



# Land Use Planning and Water Management

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- Land use planning is a **regulatory instrument** influencing the **allocation of land uses** to designated territorial units (e.g. land parcels).
- **Allocation of land uses** refers to the question what land is used for and if this land use meets politically determined objectives.
- **Land use planning** (LUP) includes among others **zoning**, building permit control, protection of natural resources, urban conservation, aspects of environmental protection (especially pollution control), coastal zone management.

# Land Use Planning



- LUP covers a wide range:
  - **basic systems** only covering the allocation of land use rights or approval of building construction
  - **elaborated systems** of planning based on an integrated, multi-level approach
- LUP systems vary in terms of scope, spatial extension, participation and the gap between expressed objectives and outcomes.
- They also vary in terms of **the location of power** (centralization vs. decentralization) and the **roles of public and private sector**.
- LUP systems are influenced by the **political and administrative situation** of a country and by its **jurisdiction**.

Williamson et al., 2010

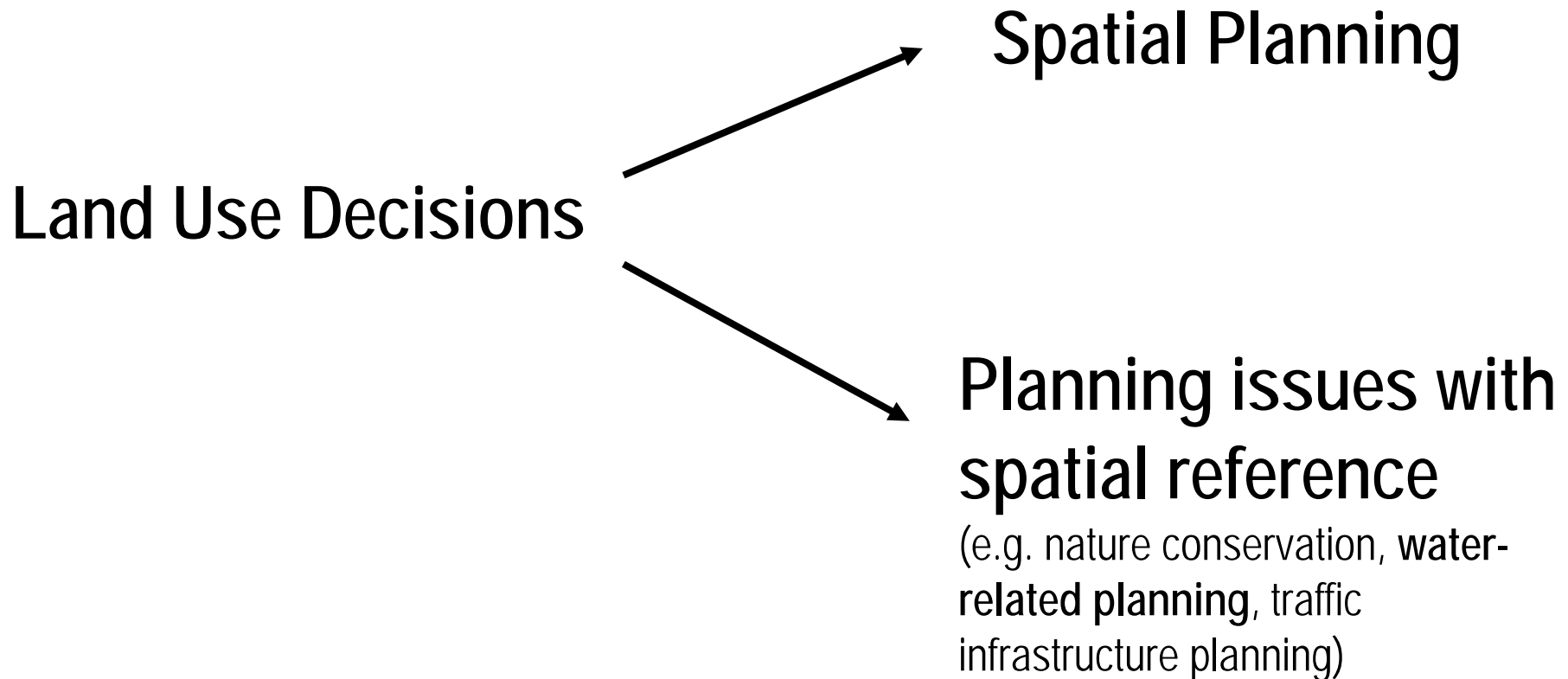
# Land Use Decisions at European Union Level



- European Spatial Development Concept (ESDC)

## **More importance of sectoral policy fields in land use planning:**

- Common Agricultural Policy (CAP)
- Transportation policy (e.g. TEN – Trans European Networks)
- Regional policy
- Nature conservation (Nature 2000 network)
- Water management (EU Water Framework Directive, EU Flood Directive)



# Spatial Planning in Austria

- Spatial planning in Austria follows a **comprehensive integrated approach**
- Spatial planning is conducted through a **systematic and formal hierarchy of plans**. These are organized in a control system, where plans at lower levels must not contradict planning decisions at higher levels
- Substantial **coordination demands**



Source: GIS Steiermark

# Land Use Planning and Water Management



Two important issues in the relationship between land use planning and water management:

- Coordinate land use in order to **ensure water availability** in terms of **quantity and quality**
- Coordinate land use in order to **minimize the risk induced by water related hazards** (e.g. torrent or river flood hazards)

# Land Use Planning and Water Availability



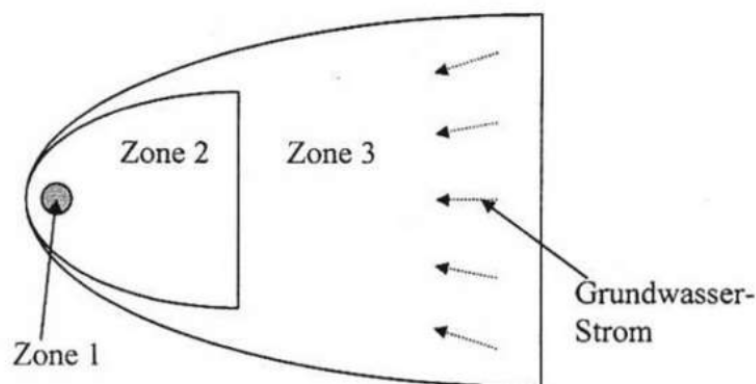
# Water-Related Planning

- **Water-related planning** entails proactive coordination and systematic management of water resources in their various manifestations.
- In Austria water-related planning is based on the **Austrian Water Act** but there are also water-related regulations in spatial planning instruments (e.g. water-related zoning in local and regional land use plans).
- Reorganisation of water-related planning by the implementation of the **EU Water Framework Directive (EU WFD)**
- The objective of this directive is that all waters have at least a **good status**. This means, particularly for lakes and rivers, that only minor deviations from the original, natural and typical status are permitted.

- **Surface waters (rivers and lakes)** are monitored and assessed. Apart from the impacts of material pollution, also hydromorphological interventions that change the function of waters as habitats are considered in the assessments. The quality of water bodies is defined by **their chemical and ecological status**.
- In the case of **groundwater** the **good chemical and quantitative status** is aimed at.
- **Management plans** for river basins and catchment areas.
- Management plan provisions interrelate with land use planning.

# Water-Related Planning

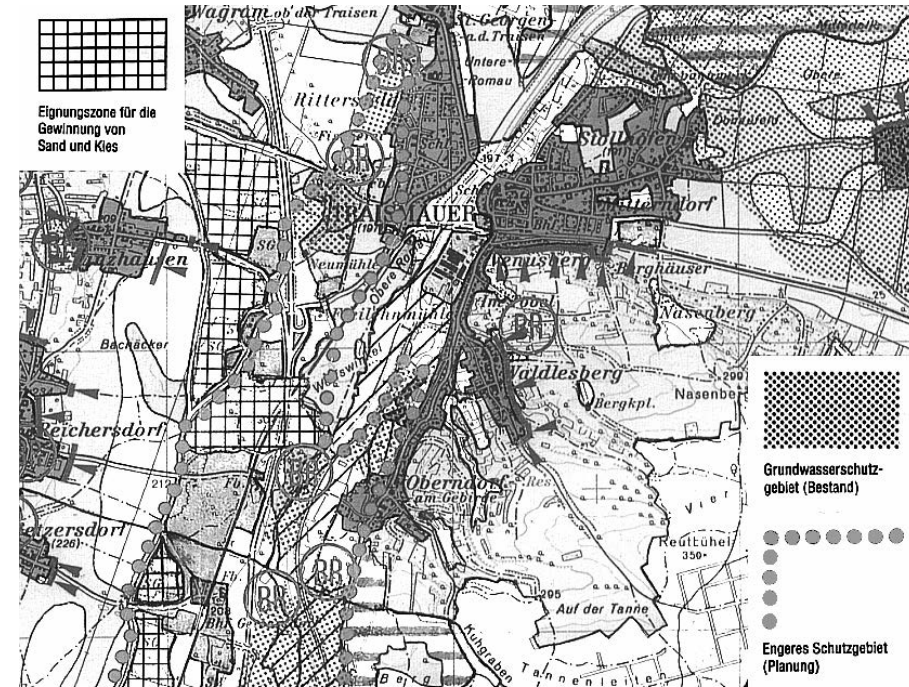
- Issuing **water permits** for specified water uses is the basic instrument of water-related planning. Water permits are issued by water management authorities.
- **Groundwater protection zones:** land use restrictions are imposed by water management authorities within a designated area; groundwater protection zones have to be integrated into local land use plans



Source: <http://www.oewasser.at/de/wasserversorgung/technik/wasserschongebiet-und-wasserschutzgebiet.html>

# Water-Related Planning

- **Regional water management programs:** zoning of areas defined for specific water management purposes at regional level; imposed by water management authorities; affecting regional and local land use planning
- **Coordination** between land use demands for mineral extraction and groundwater bodies relevant for water supply **in regional land use planning:** priority zones for mineral extraction adjusted to groundwater protection zones



Source: Provincial Government of Lower Austria

# Land Use Planning and Flood Risk Prevention



Source: Öst. Bundesheer, o.J.



Source: Kleeberg, Rother, 1996

# Functions of Land Use Planning within Flood Risk Prevention



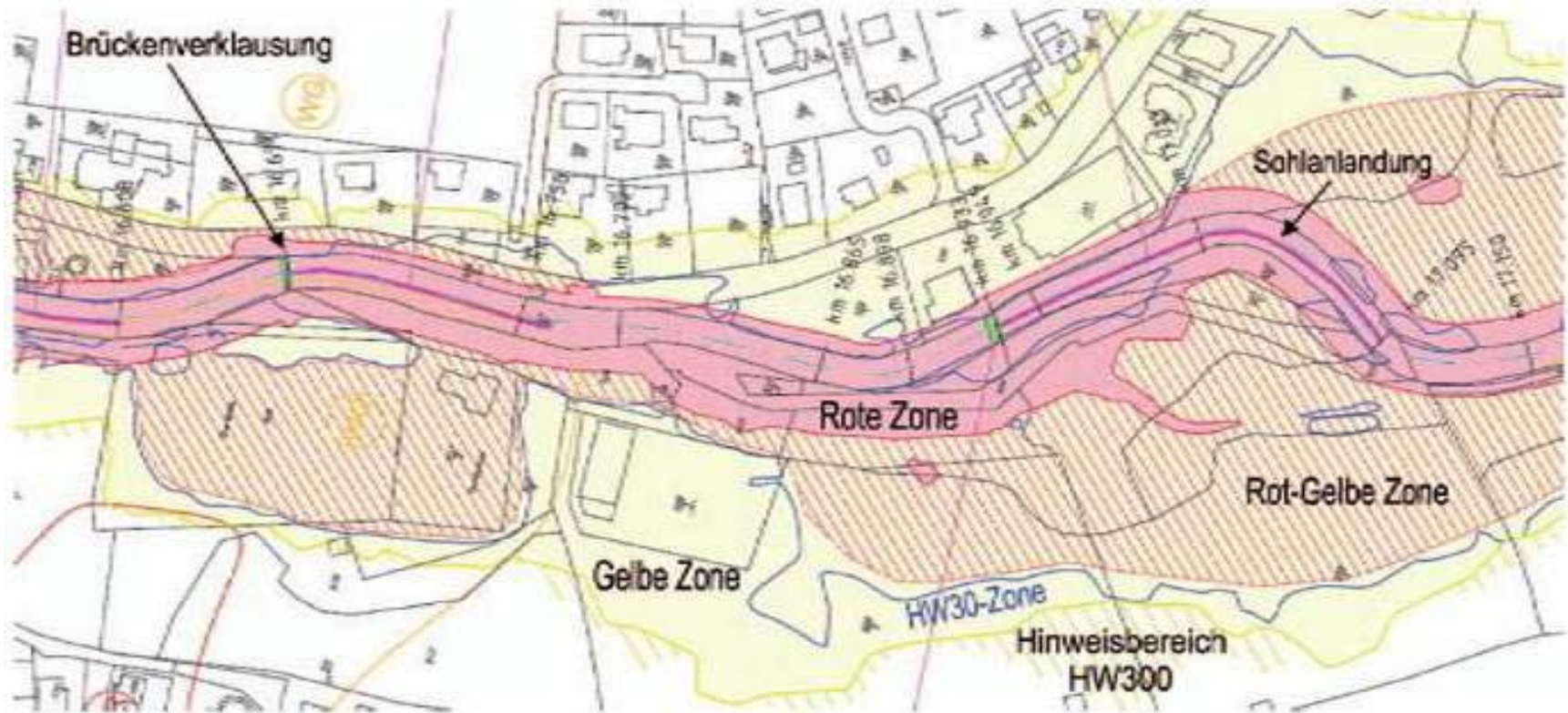
- Documentation of flood extension within land use planning instruments (**informative function**)
- Reduction of damage potential (**regulatory function**)
  - Distribution of land uses and demands for future land uses according to the suitability of locations: zoning restrictions for highly vulnerable land uses (e.g. building land) in endangered areas
  - Coordination of hazards and land use interests legally binding for land owners
- Land use planning is able to contribute to risk prevention, but it is just one player among many others.

# Land Use Planning and Flood Risk Prevention



- Land use planning is not able to carry out risk analysis
- **Hazard information** is provided by responsible water management bodies (sectoral planning), on the example of Austria:
  - Flood hazard mapping
  - Flood risk mapping

# Flood Hazard Map

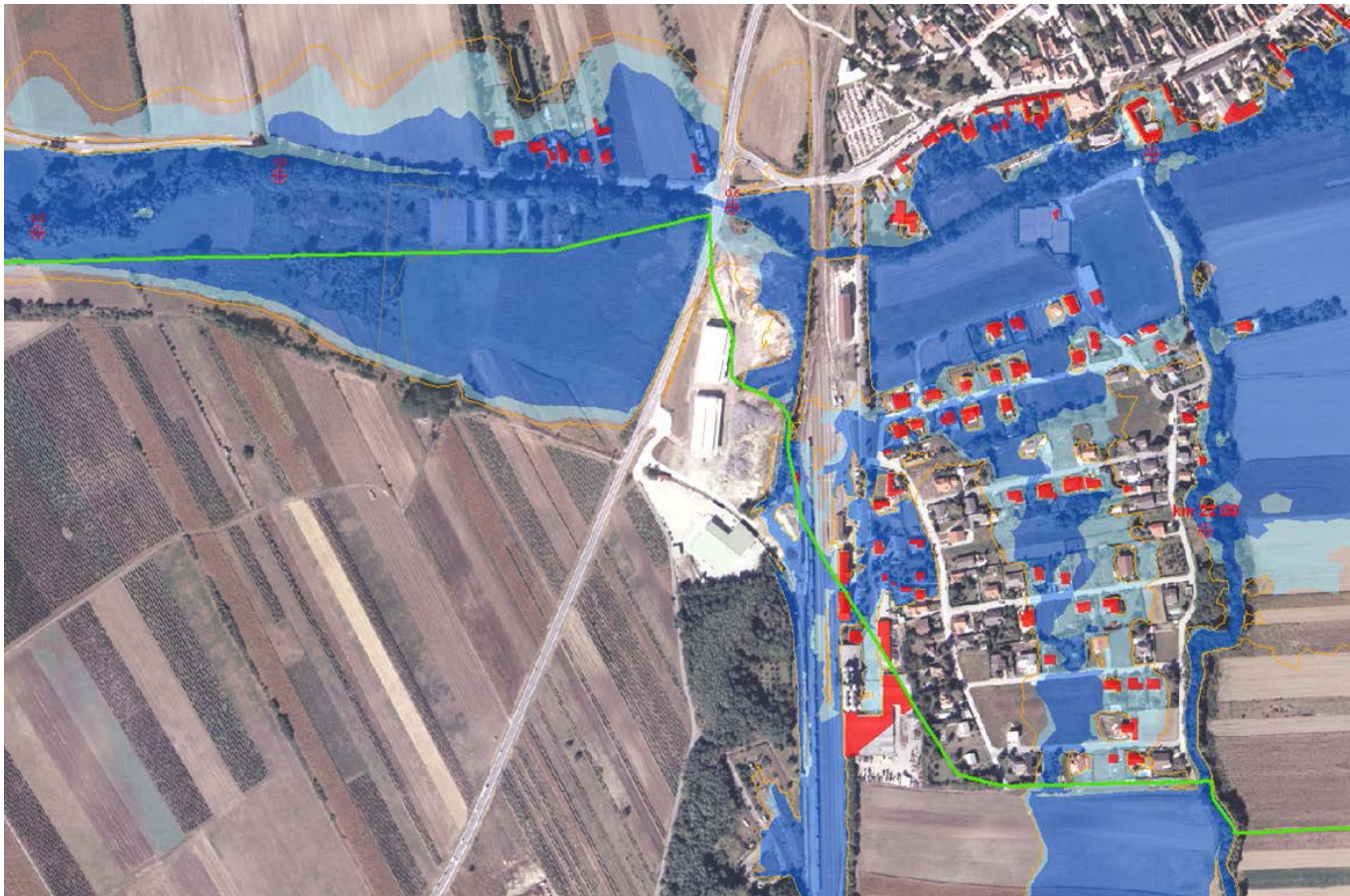


Source: Loizl, 2013

Hazard information based on hazard intensity (red zone, yellow zone)



# Flood Hazard Map



Source: Pieler, ZT GmbH, 2010

Hazard information based on reoccurrence intervals (e.g. 100-year flood)

# Flood Hazard Map



## Gefahrenkarte - Überflutungsflächen

Dargestellt werden die Überflutungsflächen durch Hochwasser hoher/mittlerer/niedriger Wahrscheinlichkeit (Wiederkehrintervall durchschnittlich 30/100/300 Jahre / Extremereignis oder Extremereignis) auf Basis von Modell-Szenarien.

### LEGENDE:

Ausmaß der Überflutung durch Hochwasser mit Wiederkehrintervall

#### Daten aus Detailuntersuchung

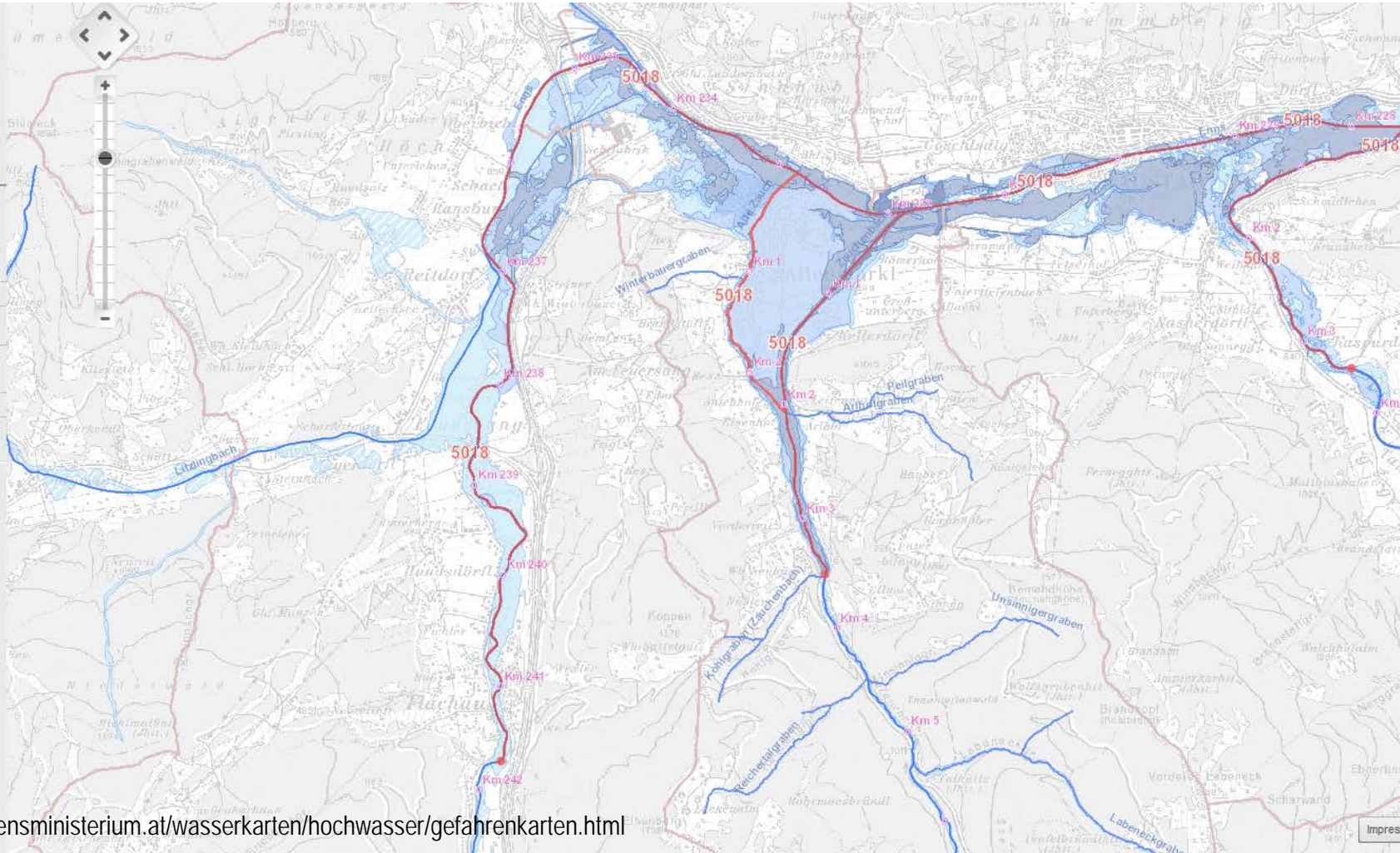
- 30 Jahre (HQ30)
- 100 Jahre (HQ100)
- 300 Jahre / Extremereignis (HQ300/Extrem)

#### Daten aus anderen Untersuchungen

- 30 Jahre (HQ30)
- 100 Jahre (HQ100)
- 300 Jahre / Extremereignis (HQ300/Extrem)

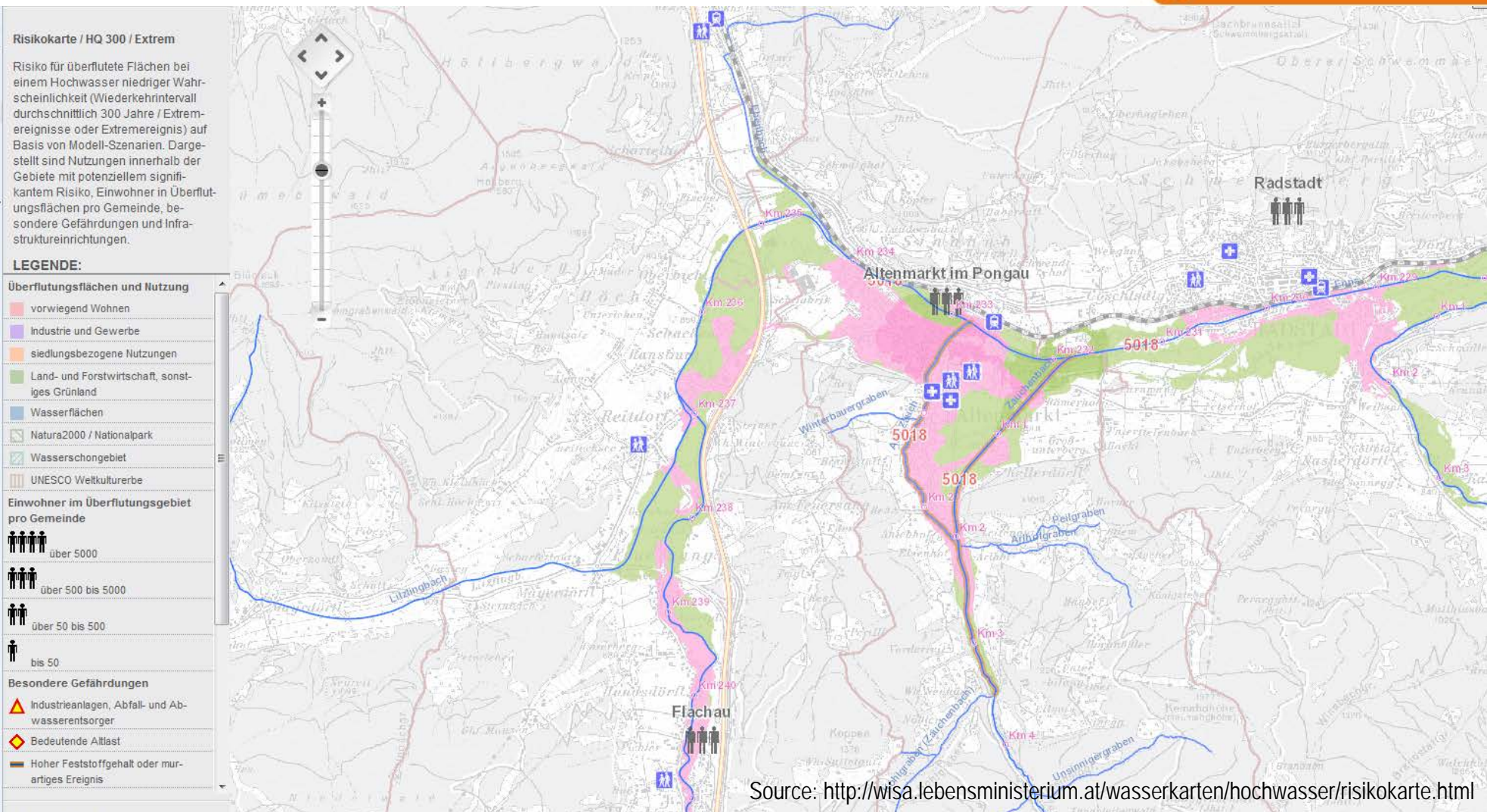
#### Verwendete Grundlagendaten:

© OpenStreetMap-Mitwirkende, © BMLFUW, © BEV 2002, Zl. 6843/2002



Source: <http://wisa.lebensministerium.at/wasserkarten/hochwasser/gefahrenkarten.html>

# Flood Risk Map

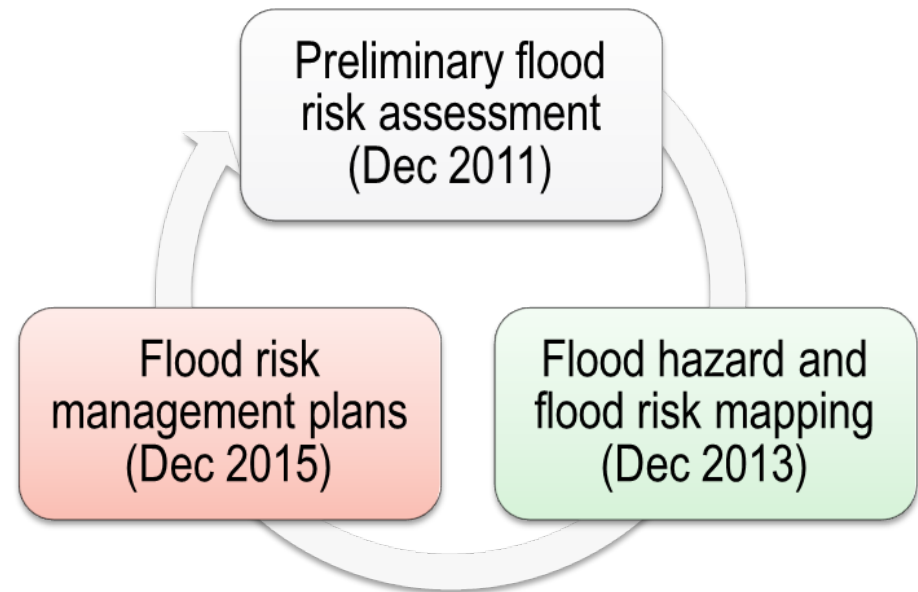


Source: <http://wisa.lebensministerium.at/wasserkarten/hochwasser/risikokarte.html>

# EU Flood Directive



- Directive on the assessment and management of flood risks
- **Standardising framework** for flood hazard information, flood risk information and flood risk management in the European Union
- Priority for **non-structural preventive measures**



Source: IRUB

# Land Use Planning and Flood Risk Prevention

- Indication of hazard areas in (local) land use plans is mandatory
- Zoning restrictions in hazard areas according to spatial planning laws
  - Restrictions for zoning of building land
  - Restrictions for development of existing building land

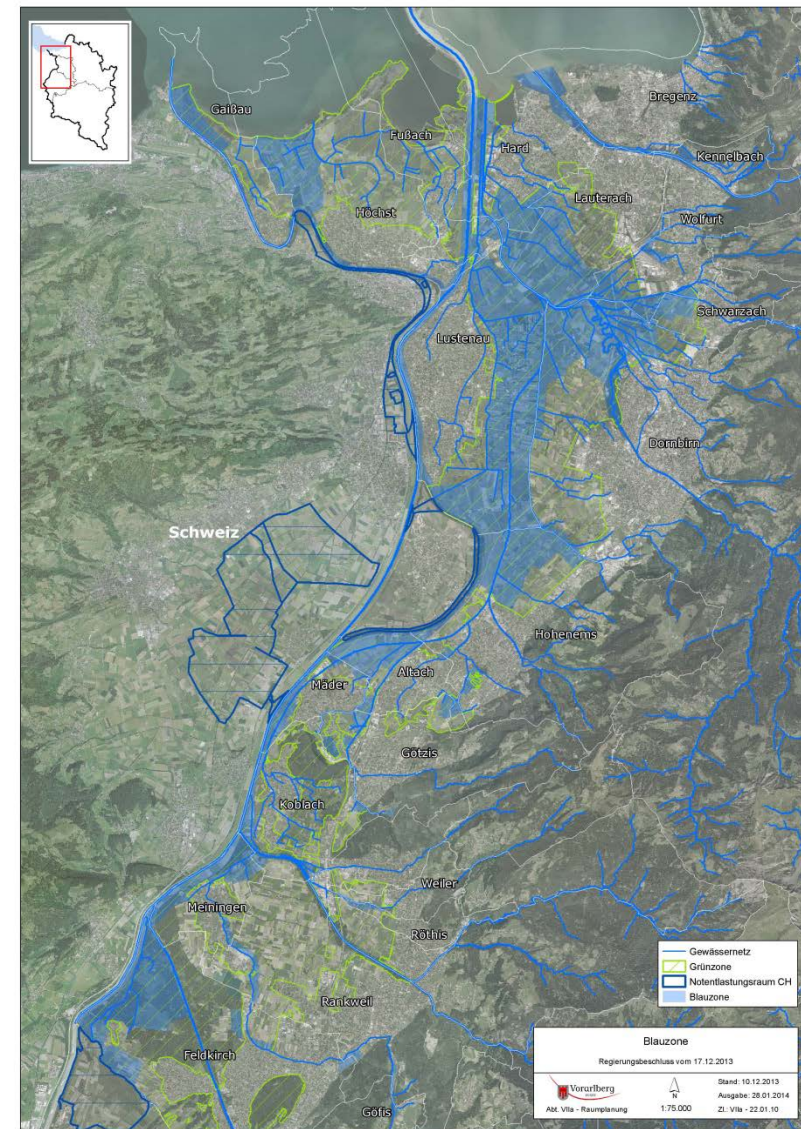


Source: IRUB

# Land Use Planning and Flood Risk Prevention



Zoning for flood runoff, flood retention and flood protection in **regional land use planning**

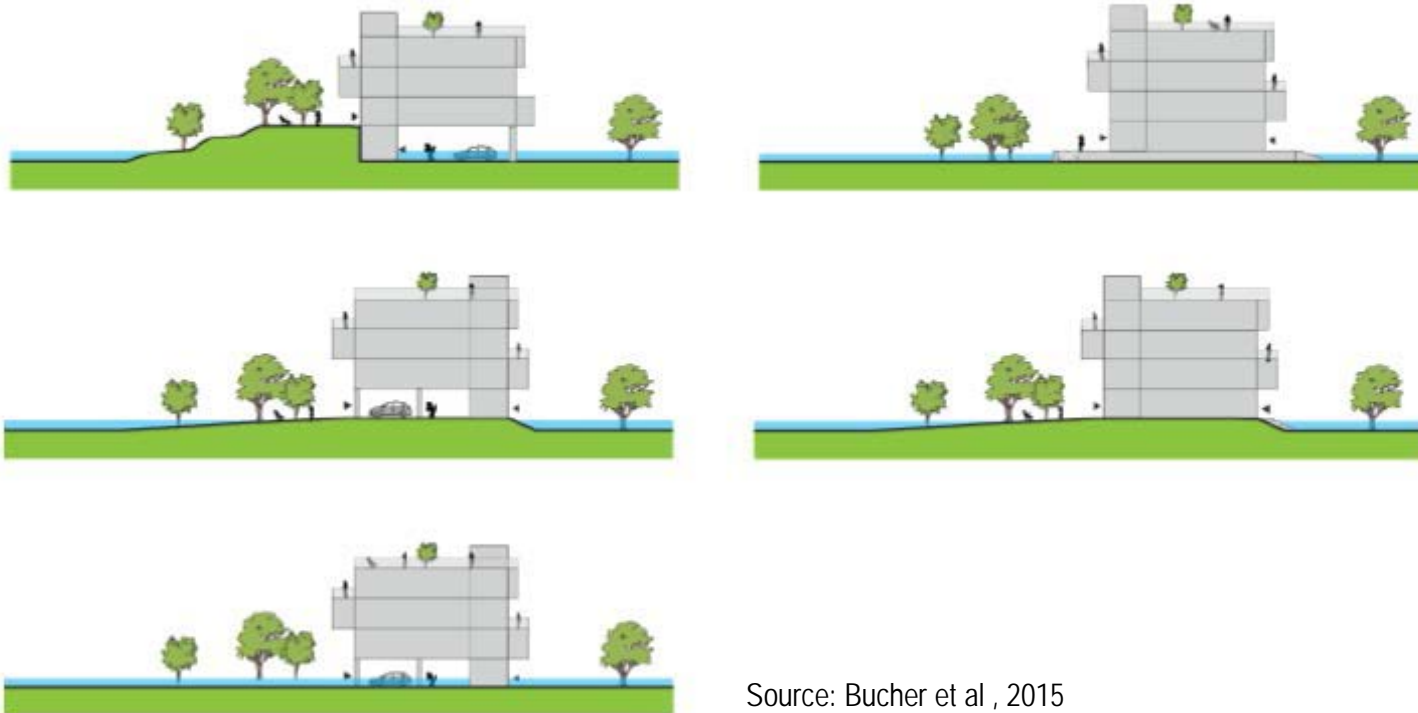


Source: [www.vorarlberg.at/pdf/blauzonerheintal-plandars.pdf](http://www.vorarlberg.at/pdf/blauzonerheintal-plandars.pdf)

# Land Use Planning and Flood Risk Prevention



## Adapting buildings to flood hazards in local land use planning



Source: Bucher et al , 2015

# Land Use Planning and Flood Risk Prevention



## Flood adapted building and infrastructure



Source: IRUB



# Land Use Planning and Flood Risk Prevention



Foster **complementary** (low risk) **land uses** in flood plains by land use planning, e.g. recreation, short rotation forestry, adaptive agriculture



Source: [www.toposmagazine.com](http://www.toposmagazine.com)



# Thank you for attention!

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