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** ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

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Dynamic climate/Dynamic exposures

The COIN approach for Austria

Core questions

1. How is the climate developing up to 2030/2050/2070/2100 with respect to damaging/cost-relevant trends and extreme events?

2. How to valuate potential physical impacts to production and assets as well as higher order effects along impact chains? How to generate sectoral damage costs and a total range for costs of inaction, i.e. how to aggregate?

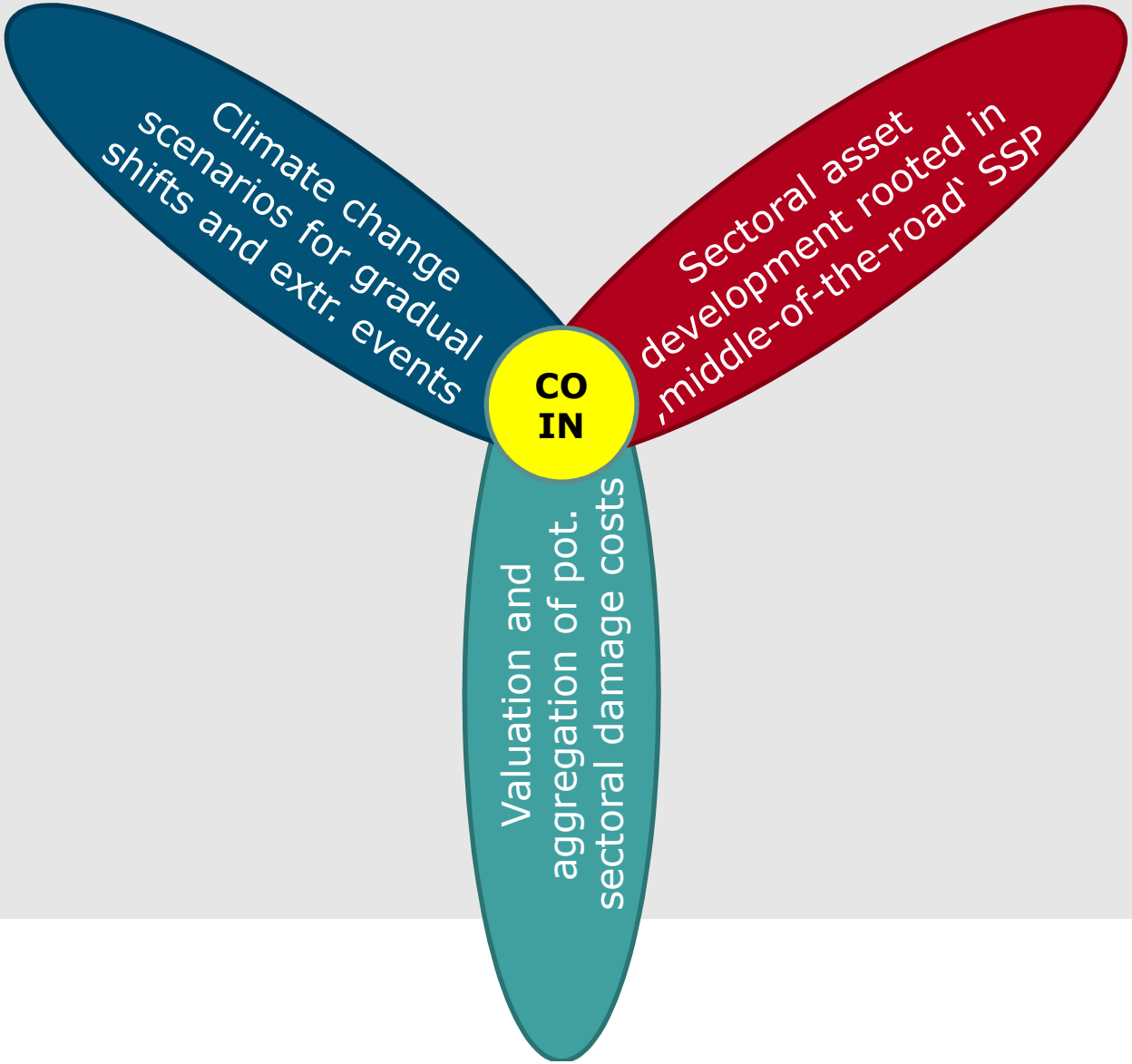
3. Which are the most climate sensitive assets at risk in each sector and how do they evolve throughout the century;
   how does Austria look like in 2030/2050 in terms of potential sectoral damages i.e. assets put and activities performed 'beneath the atmosphere' and thus exposed to climate change?

Core questions

4. For each sector: which development constellations (non-climate and climate developments) are potentially high (low) damaging for each sector?

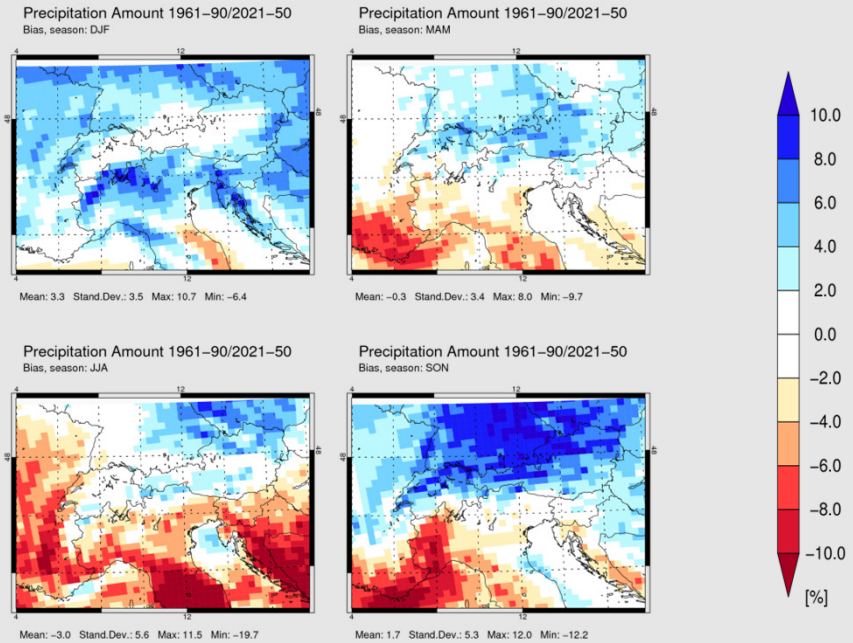
5. Which damage ranges can be associated to these situations? Which climate-driven probability is connected to their occurrence? (i.e. monetary fat-tail evaluation, →looking also at extremes not only at mean values)

Basic concept for the COIN assessment



Climate change signals for Austria

- Precipitation in its temporal and regional pattern is crucial for agriculture & forestry, energy supply, biodiversity, infrastructure, ….



Estimating the economic value of climate change impacts

- Provide a **consistent framework for costing climate impacts across fields of action**
- Requirements
  - Consistent cost evaluation methodology across fields
  - Revised reflection on existing studies /methods in each field
  - Uniform terminology
  - Uniform data (exchange) formats
- Assessment of gross benefits and costs per sector
- Overall goals
  - Quantification (monetary values) where possible
  - Comparability
  - Completeness
  - Accuracy (no double counting)

Direct and indirect costs

Lower-order effects = direct costs

- Physical impact on production
  - E.g. Change in crop yields, change in water availability, change in service quality in transportation
- Physical impact on assets (infrastructure, buildings)

Higher-order effects = indirect costs

- Changes in cost structure (supply-side)
- Changes in demand structure (incl. investments)
- Knock-on effects: to other sectors, macro-economic effects

The costing methodology in COIN

1. Identify and quantify climate impacts in the specific sector (in physical units)

2. Choose a method to value these impacts

3. Convert physical units into monetary terms [EUR]

COSTS of inaction

Choice of valuation method

Direct market based costing methods

- Change in productivity
- Replacement cost
- Forward projection based on observed data
- *Expert guess*

Other costing methods

- Hedonic analysis
- Travel cost method
- Contingent valuation
- *Benefit transfer*
- *Expert guess*

Source: based on UKCIP (2004)

In which global socio-economic assumptions will our WP16 scenario root?

IPCC-SRES A1 family:
A future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies.

Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income.

In which global socio-economic assumptions will our WP16 scenario root?

IPCC AR5 SSP2: ;Middle of the road' scenario
In this world, trends typical of recent decades continue, with some progress towards achieving development goals, reductions in resource and energy intensity at historic rates, and slowly decreasing fossil fuel dependency. Some countries making relatively good progress while others are left behind. Partially functioning and globally connected markets. Comparatively weak global institutions exist, EU 'muddles through'. Per-capita income levels grow at a medium pace with slowly converging income levels between developing and industrialized countries. Medium population growth.

after O'Brien et al. 2012

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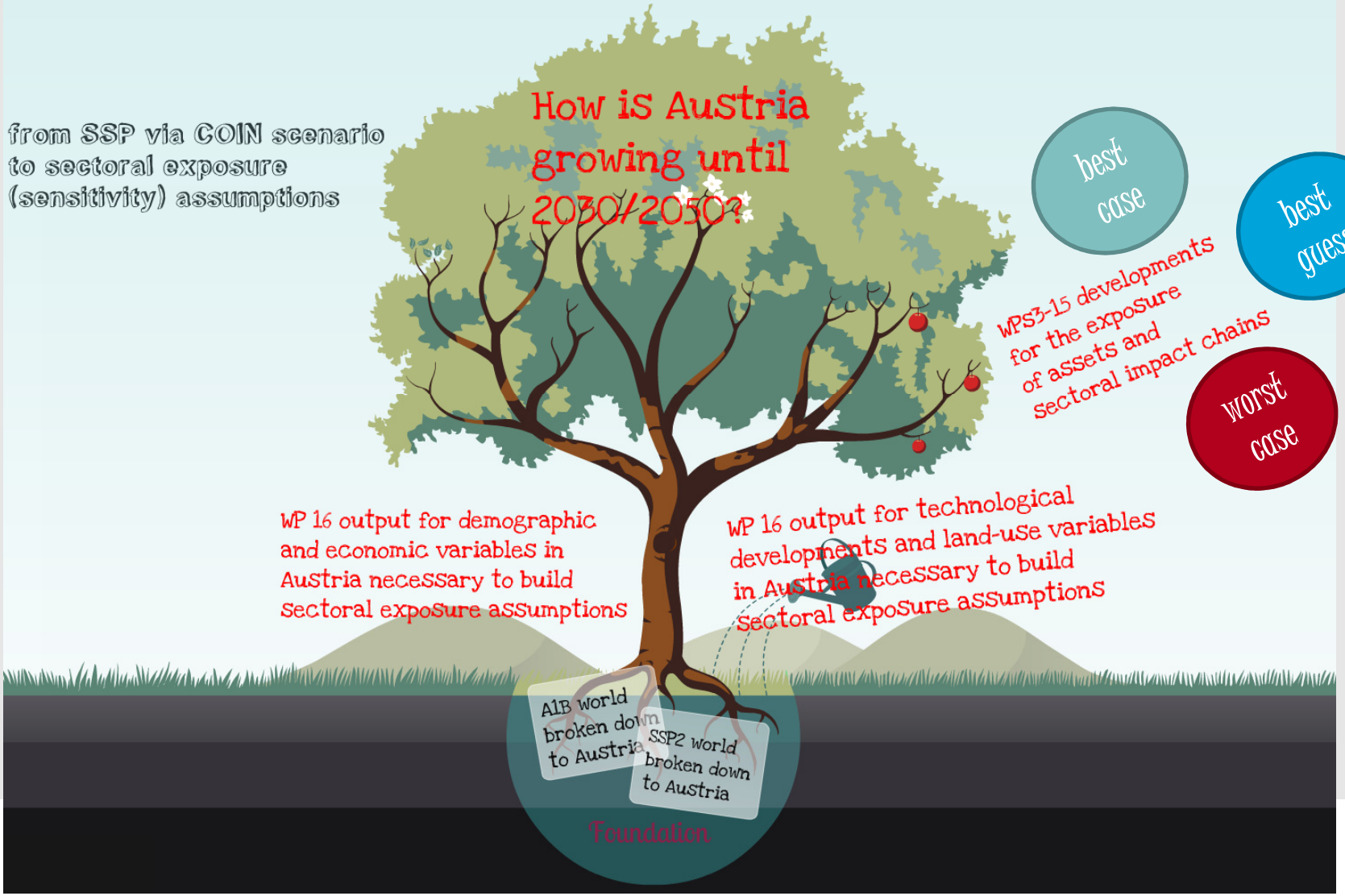
non-climate scenarios

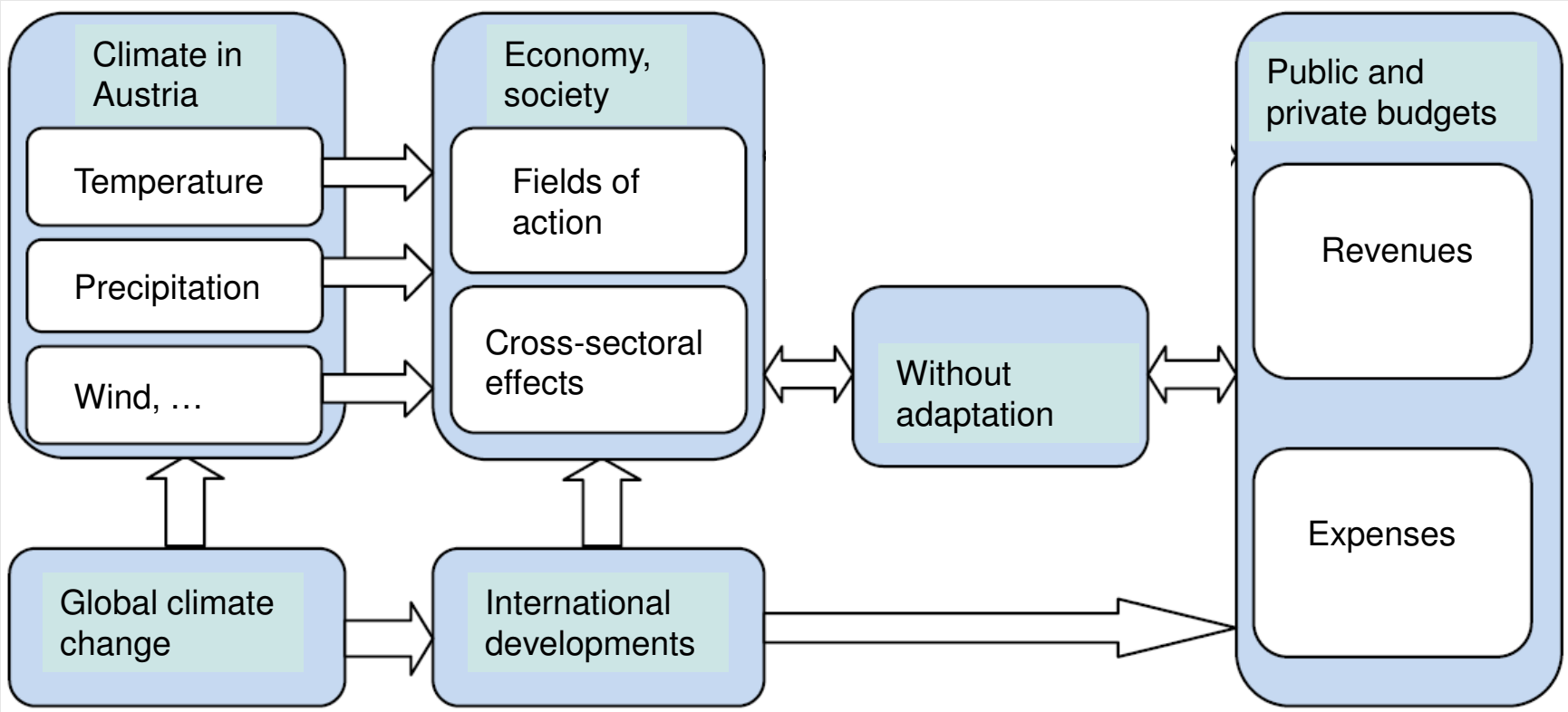


What should exposure scenario provide?

- **Demographic scenarios including for example**
  - data on vulnerable population (esp. elder people)
  - Data on growth centres/urbanisation trends,...
- **Socio-economic scenarios including for example**
  - General and sectoral growth rates, hints on discounting
  - Welfare and private/public assets at risk,...
- **Technological scenarios including for example**
  - Infrastructure development
    - Energy infrastructure
    - Transport infrastructure (rail/road/water transport/aviation)
    - Building infrastructure
  - Innovations altering vulnerability,...
- **Land-use scenarios including for example**
  - Share of forest (timber assets)
  - Share of agriculture (pot. yield assets)
  - Share of protected areas (as proxy for ecosystem functions and biodiversity),...

- All this is now going into specification!

Impacts on private and public budgets



Source: adapted from Infras & Ecologic (2009)