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Assessing the Impacts of Biodiversity and Ecosystem Services in Response to Climate Change in Europe

- Results from a Partial-General Equilibrium Valuation Model

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Outline

- **Introduction**
- **Methodological Road Map**
- **Reporting the economic valuation results**
- **Discussion**

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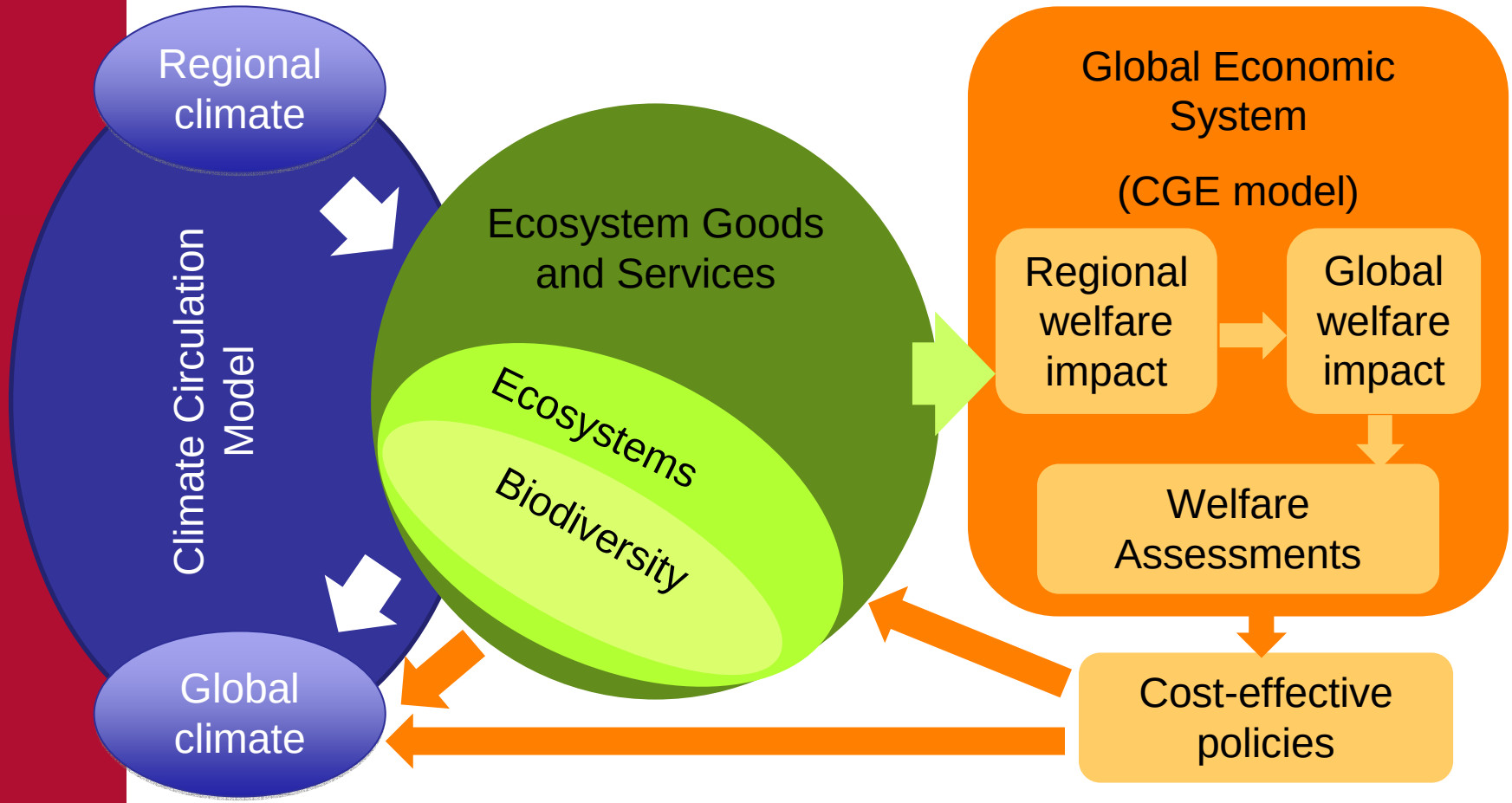
Introduction

- The relationship between climate change, biodiversity & ecosystem and human welfare is complex and interrelated.



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The-state-of-the-art assessment of the economic impacts of climate change

- The economic impacts of climate change is mostly focused on market-related impacts (Tol, 2005);
- Using a monetary metric to express non-market impacts, such as effects on ecosystems or human health is more difficult due to a lack of economic valuation in a climate change context (Pearce et al., 1996; Tol, 2005).

Therefore, there is the need for the development of a more comprehensive valuation framework.

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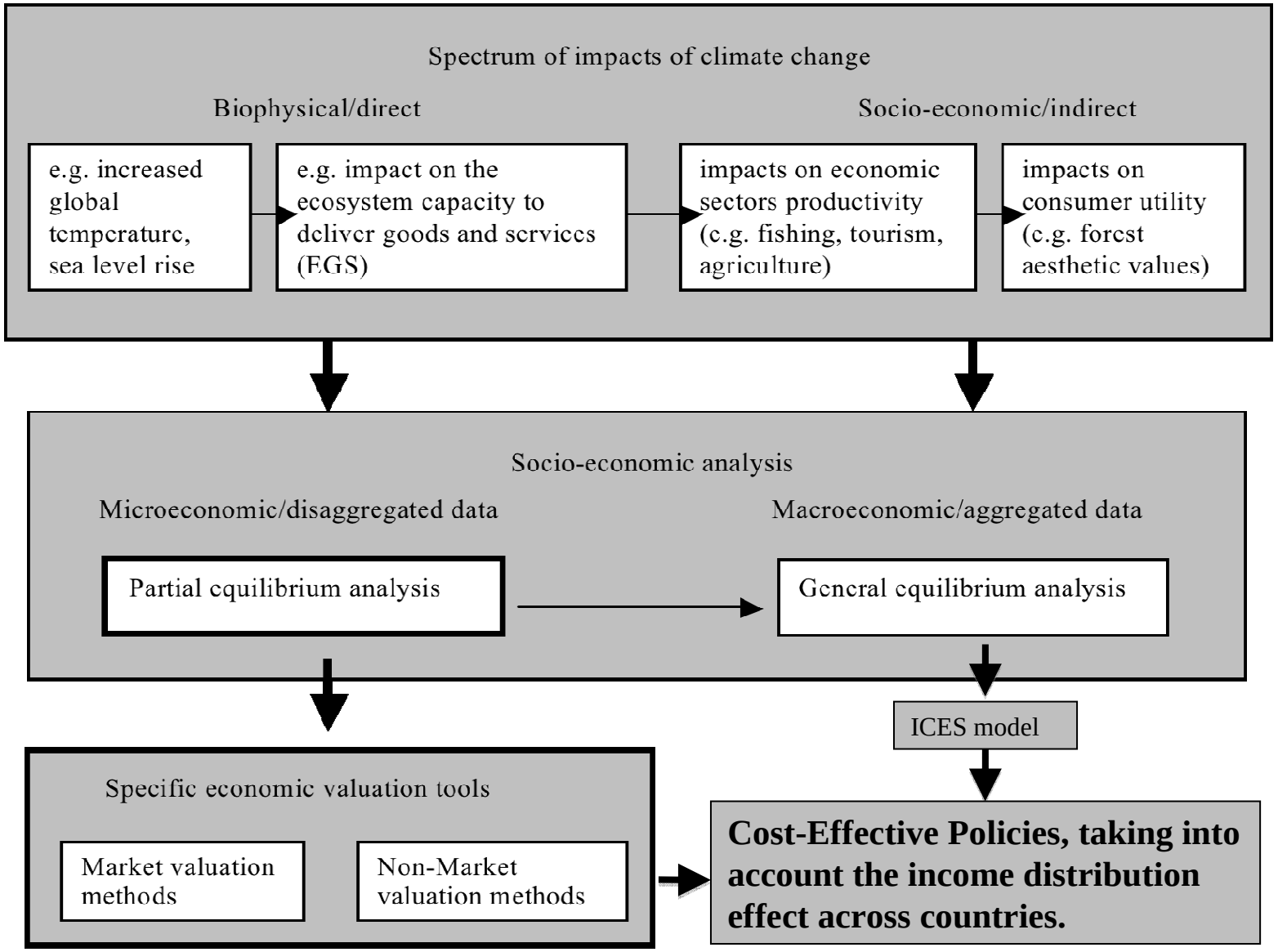
Conceptual assessment framework



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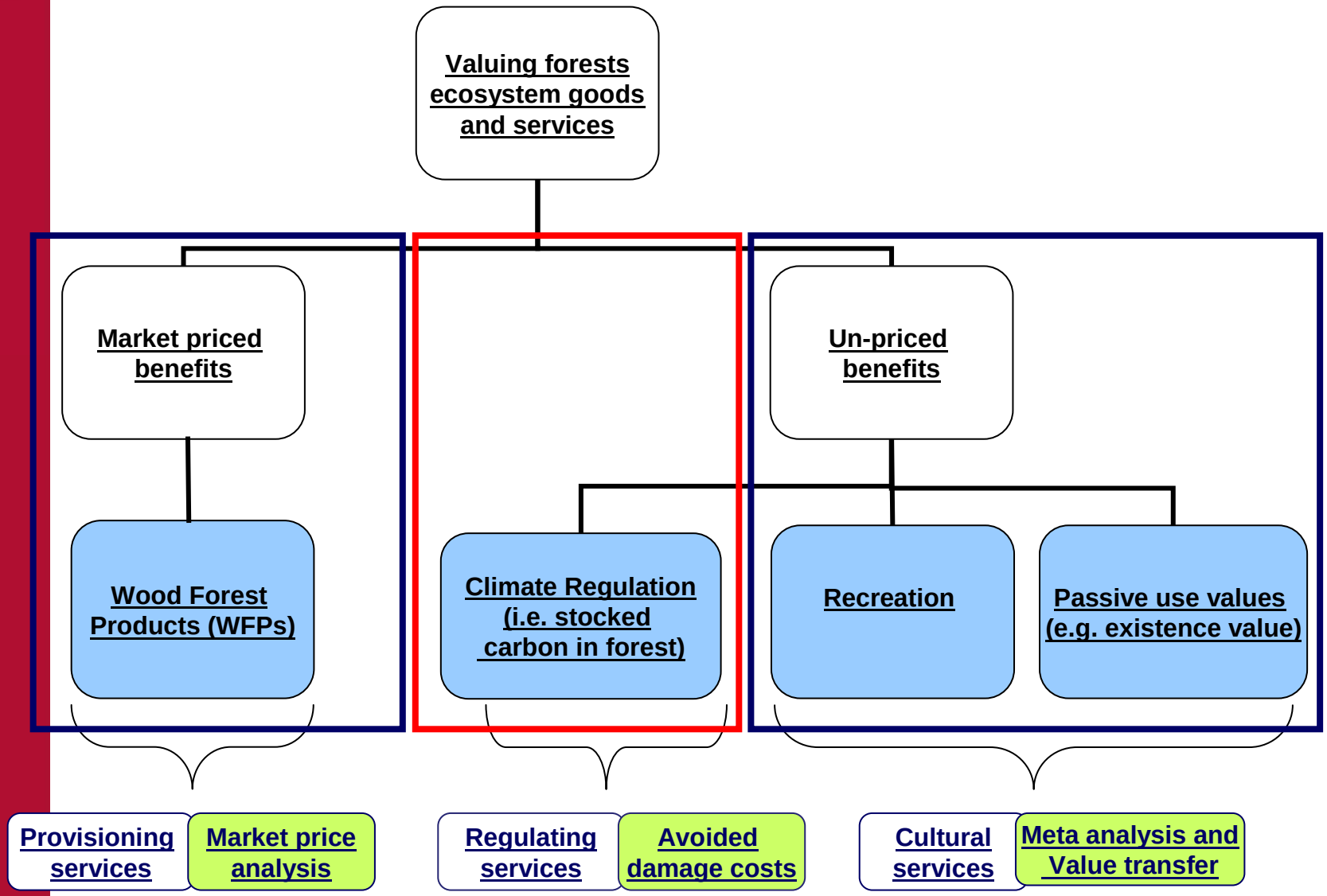
Microeconomic valuation analysis - A hybrid approach



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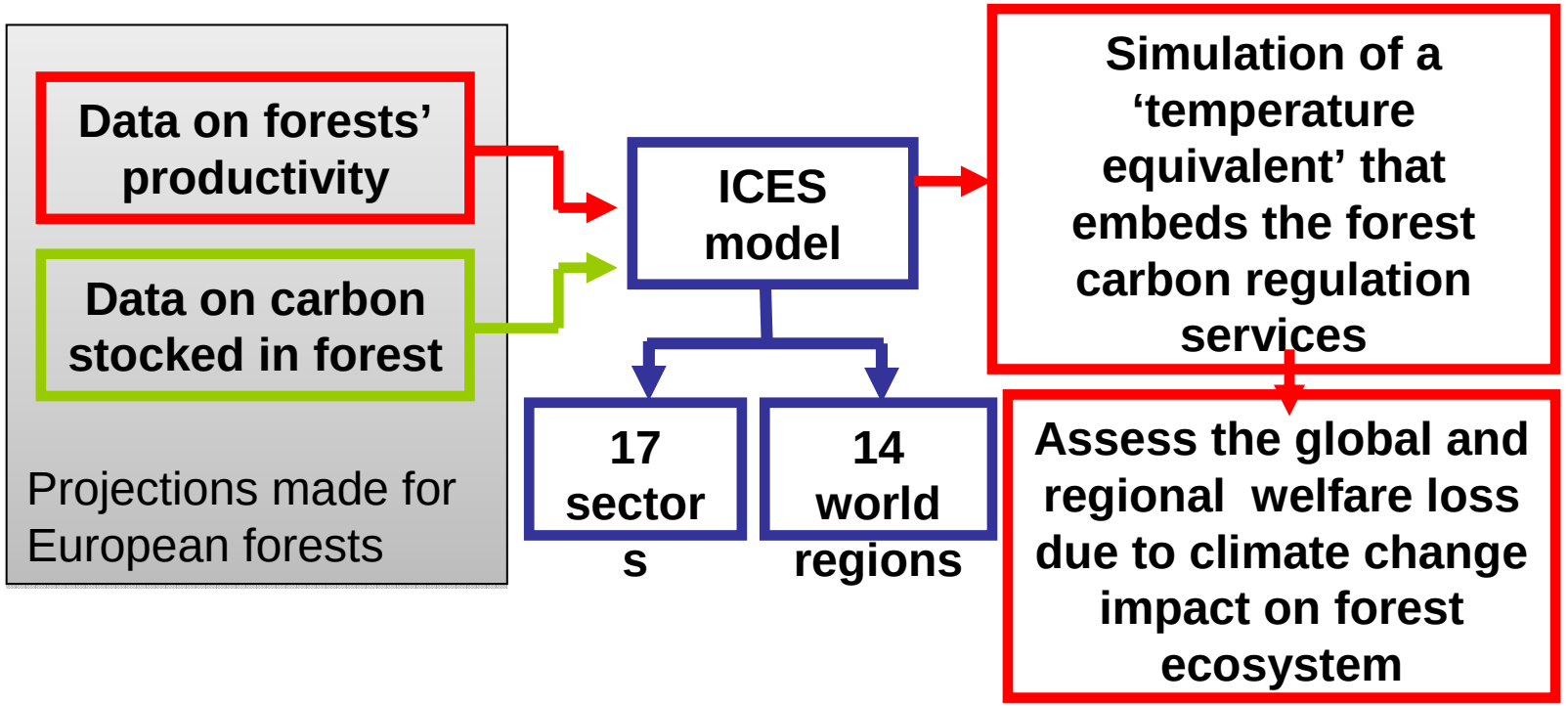
Macroeconomic impact assessment – the use of ICES model

ICES is a recursive dynamic model that generates a sequence of static equilibria under myopic expectations.

Dynamic behaviour based on two essential sources:

1. Endogenous: governed by international trade flows.
2. Exogenous: based on external values wrt endowments and productivities.

Advantage: ICES is flexible for regional analysis including different sectors within every world region under consideration



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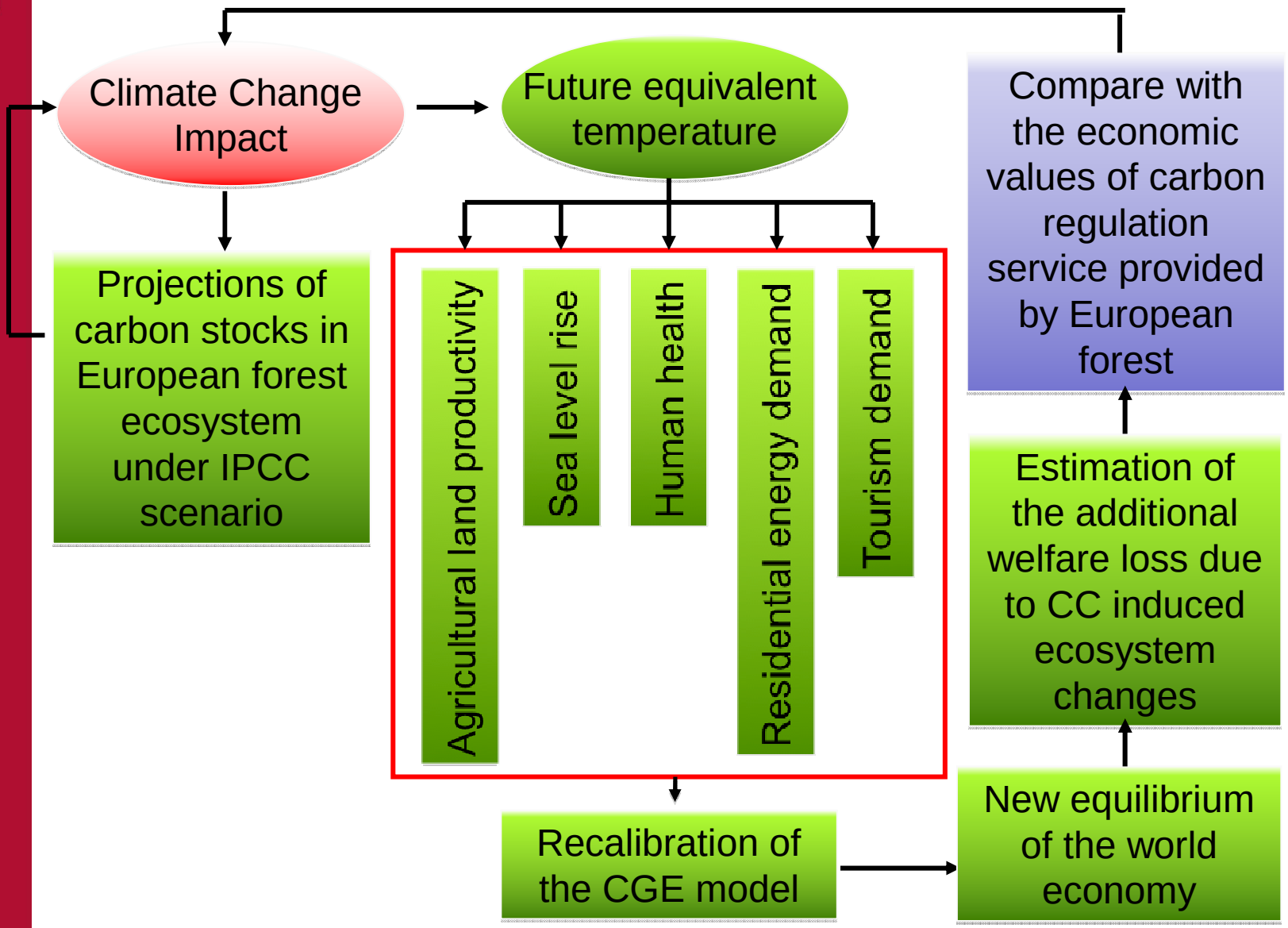
ICES plus Biodiversity Ecosystem Services (BES) sector: a new welfare assessment



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The partial-general equilibrium economic valuation results, including:

- Macro-economic valuation results derived from the recalibrated ICES model (which now includes the Biodiversity Ecosystem Services sector) under different temperature scenarios.

- These economic valuation results include both the direct and indirect impacts of climate change on forest ecosystem services.

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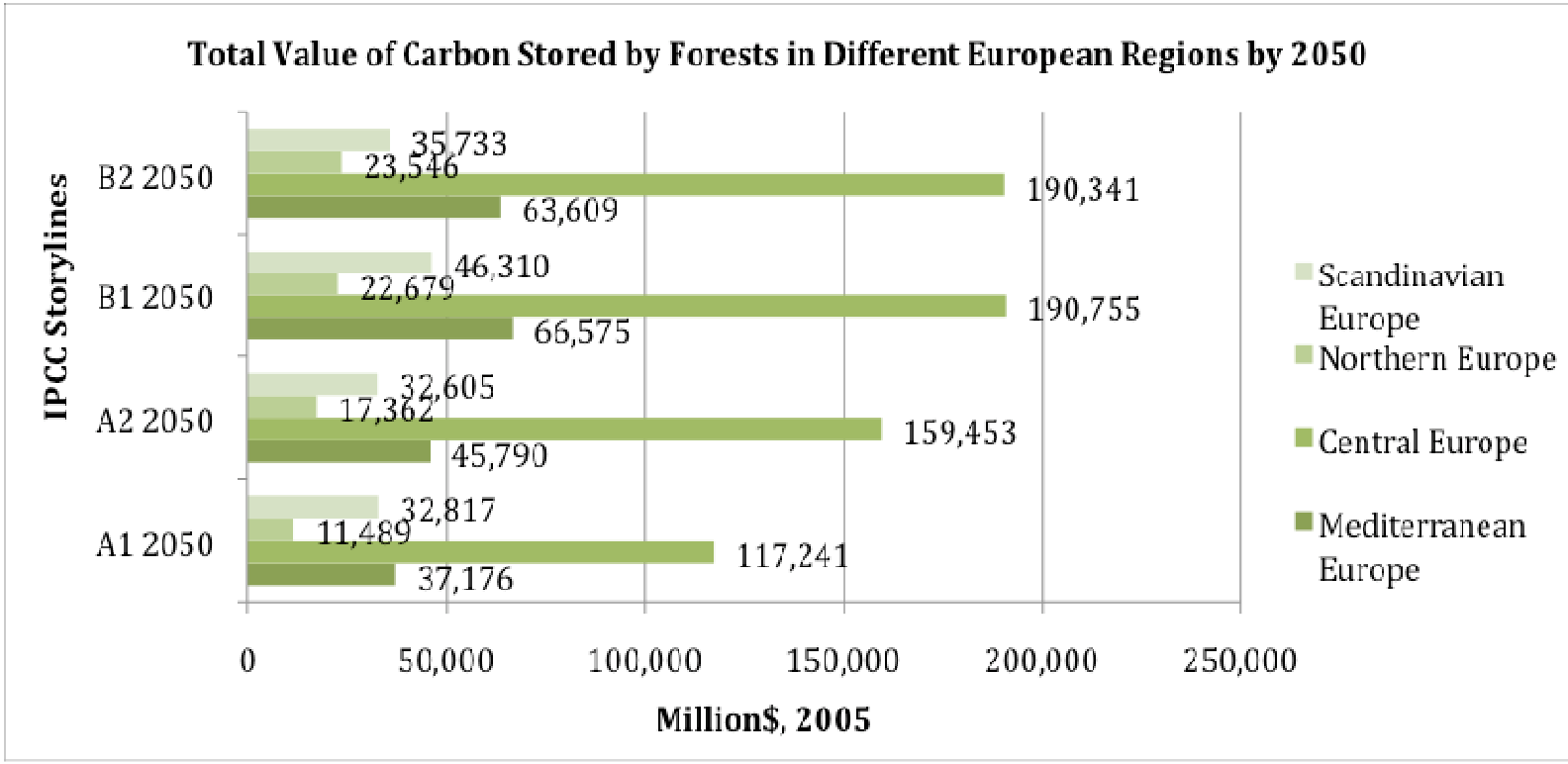
Forests in Central Europe provide highest carbon value in 2050



- Climate-change-caused impacts on forest ecosystem services present significant welfare impact among the regions under considerations.
- These impacts are not uniformly distributed: we observe distinct spatial distributional patterns.
- The impacts do vary according to the IPCC scenario under consideration, and therefore reflecting the underlying assumptions regarding the geo-climatic and socio-economic storylines.

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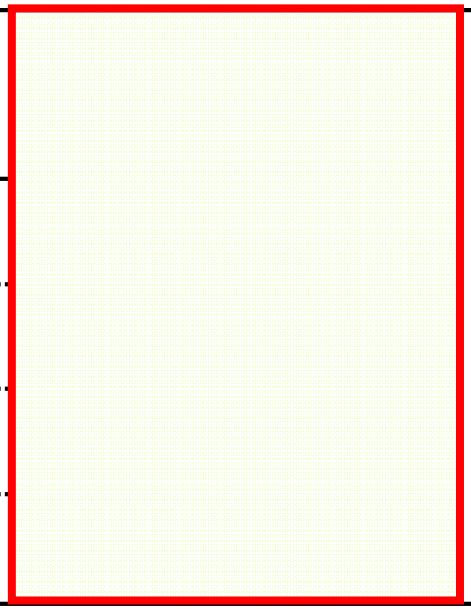
Welfare Impacts of Climate Change in 2050

(in Billion USD, at real prices, 2005)

Region Model	CGE (1)
Med	-34
Europe	-65
	+488
North Europe	+1,360
	-21
East Europe	-102
	-1,491
World	-5,576



Note:

- CGE: refers to the ICES modeling approach

- CGE & BES: refers to the ICES model plus an sector of Eecosystem services.

- There are two value estimates per region, for a mean temperature increase of 1.2 and 3.1. degrees Celsius, respectively.

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The CGE-BES model results show that:

1. GDP value estimates of the climate-change-caused impacts on biodiversity and ecosystems services imply **no single welfare change pattern** across countries, but involves substantive global welfare loss.
2. By the end of 2050, climate change through its impact on ecosystems will lead to **an additional global welfare loss**, amounting up to NPV of 85.1 billion USD. At the same time, a region like the **Northern Europe can assist to a welfare gain** up to NPV 7.6 billion USD.
3. Finally, among all European regions, **the Mediterranean Europe suffers the strongest welfare loss** from the climate-change-induced impacts on biodiversity and ecosystems.

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Important policy insights

- NO SILVER BULLET option for policy design at different geographical scales.
- The observed uneven distribution of climate change impacts represent **a first impediment when scaling up the regional impacts** across different geographic regions.
- The spatial pattern of climate change impacts indicates that **autonomous adaptation cannot be invoked as the solution to climate change**.
- Cost-effective policy design should also take into account the **intra-generation equity and vulnerability** between the rich and the poor nations.

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Thank you for your attention!

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