Post-disaster landscape design approaches

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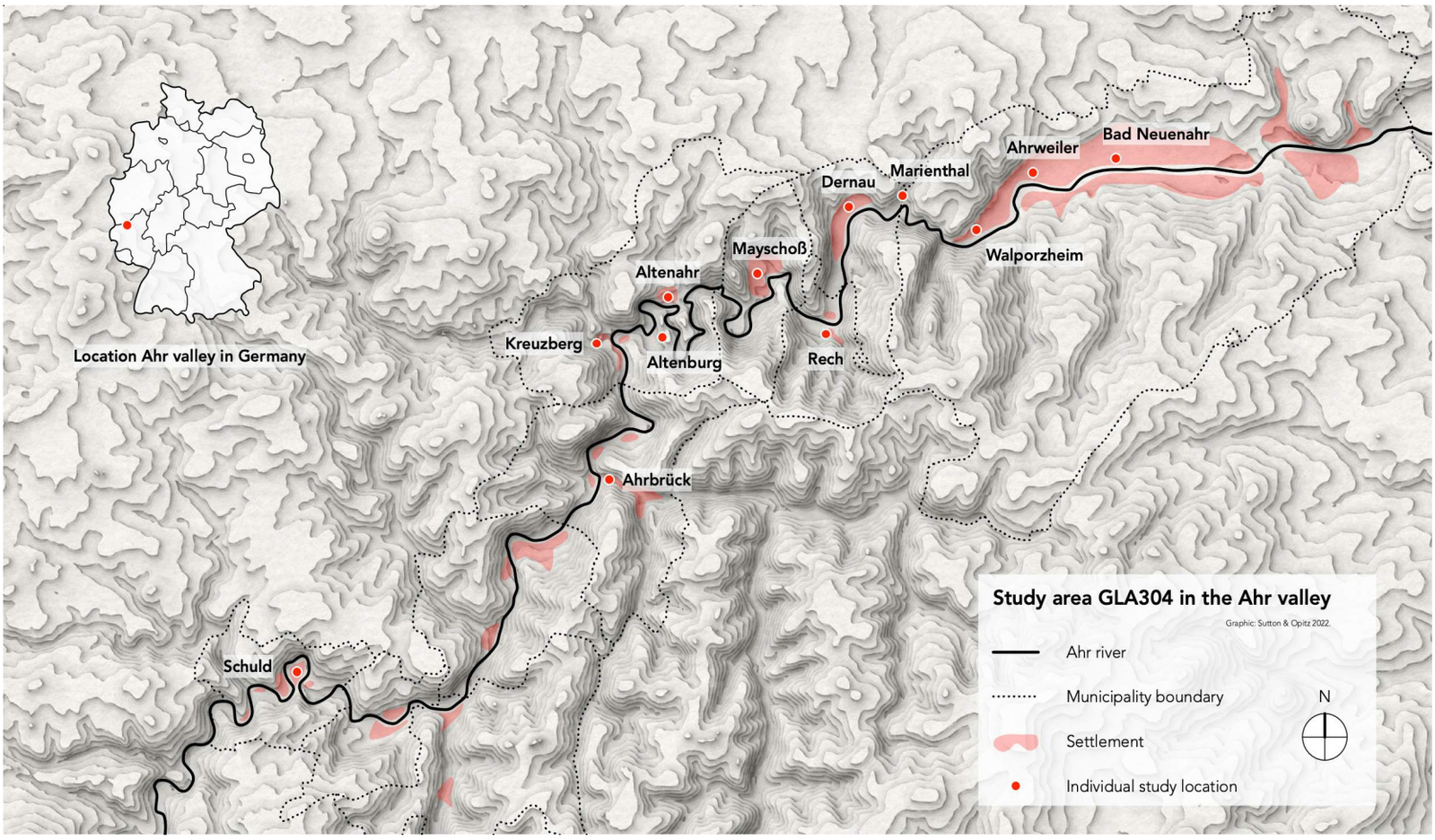
Ahr Valley in Germany was hit by a devastating flood in the summer of 2021. On July 13th and 14th, enormous amounts of rain of 100 to 150 mm fell over Western Germany as well as parts of Belgium and Luxembourg. The two federal states of North Rhine-Westphalia and Rhineland-Palatinate were particularly affected.

The water level on the Ahr river (Altenahr) exceeded its previous record of 2016 (3.71m, discharge: 236 m3/s), whereby the measuring station reached a value of 5.05 m (discharge: due to the flooding). 332 m3/s) failed. Current estimates assume a water level between 7 and 8m for this event, with a discharge between 400 and 700 m3/s.



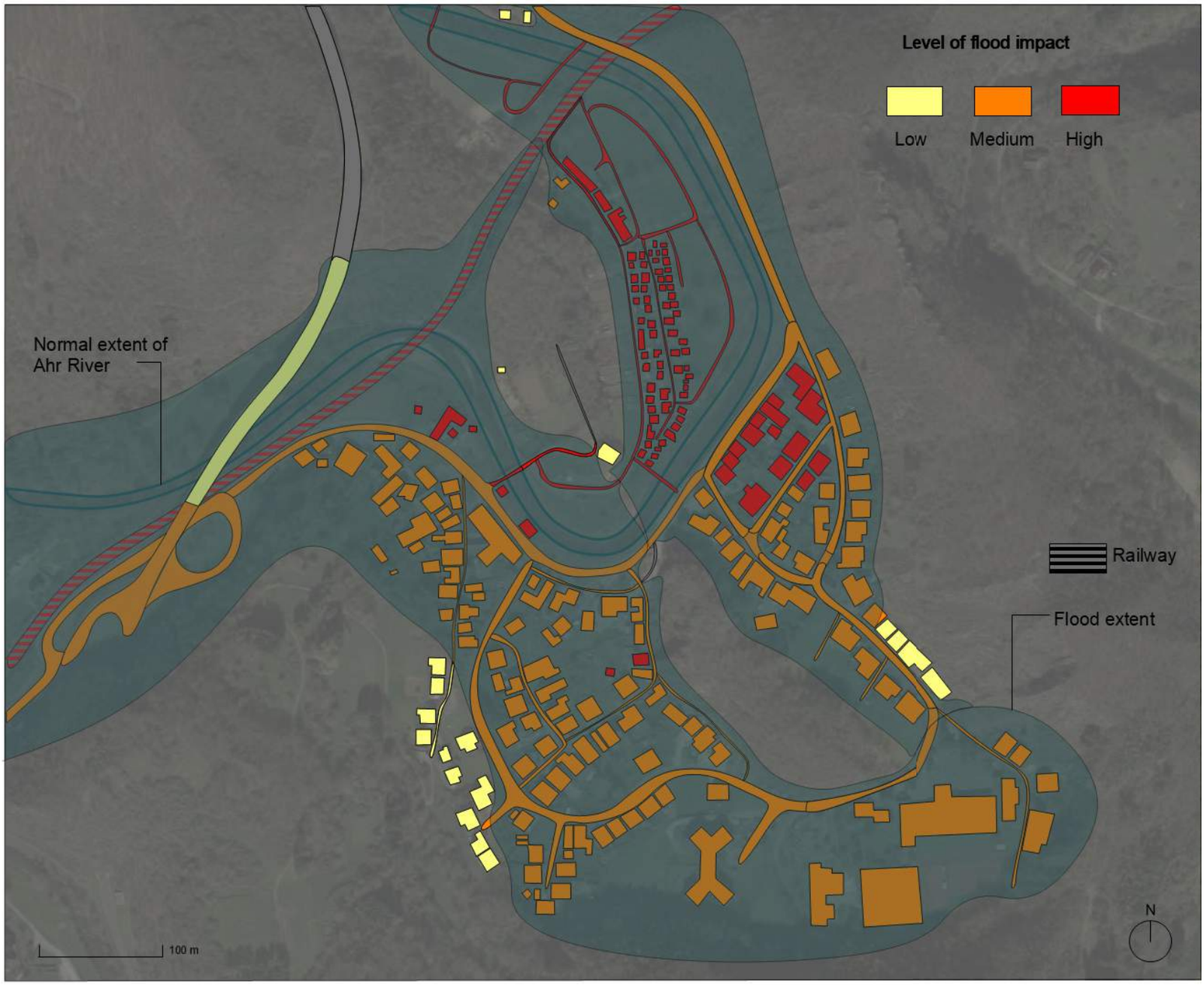
Catchment area of Ahr

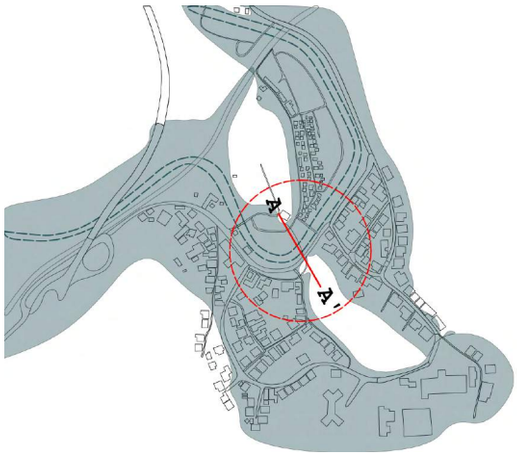
Focus area: Altenburg, Altenahr

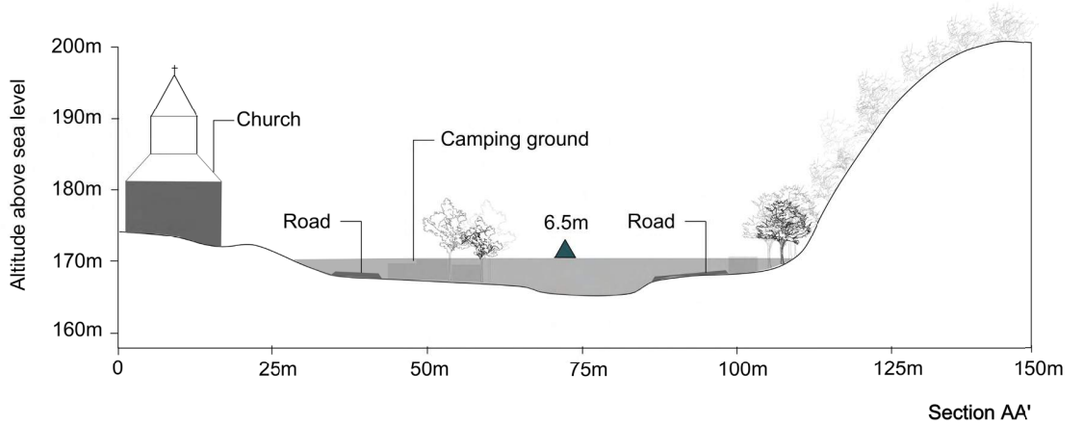
Altenburg is part of the Altenahr municipality in the Rhineland-Palatinate district of Ahrweiler. The town between Altenahr and Kreuzberg is 175 meters above sea level and has around 600 inhabitants.

Workshop 01: What happened?

Altenburg is one of the districts in Ahr valley where more or less everything was destroyed or affected by the flood. Most of the camping grounds were washed away and some of the buildings near the river were destroyed. The calculated flood level in Altenburg is 6.5m.





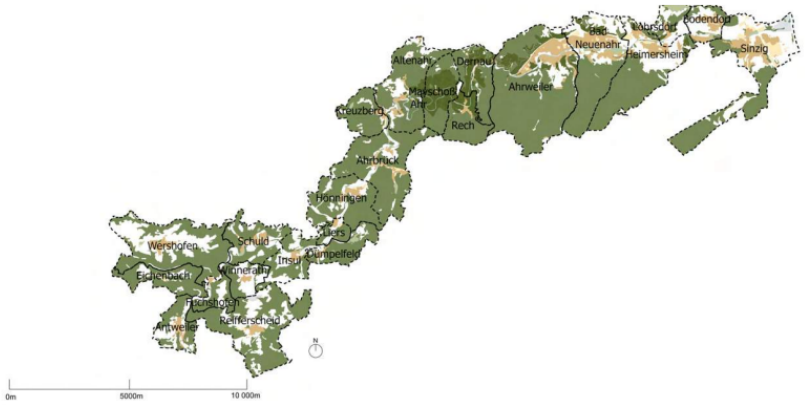


Workshop 02: What happens?

The district has replaced old bridges with temporary ones.
They have cleaned up the debris and mess caused by the flood and preparing the ground for future renovation. For now, people are living in temporary houses and working in temporary offices.

Workshop 03: What should happen?

The flood hazard map, together with the land use map and the historical map gives a basis for the design proposal. The maps give an idea of where there should not be any buildings and any other form of impervious surfaces in the hazard zones. Instead, there should be more green areas where the water can infiltrate.



Land use map of Ahr valley, Germany

- Districts
- Ahr river
- Vineyards
- Forest
- Recreation area
- Industry and commercial area
- Settlement area
- Nature reserve

Land use map of Altenburg, Altenahr

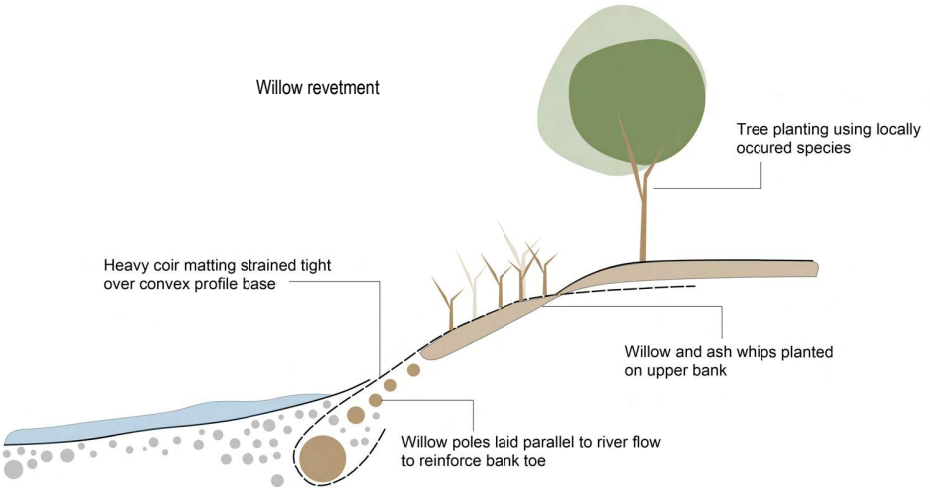
- Ahr river
- Vineyards
- Forest
- Recreation area
- Industry and commercial area
- Settlement area

Design proposal: “Green space for the river”

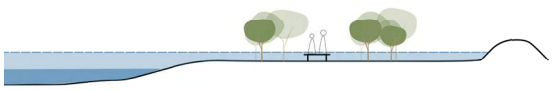
The main design approach is to give more space for the river and extend the floodplain with more green areas. This will help soak up the water and reduce the amount of water coming into the residential areas during the flood.

The impact of large amounts of sediments moving down the river has caused erosions. It is, therefore, necessary to reinforce the river bank and stabilize the soil. The Willow revetment method will be important for the long-term stability of the banks since the roots of the trees will bind the bank sediments together. The vegetated banks will, therefore, be able to withstand erosion processes in the coming years.

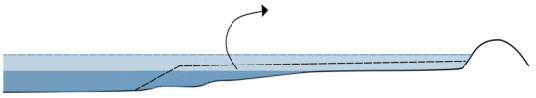
By using “soft” methods (natural elements such as vegetation) to implement flood protection measures, the design aims to achieve sustainable solutions which take account of the current environmental, social, and economic aspects.



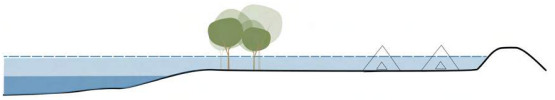
Tolerating: Paths within the floodplain



Extending the space: Reprofiling the floodplain



Tolerating: Camping and caravan sites



Green structures

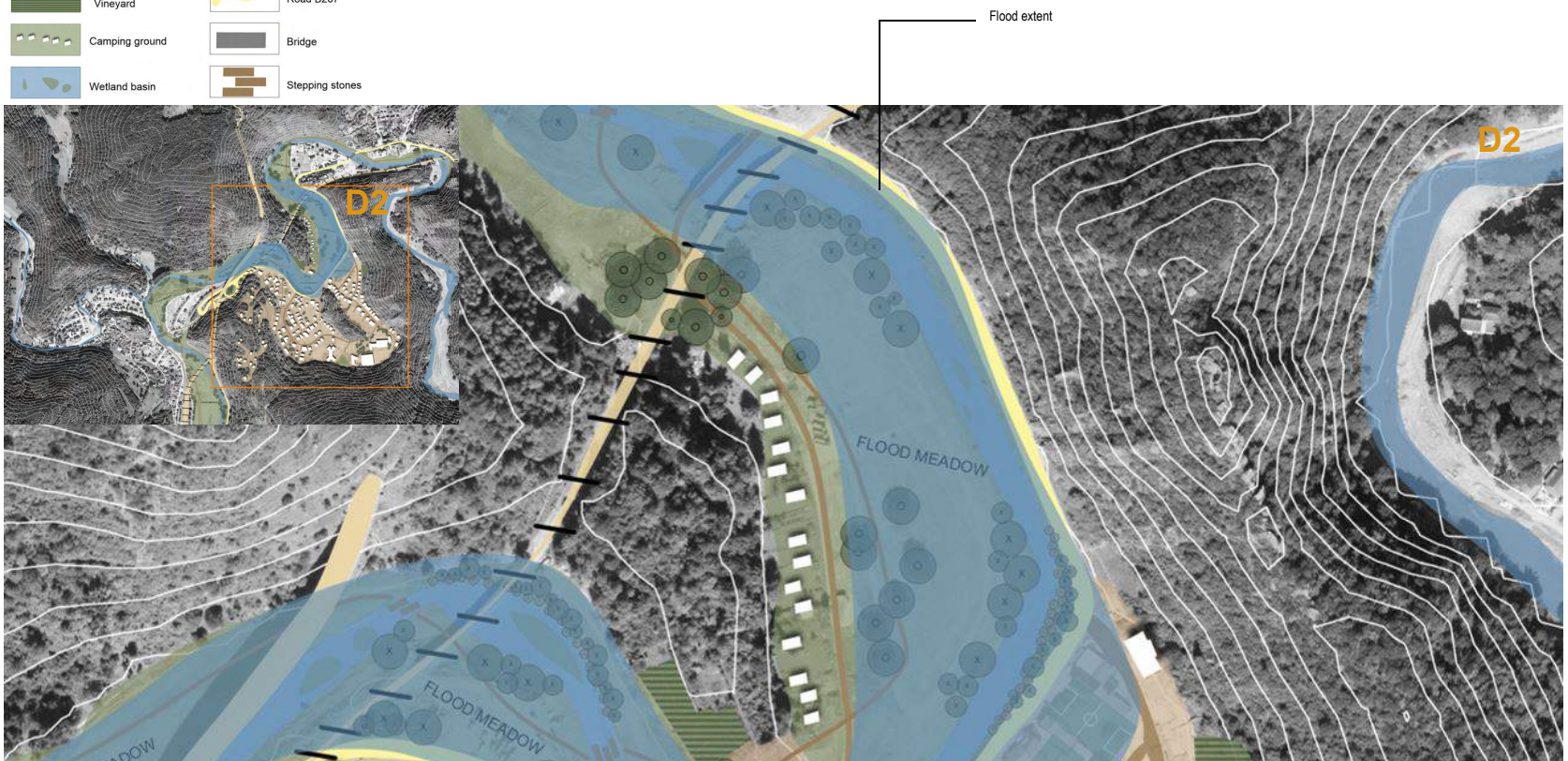
- Existing tree
- New tree
- Willow and ash whips
- Rain garden
- Vineyard
- Camping ground
- Wetland basin

Infrastructure

- Pathway
- Municipal road
- Elevated railway
- Road B257
- Road B267
- Bridge
- Stepping stones

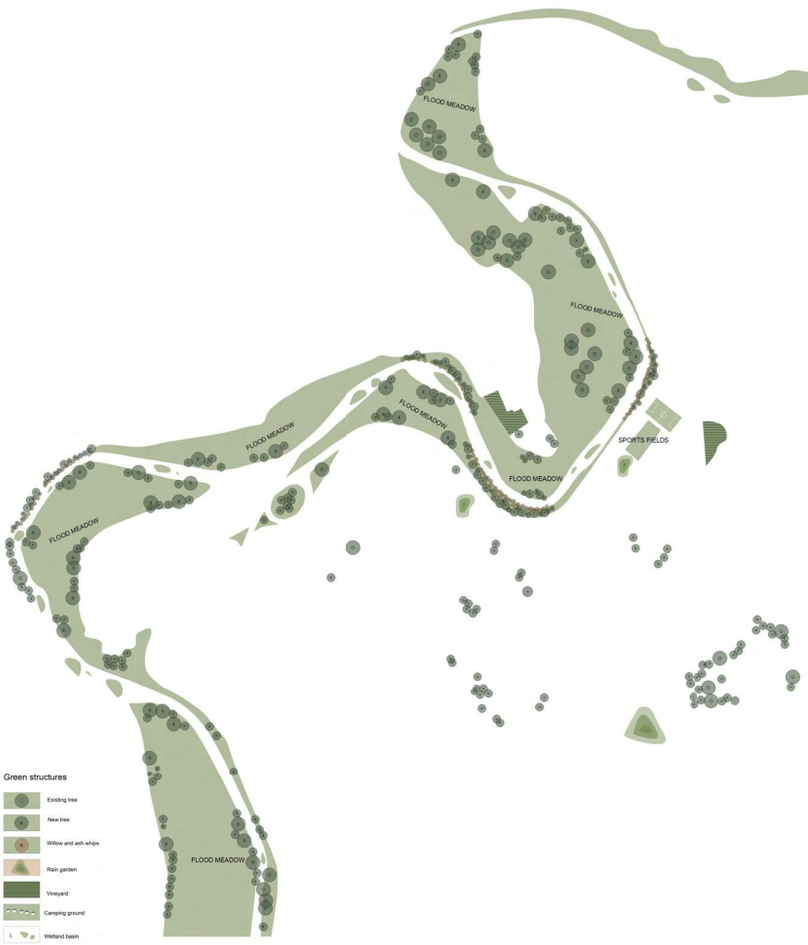
Settlements

- Existing settlements
- New settlements with green roofs



Green structures:

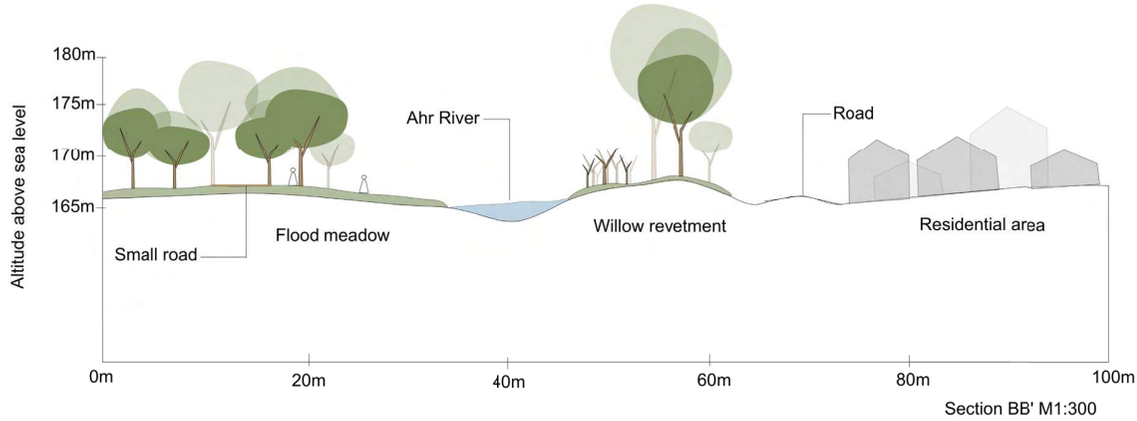
Having a sustainable drainage system (SuDS) that can catch up and reduce the amount of rainfall-runoff is important. Rain gardens and green roofs are some measures for SuDS.



Paths within the floodplain

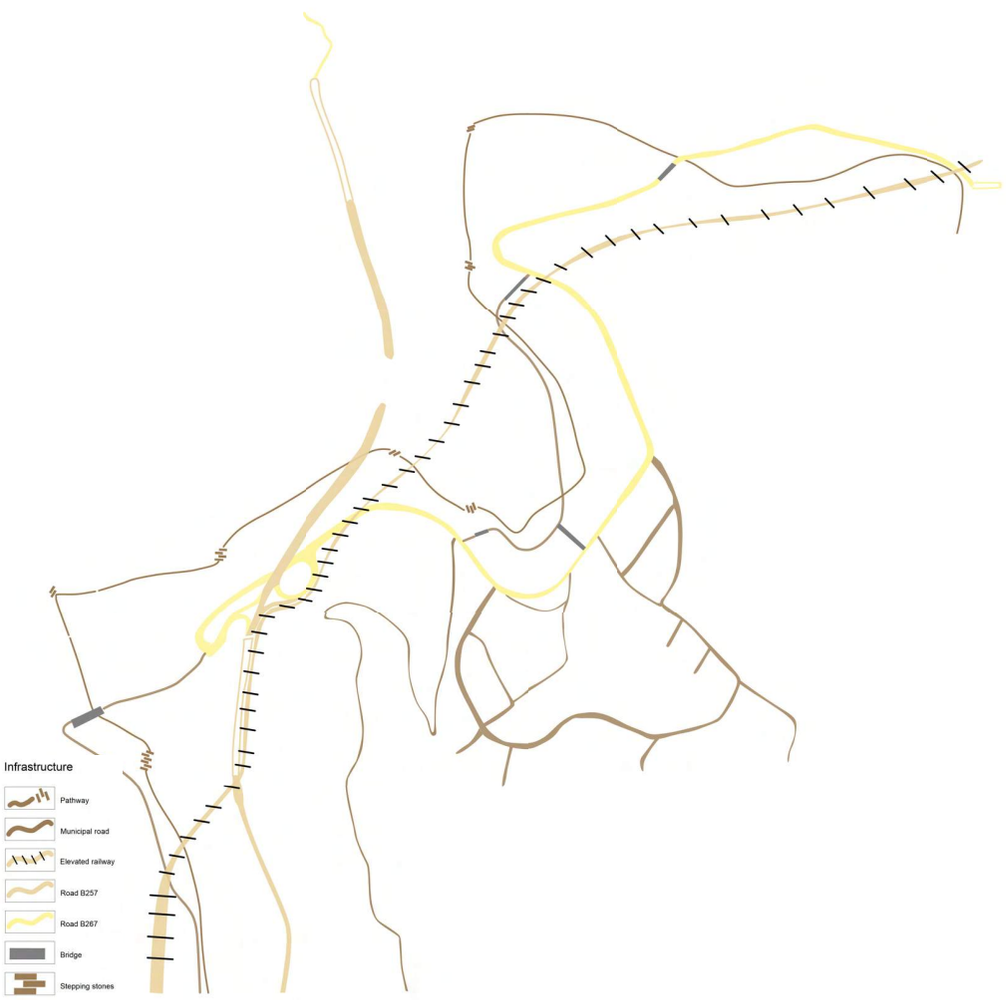
Flood tolerant vegetation

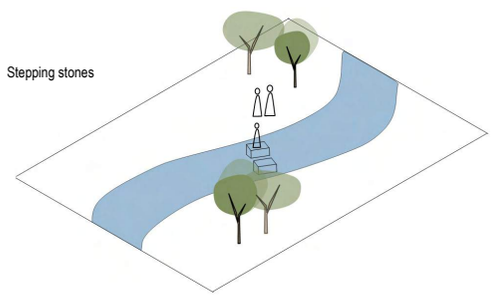
Type of vegetation	Botanical name	Common name	Notes
Trees and shrubs			
	Acer saccharinum	Silver maple	Occurs in Rhineland-Palatinate (western state of Germany)
	Populus alba	White poplar	Occurs in Rhineland-Palatinate
	Populus nigra	Black poplar	Occurs in Rhineland-Palatinate
	Salix babylonica	Weeping willow	Occurs in Rhineland-Palatinate
	Sambucus nigra	Elder	Occurs in Rhineland-Palatinate
	Spiraea douglasii	Douglas-spiraea	Occurs in Rhineland-Palatinate
	Ulmus glabra	Scotch elm	Occurs in Rhineland-Palatinate
	Cornus sericea	Red osier dogwood	Occurs in Rhineland-Palatinate
Meadows			
	Achillea ptarmica	Sneezewort	Occurs in Rhineland-Palatinate
	Alopecurus pratensis	Field Meadow-Foxtail	Occurs in Rhineland-Palatinate
	Angelica sylvestris	Wild Angelica	Occurs in Rhineland-Palatinate
	Briza media	Common quaking grass	Occurs in Rhineland-Palatinate
	Caltha palustris	Marsh-marigold	Occurs in Rhineland-Palatinate
	Cynosurus cristatus	Crested dogtailgrass	Occurs in Rhineland-Palatinate
	Deschampsia cespitosa	Tufted hair grass	Occurs in Rhineland-Palatinate
	Ranunculus acris	Tall buttercup	Occurs in Rhineland-Palatinate
Perennials for rain garden			
	Angelica sylvestris	Wild Angelica	Occurs in Rhineland-Palatinate
	Athyrium filix-femina	Lady fern	Occurs in Rhineland-Palatinate
	Caltha palustris	Marsh-marigold	Occurs in Rhineland-Palatinate
	Dryopteris filix-mas	Male fern	Occurs in Rhineland-Palatinate
	Eupatorium cannabinum	Hemp-agrimony	Occurs in Rhineland-Palatinate
	Filipendula ulmaria	Meadowsweet	Occurs in Rhineland-Palatinate
	Geum rivale	Water avens	Occurs in Rhineland-Palatinate
	Iris pseudacorus	Yellow flag	Occurs in Rhineland-Palatinate

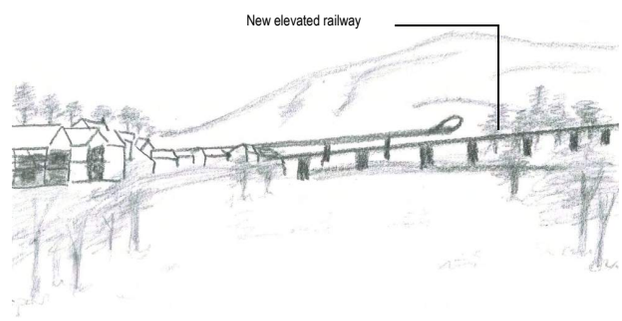


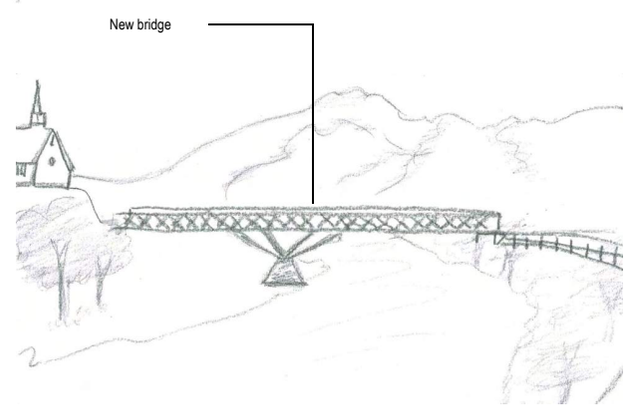
Infrastructure:

Stepping stones in the river work as a functional and recreation element. It will connect different parts of Altenburg and the nearby districts. It can also work as an obstacle that can prevent some of the debris from going downstream during a flood.





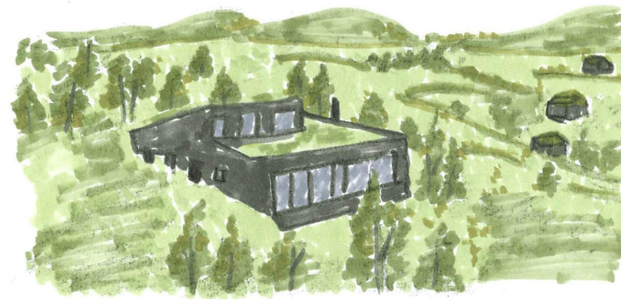


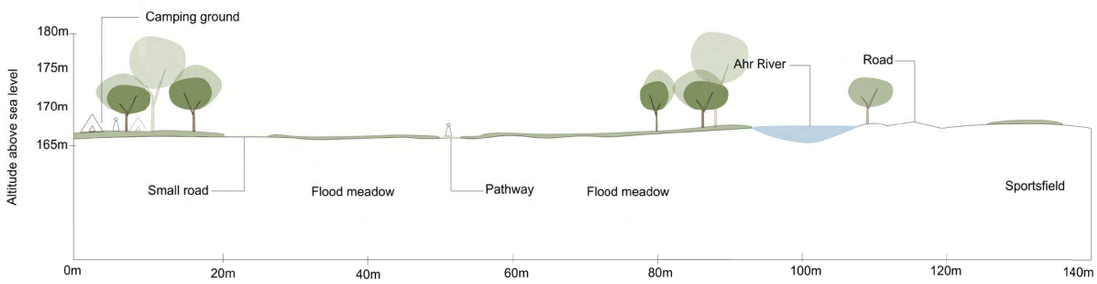


Settlements:

Several houses in the hazard zones were destroyed by the flood, and it is not recommended to rebuild in the hazard zones. A proposed solution is to create new settlements higher up on the hills where new houses can be built with green roofs that can infiltrate the rainwater and minimize runoff. Those who don't want to move, need to have protection elements for their houses. One method is to implement fold-out protection elements in front of the buildings.

Fold-out protection elements





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