



## **VIRGEN**

**An Alpine community  
with high quality of life  
faces multiple (climate change) challenges**



## An Alpine community

- located in East Tyrol, south of the main chain of the Alps
- 2199 inhabitants
- 8881ha (= 21,945 acres)
  - 5600ha agricultural and recreational areas
  - 2500ha forests
- ~ 1200 m above sea level
- mean annual temperature 6.4°C
- average summer days (>25°C) 18.8/yr
- average days with more than 10 hrs of sunshine 45.5/yr ; > 2000 hrs sunshine/yr
- average annual precipitation 819 mm (= 32 in)
- average days with snow cover 109.4/yr







## High quality of life

- Main sectors: agriculture and tourism  
(Currently: climatic health resort, very sunny)
- High quality of the environment and nature
- Good infrastructure (local suppliers, recreational areas)
- High engagement in community life and voluntary organizations
- Inhabitants value the sense of community, political participation is encouraged
- Educational facilities up to Grade 8 and for adults
- High efforts regarding climate change mitigation (e.g. subsidies for solar panels, e5 energy label)



# Community challenges

- Demographic change
- Out-migration
- Aging community
- Community with low financial resources
- Lack of local employment, scarcity of jobs in the region, high level of commuters
- Too little entrepreneurial thinking and acting
- Decreasing summer tourism and increasing winter tourism







# Active climate change mitigation

- Virgen has been committed for more than two decades to environmental and climate protection and in particular to the energy issue
- Since 1991 it is part of the Hohe Tauern National Park
- Climate Alliance Community
- Energy Conscious Community (European energy award gold)





# Mitigation activities

- **Energy saving:** support programmes; building renovation; awareness raising
- **Solar energy:**  
Thermal solar installations  
(4,600 m<sup>2</sup>; 1,840.00 kWh/yr);  
Photovoltaic installations  
(27 systems; 14,000 kWh/yr)
- **Wood:** Village district heating system  
(wood chips); support for  
wood-fired boilers – 94 installations
- **Water:** 3 small hydropower plants  
(in total 2,686,000 kWh/yr)
- **Geothermal energy:** about 25 installations





## Model calculations for 2050 (region of East Tyrol)

### Temperature

- Temperature increase of about 2.3 - 2.5° C
- Increase of summer days (days with  $> 25^{\circ}\text{C}$ ) up to 3-6 days/year
- Decrease in frost days (days with daily minimum temperature  $< 0^{\circ}\text{C}$ ) up to 23-25 days/year.

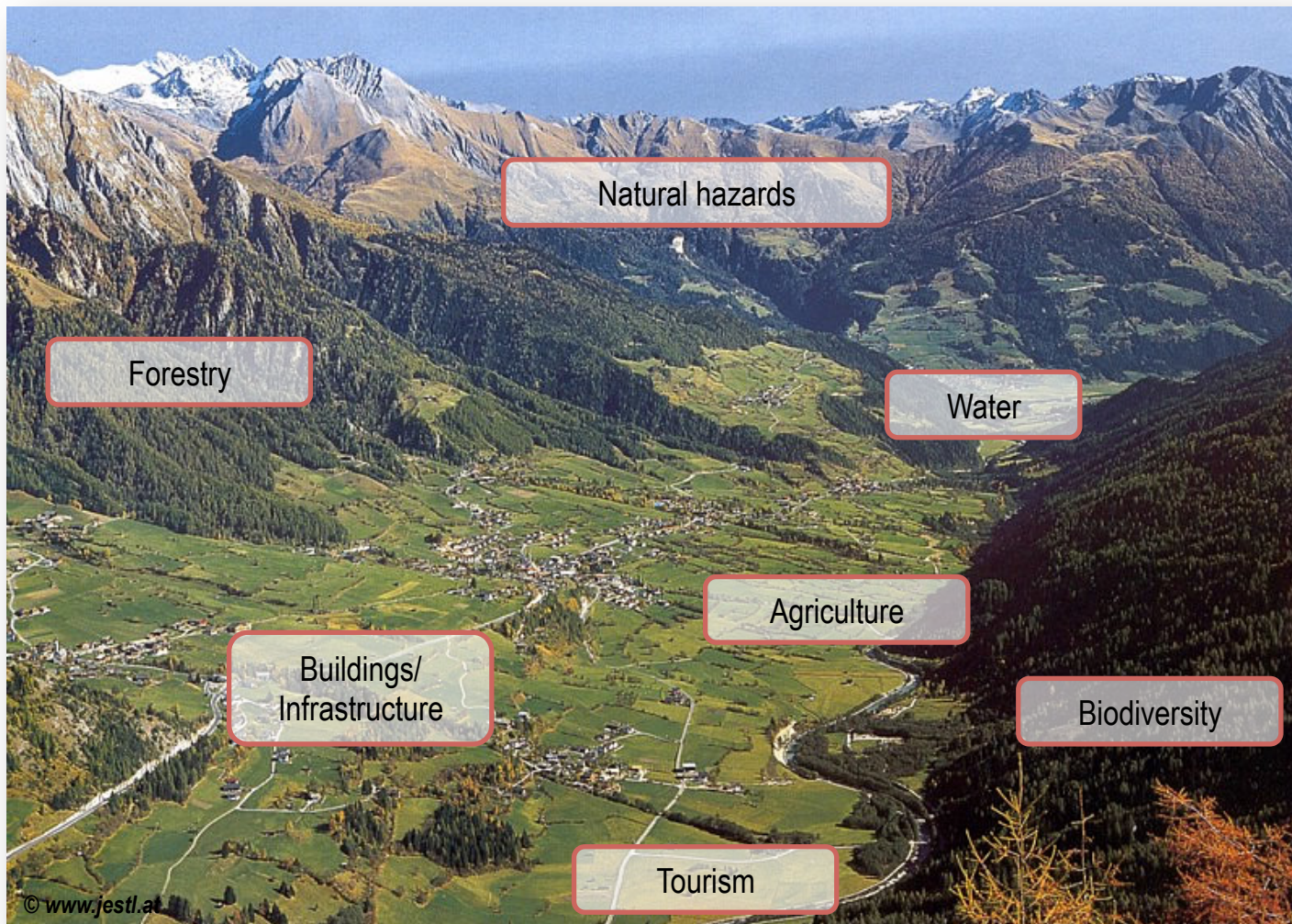
### Precipitation

- Annual precipitation remains fairly constant
- Decrease in summer precipitation and increase in winter precipitation
- More intense rainfall (particularly small-scale) and increased rainfall variability may occur in the summer

### Snow cover duration

- Decrease in the snow cover duration by up to 30 - 50%.

# Anticipated challenges





## Natural hazards

- Extreme weather events and melting permafrost
- Increased mudslides, heavy rain, storms, droughts, etc.



## Ecosystems and biodiversity

- Changing habitats along climatic zones, altitudes and humidity
- Change in number of species, species composition in habitats
- Changing river ecosystems, reduction of wetlands
- 45% of all Alpine species could be extinct by 2100



## Agriculture

- Longer vegetation periods
- Better use of water stored in soil during winter
- Less precipitation in summer → droughts → uncertain yields and changes in fodder quality
- Heavy rain falls → soil erosion

## Forestry

- Alpine tree line changes → Possibility of increases in forest growth
- Rising temperatures, longer vegetation periods and higher evaporation → water demand
- Mild winter, longer summer → spread of bark beetle
- Climate change affects protective forests, communal benefits and forest recreation







## Tourism

- Challenges for winter tourism, opportunities for summer and autumn tourism through changing recreational patterns → recreation in cooler areas with good air quality
- Changing demand and supply of energy and water for tourism

## Health

- Increasing UV-radiation through reduction of stratospheric ozone
- Spread of diseases (e.g. ticks)





# Infrastructure and buildings

- Temporary failures or damages to transport infrastructure and housing areas
- Long-term damages (streets, electricity, hiking routes, etc.)
- Less days of heating

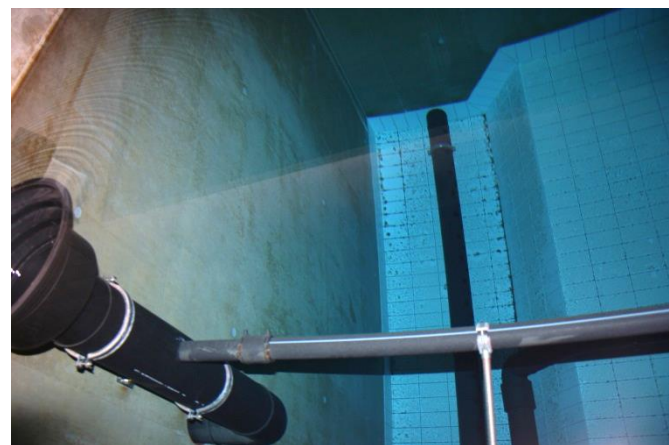




# Adaptation to climate change

## Avoiding negative impacts

- Active engagement with the challenges
- Education and training for members of support organizations
- Awareness raising, information
- Irrigation systems, storage systems
- Optimise early warning systems
- Improve emergency services
- „Green“ construction
- Prepare for emergencies



# Adaptation

## Use the opportunities

- High altitude will be attractive for tourists
- Advertise regional specialities
- Alternatives for agriculture (fruit cultivation)
- Plant trees suited to future climate (e.g. deciduous trees)
- Irrigation systems
- Return to using steep meadows for making hay







**Thank you for your attention**

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