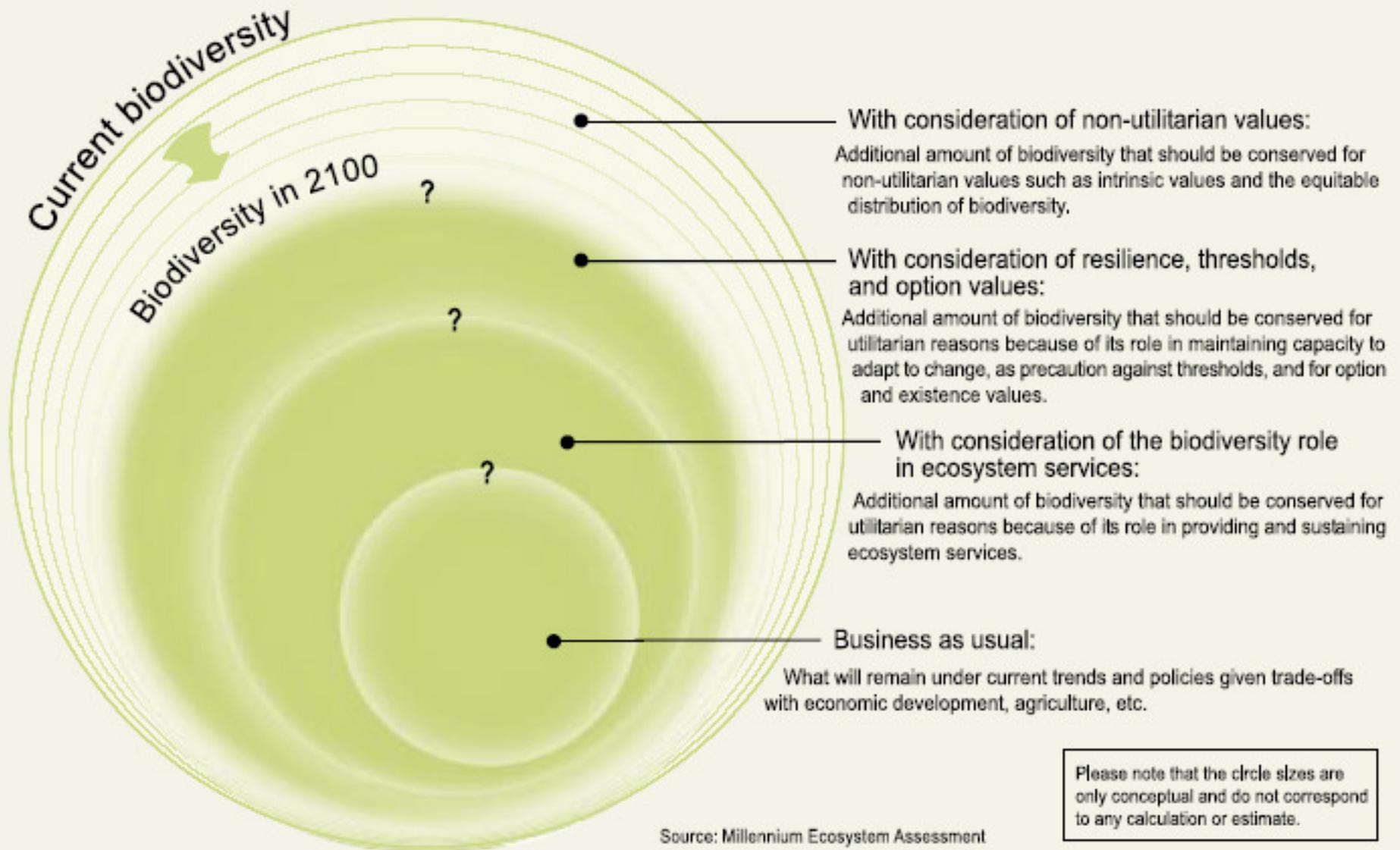
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Because some ecosystem services are more difficult to value, many decisions continue to be made in the absence of a detailed analysis of the full costs, risks, and benefits.

WHY SOME BIODIVERSITY LOSS IS INEVITABLE IN THE FUTURE



WHAT CAN WE DO?

- Make sure the value of all ecosystem services, not just those bought and sold in the market, are taken into account when making decisions.
- Better integration into broader development and poverty reduction strategies and greater coherence and synergies among sectoral responses
- more systematic consideration of trade-offs among ecosystem services
- More equitable and fair access to and use of ecosystem services, especially regulating services

ACTIONS TO TAKE

- To strengthen responses with a primary goal of conservation that have been partly successful.
- To strengthen responses with a primary goal of sustainable use that have shown promise
- To strengthen the use of integrated responses that address both conservation and sustainable use
- To strengthen responses that address direct and indirect drivers and that seek to establish enabling conditions that would be particularly important for biodiversity and ecosystem services

Contd...

- Opportunity exists to harness the synergy among different conventions (CBD, UNFCCC)
- Transparent and Participative decision making process
- Ecosystems management and biodiversity conservation have strong bearing on success of adaptation strategy.
- Innovative decision making tools and responses are available and should be utilised effectively.