Climate COsts of INaction in Austria

a scenario-based approach: assessing the costs of climate change without planned adaptation

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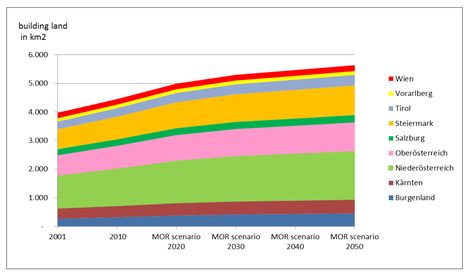
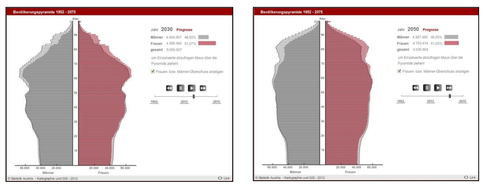
1

A shared socio-economic pathway (SSP) and sectoral assumptions to get a handle on exposure and sensitivity

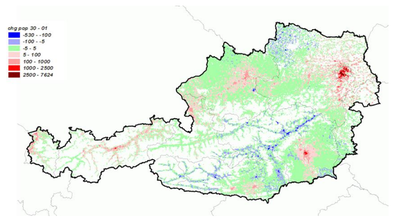
Economic and demographic growth, land-use patterns and technological innovations will shape the exposition to and the sensitivity of all sectors. Thus, we have developed a common **COIN SSP** that provides a frame for the sectoral experts on which to develop sectoral assumptions for the exposure and sensitivity of assets and people. The **COIN SSP is consistent with the global SSP2 (Middle-of-the-Road)** that has been developed in the IPCC context.



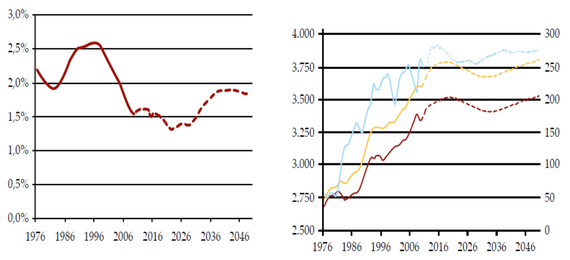
Observed and expected growth of building and transportation infrastructure land 2001, 2010, 2020-2050, data: Umweltbundesamt, BEV-Grundstücksdatenbank, projections: AIT



Age distribution and total population in Austria 2030 (left) and 2050 (right). Source: Statistik Austria 2011.



Expected change of population density per km² 2010-2030, Data: Statistik Austria, ÖROK projections by projection regions, disaggregation and processing: AIT

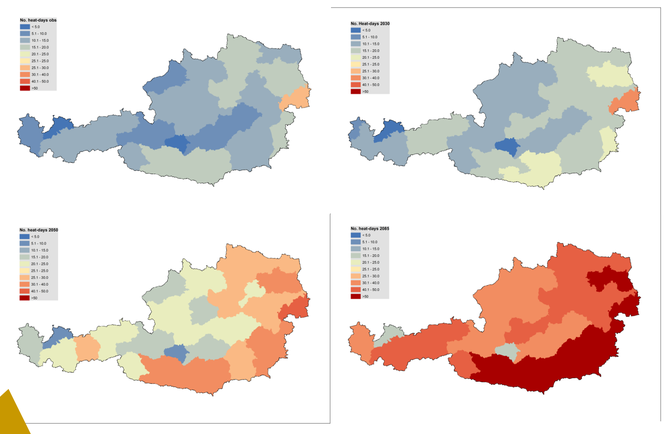


Trend GDP growth % p.a. (left) and projection of employment, unemployment and labour supply (right) in 1000 (Source: Schiman & Orischnig, 2012)

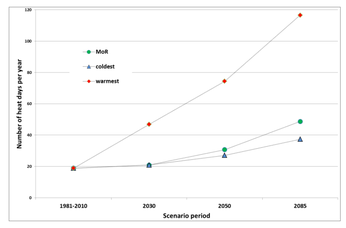
2

A shared climate scenario to get a handle on physical climate impacts

Cost-relevant climate parameters have been detected by all sectoral experts. As **Middle-of-the-Road scenario**, A1B ECHAM5 GCM is used as force. The agreed-upon climate parameters have been calculated for the time frames 2016–2045 (2030), 2036–2065 (2050) and 2071–2100 (2085), and their relative changes to the reference period 1980–2010 are the climate change scenario for COIN. Climate output data was aggregated from 1×1 km resolution to **NUTS3 level** to enable coupling with socio-economic data and statistics. To assess the **range of potential climate change** in Austria the monthly data for temperature and precipitation of 17 GCMs and 12 RCMs, forced by 4 different emission scenarios are used.



Spatial distribution of the numbers of heat days (Tmax ≥ 30 °C) in Austria for the 10 hottest km² per NUTS 3 region. For the Observation period (2003-2012; upper left) and the scenarios for 2030 (upper right), 2050 (lower left) and 2085 (lower right) for the MoR scenario.



Numbers of heat days for the 10 hottest km² of the NUTS 3 region Vienna. Observation period (2003-2012) and the scenarios for 2030, 2050 and 2085 for the MoR sceanraio (green) and the coldest (blue) and hottest (red) ensemble realization. For the period 2030 the MoR Scenario was the coldest realization.

3

Economic valuation of direct costs and indirect effects to assess the macro-economic impacts

As the objective is to ensure consistency and avoid double counting, it is crucial that (i) each sector is assessed within the same **framework of economic valuation,** which means that the work for each sector/field of activity is based on the same tools and methods for the assessment of climate change costs in determining direct costs of inaction (i.e. no planned adaptation and no mitigation beyond what is ratified up to now happens), (ii) a **macro-economic model** is developed, suitable **to assess the costs of inaction that arise because of knock-on and feedback effects** that trickle down through the whole economy, as triggered by the direct impacts and costs.

Marketed goods & services
(conventional market techniques)

1. **Changes in productivity**
2. **Changes in production technology (i.e. production cost structure)**
3. **Changes in investment**
4. **Change in final demand**
5. **Change in replacement/restoration cost**
   indirect measure
   (e.g. loss in protection forest function)

→ *Use of market price data to value climate impacts, use of primary data*

Non-marketed goods & service
(surrogate or constructed markets)

Individual costing techniques (hedonic analysis, loss-of-time method, contingent valuation), e.g. bio-diversity, human health

→ *Benefit transfer instead of expensive primary studies*

Valuation techniques applied in COIN, based on UKCIP. Methods 1–5 are applied in COIN, while individual costing techniques potentials are shown in various sectors for future deeper analysis

model code	Activity / industry	Field of activity	NACE code
AGRI	Crop and animal production, hunting and related service activities	agri	1
FORE	Forestry and logging	fore	2
REXT	Rest of extraction sectors (Fishing and aquaculture; Mining of coal and lignite, Extraction of crude petroleum and natural gas, Mining of metal ores, Other mining and quarrying, Mining support service activities)		0 03, 05-09
FOOD	Manufacture of food products; Manufacture of tobacco products	m&ts	10, 12
WOOD	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	m&ts	16
BEVE	Manufacture of beverages	m&ts	11
PAPE	Manufacture of paper and paper products	m&ts	17
COKE	Manufacture of coke and refined petroleum products	c&b	19
CHEM	Manufacture of chemicals and chemical products	m&ts	20
PHAR	Manufacture of basic pharmaceutical products and pharmaceutical preparations	m&ts	21
PLAS	Manufacture of rubber and plastic products; Manufacture of other non-metallic mineral products	m&ts	22-23
META	Manufacture of basic metals; Manufacture of fabricated metal products, except machinery and equipment	m&ts	24-25
MACH	Manufacture of machinery and equipment n.e.c.; Manufacture of electrical equipment	c&b	28-29
RMAN	Rest of manufacturing (Manufacture of textiles; Manufacture of wearing apparel; Manufacture of leather and related products; Printing and reproduction of recorded media; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of other transport equipment; Manufacture of furniture; Other manufacturing; Repair and installation of machinery and equipment)	m&ts	13-15, 18, 26, 27, 30-33
ELEC	Electricity, gas, steam and air conditioning supply	ener	35
WATE	Water collection, treatment and supply	water	36
WAST	Sewerage; Waste collection, treatment and disposal activities; materials recovery; Remediation activities and other waste management services	water	37-39
CONT	Construction of buildings; Civil engineering; Specialised construction activities	c&b	41-43
MOTO	Wholesale and retail trade and repair services of motor vehicles and motorcycles	t&m	45
TRAD	Wholesale trade, except of motor vehicles and motorcycles; Retail trade, except of motor vehicles and motorcycles	m&ts	46-47
LTRA	Land transport and transport via pipelines	t&m	49
WTRA	Water transport	t&m	50
ATRA	Air transport	t&m	51
STRA	Warehousing and support activities for transportation; Postal and courier activities	t&m	52-53
ACCO	Accommodation; Food and beverage service activities	tour	55-56
FINA	Financial service activities, except insurance and pension funding	catm	64
INSU	Insurance, reinsurance and pension funding, except compulsory social security	catm	65
AFIN	Activities auxiliary to financial services and insurance activities	catm	66
REAL	Real estate activities	c&b	68
ARCH	Architectural and engineering activities; technical testing and analysis	c&b	71
TRAV	Travel agency, tour operator and other reservation service and related activities	tour	79
PUBL	Public administration and defence; compulsory social security	catm	84
HEAL	Human health activities	heal	86
ENTE	Creative, arts and entertainment activities	tour	90
CULT	Libraries, archives, museums and other cultural activities	tour	91
SPOR	Sports activities and amusement and recreation activities	tour	93
RECR	Recreational services (publishing activities; motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities ; gambling and betting activities)		58-60; 92
TELE	Telecommunication & computer services (telecommunications; computer programming, consultancy and related activities; Information service activities; Repair of computers and personal and household goods)		61-63, 95
SCIE	Scientific & professional services (Legal and accounting activities; Activities of head offices, management consultancy activities; scientific research and development; Other professional, scientific and technical activities; Veterinary activities; advertising and market research)		69-70, 72-75
RSER	Rest of services and education (Rental and leasing activities; Employment activities; Security and investigation activities; Services to buildings and landscape activities; Office administrative, office support and other business support activities; Education; Activities of membership organisations; Other personal service activities; Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use; Activities of extraterritorial organisations and bodies)		77-78,80-82;85, 94, 96, 99

Macro-economic coverage by COIN / NAS fields of activity

Legend:

wp3	agro (agriculture)
wp4	fore (forestry)
wp5	essb (ecosystems and biodiversity)
wp6	heal (health)
wp7	water (water)
wp8	ener (energy)
wp9	c&b (construction and buildings)
wp10	t&m (transport and mobility)
wp11	m&ts (manfacturing and trade services)
wp12	c&ug (cities and urban green space)
wp13	catm (catastrophe management)
wp14	nd&sp (natural distaster protection and spatial planning)
wp15	tour (tourism)

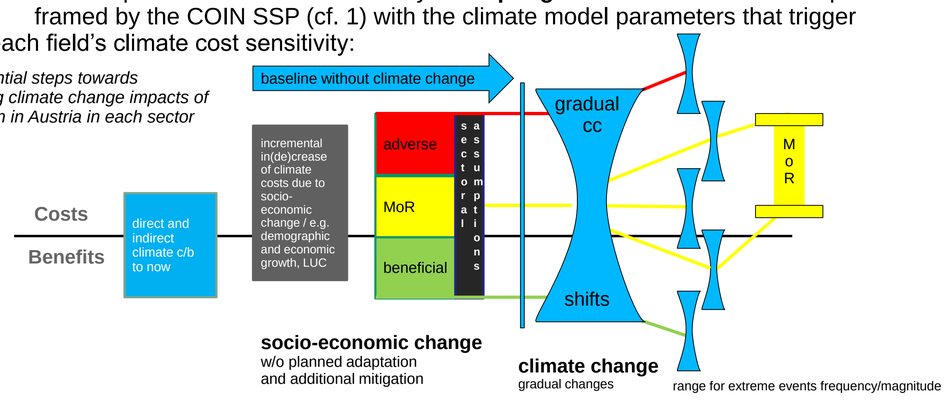
COIN fields of activities ('sectors')

4

COIN scenario-based approach ...

...requires for each field of activity a **coupling** of socio-economic assumptions framed by the COIN SSP (cf. 1) with the climate model parameters that trigger each field's climate cost sensitivity:

Sequential steps towards Costing climate change impacts of Inaction in Austria in each sector

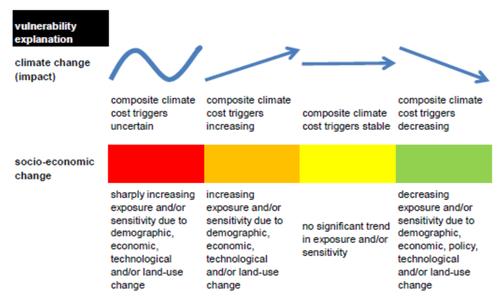


First qualitative interim results for NAS fields of activity

All fields of activity – **cluster 1: agriculture, forestry, ecosystems/biodiversity, health; cluster 2: water supply and sanitation, energy supply, construction and buildings, transport and mobility; cluster 3: manufacturing and trade services, cities and urban green, catastrophe management and tourism** – are affected by climate change in Austria. Until 2050, the cost signals are patchy across the fields.

COIN MoR qualitative results for Austria

sector	impact chain	change in vulnerability until 2030	change in vulnerability until 2050	change in vulnerability until 2070	change in vulnerability until 2100
agriculture	winter cereal (wheat)				
	spring cereal (maize)				
	oil seeds (rape)				
	protein crops (soybean)				
	grassland				
	dairy production				
forestry	biomass				
	protection forests				
	C credits				
ecosystems and biodiversity	pollinators				
	predators				
human health concerning…	…heat waves				
	…extreme events				
	…salmonellla				
	…chronical diseases				



Qualitatively identification of cost hot spots for the bio-resource cluster 1

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