

# Vulnerability to Climate Change and Adaptation to Water Scarcity - Case Study Valais

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## Background

The European Alps are a **highly exposed** and **sensitive** to climate change. Over the last hundred years mean temperatures increased by 1.5°C which is more than twice compared to the global average (BMU 2007) leading to widespread melting of glaciers, an upward shift of the snowline, changes in precipitation and in the run-off regime of rivers as well as in general water resources availability. **Future climate change** will challenge all socio-economic sectors relying on water and increasingly demands for **multilevel governance approaches and adaptation strategies** (Fig. 1).

This regional case study conducted in the context of the European Environment Agency (EEA) study "Vulnerability to Climate Change and Adaptation to water scarcity in the European Alps" (to be published in 2009) tries to answer the following main questions:

- What specific **water resource problems** have existed in the past in the region and have to be expected from climate change in the future?
- Which **adaptation activities** on water resources problems have already been carried out within the region and what adaptation gaps exist?
- What are **lessons learned** from the adaptation experiences?

## Case study region and methods

The area of the Valais covers nearly the entire water basin of the Upper Rhone (Fig. 2). The Rhone as the lifeline of the region has its source in the high alpine conditions of the Rhone glacier at 2274 AMSL and flows into Lake Geneva (372 ASML) after passing through 170 km of different vegetation zones. As an inner-alpine arid valley the Valais is traditionally confronted with temporal low water availability and therefore adaptation activities to water resources problems have always been carried out.

The case study is based on 14 guided interviews with local stakeholders from different sectors and public authorities who are directly involved in the adaptation activities or have knowledge about them.

## Results

### 1. Existing problems with local and temporal water shortages

- **Drinking water:** local lack of water can happen before snow melt in the mountains in spring
- **Agriculture:** in some areas more water is needed than provided by precipitation
- **Forestry:** change in vegetative ecotype; danger of forest fire
- **Hydro-power:** increasing summer droughts with negative impacts on stored water volume
- **Tourism:** lack of snow
- **Spatial planning:** droughts, danger of forest fire

### 2. Adaptation measures

**Past** measures have been mainly technological measures, reacting to existing pressures and being implemented at local scale. Most measures are primarily motivated by economic reasons or by the task to reduce risks of natural hazards.

- **Drinking water:** Connection of local water supply infrastructures, regulations to save drinking water, installation of water meters
- **Agriculture:** Implementation of new production technologies
- **Forestry:** Adapted management strategies (selection of suitable species), fire concept
- **Hydro-power:** Increasing storage capacity, more power plants powered by running water
- **Tourism:** Artificial snowmaking, incentives for water saving, diversified offers
- **Spatial planning:** Rhone correction, fire concept

Adaptation measures to decreasing and changing availability of water resources due to expected **future** climate change are still in its beginnings, hydro-power and forestry seem to be the most pro-active.

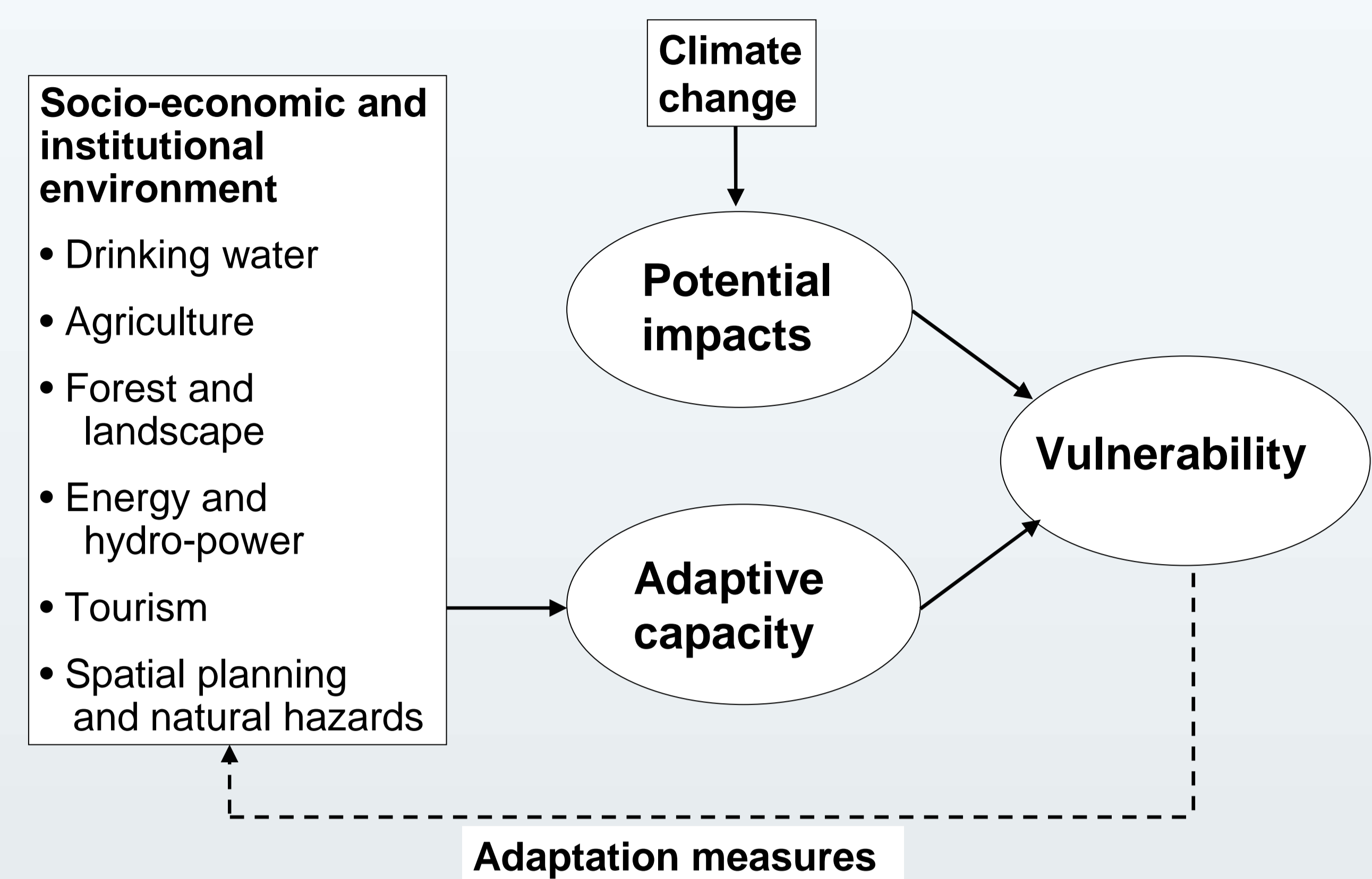


Fig. 1: Vulnerability in the socio-economic and institutional framework  
Source: IPCC 2001 (modified)

"**Adaptation** is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."

"**Vulnerability** is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system."

IPCC, Climate Change 2007: Impacts, Adaptation and Vulnerability.

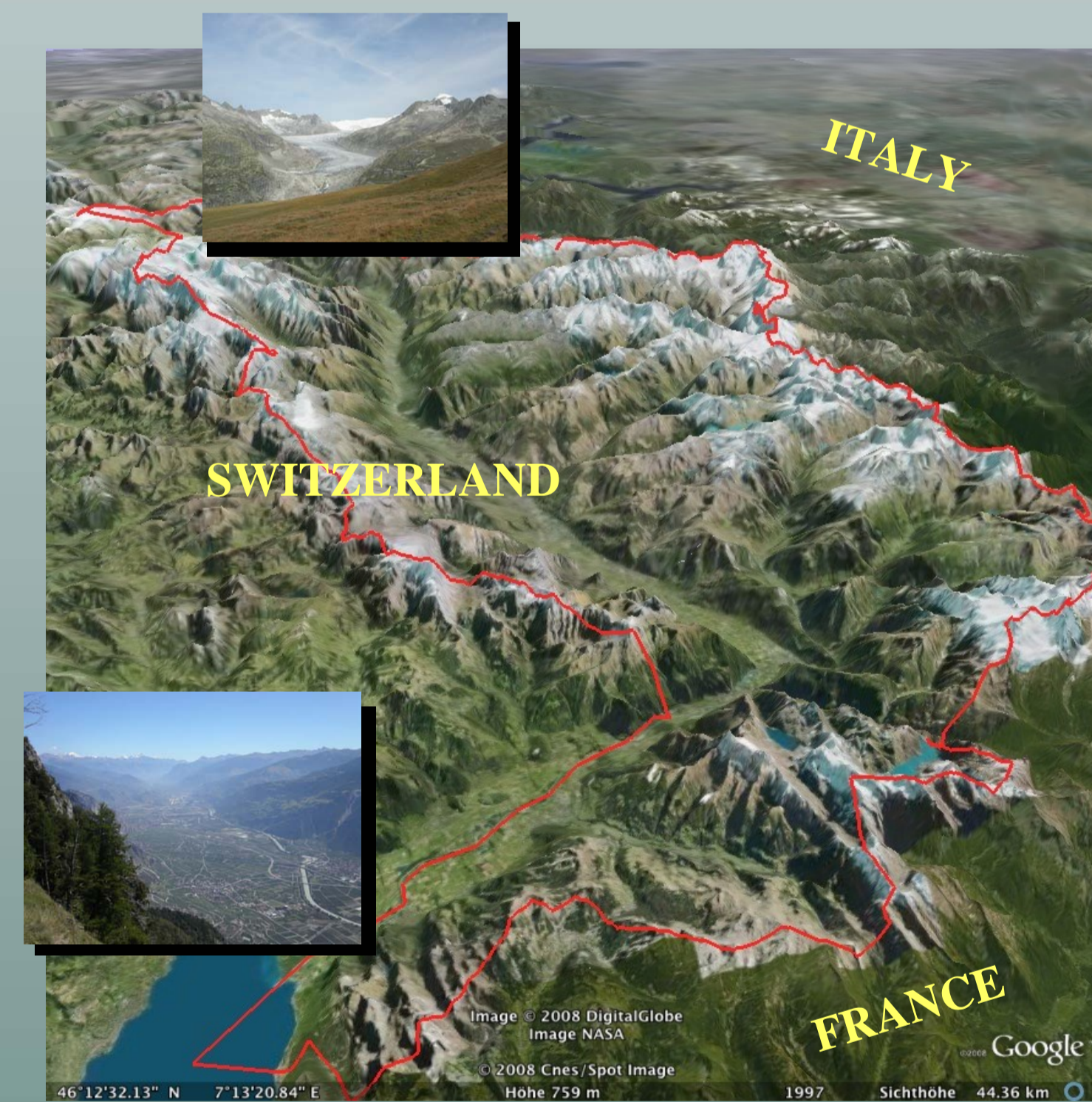


Fig. 2: Canton of Valais, Switzerland

### Key facts

Precipitation: 500-3500mm  
Evaporation: 100-1000mm  
Temperature rise since 1970: 1.5 C°

— Border of Canton Valais  
Author: David Gallati  
Sources: GoogleEarth, Bundesamt für Statistik

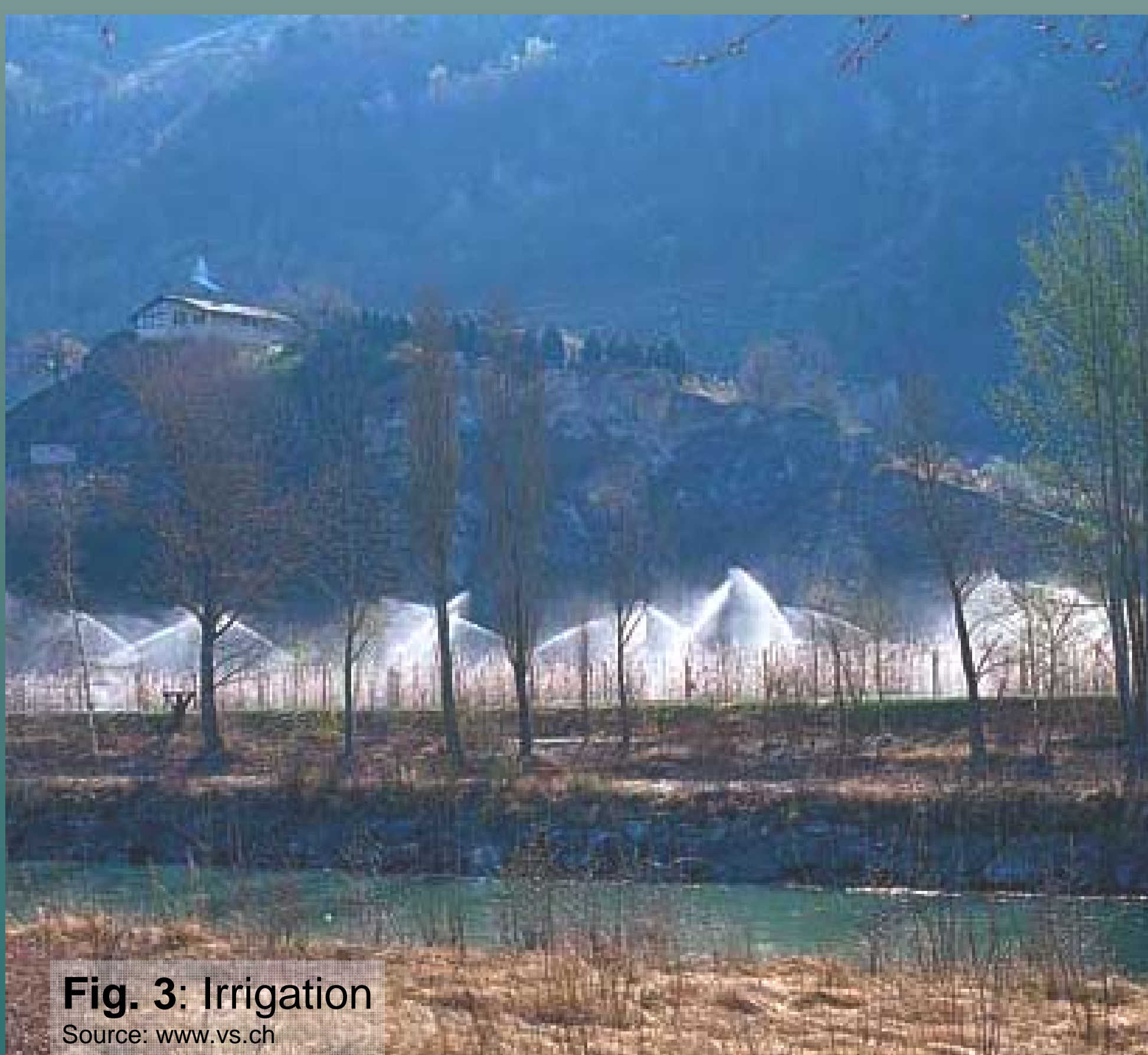


Fig. 3: Irrigation  
Source: www.vs.ch

## Lessons learnt and conclusion

- **Political will and mandate are needed** for a coordination approach to adaptation to future climate change.
- The public awareness about the need for adaptation to climate change is low because there has been **no drastic experience of water scarcity yet**. More detailed knowledge about the future local impact of climate change on water availability is estimated to be needed for taking concrete adaptation actions and for better dealing with uncertainties.
- Measures are accepted and successful when also driven by other interests and **economically beneficial**.
- Long-term adaptation planning happens mainly in sectors, where **long-term investments** are needed (hydro-power, forestry). Other sectors plan and act on shorter terms.

→ The case study highlighted that water resource problems in the past appeared in particular locations and at particular times of the year. Water-related conflicts of interest have been rare. However, future water resource management in the Valais should take climate change scenarios into account, embedded in a proactive, long-term, integrative and **adaptive water resource management** approach (adaptation and monitoring). The respective political and socio-economic framework influences the **adaptive capacity** of the region. The integration of stakeholders from different levels of politics and management (local, regional, federal) as well as from different sectors (**multi-level governance**) is important to integrate knowledge and experience from different fields to convey a mutual understanding of adaptation problems.