

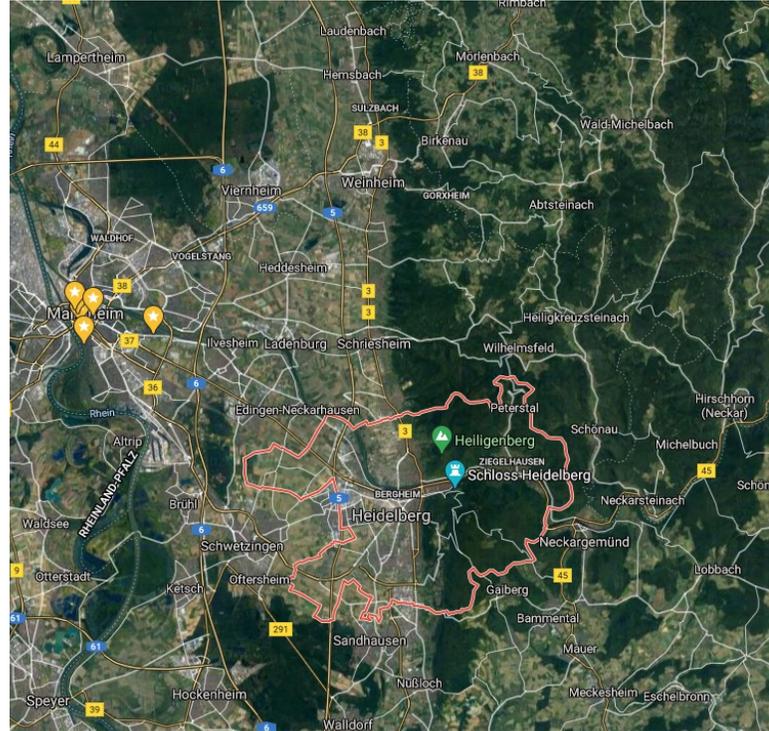
Heidelberg GreenBelt

In 2019, the City of Heidelberg agreed on a Climate Action Plan with 30 points. These include the requirement that future concepts will have to consider climate adaptation and mitigation as well as biodiversity. In this context, areas with a high ecological value have to be designated in community zoning. On a site scale, areas for planting trees as well as a so called „green belt“ on a city scale could be designated with this instrument.

The association of the City of Heidelberg and its neighboring cities, most importantly the City of Mannheim northwest to Heidelberg, have already launched a number of landscape development projects for ecological restoration.

Please note that the term „green belt“ could be confusing and that it has been discussed controversially in different contexts. In the context of this project, the „green belt“ is supposed to integrate ecological and physical landscape characteristics with different land uses (protected natural areas, agriculture, infrastructure, recreation...). Spatial focus of the project is the interim area between the Heidelberg and Mannheim urban areas across administrative and communal boundaries.

Heidelberg location in Rhine valley



Location of the study area

The Rhein-Neckar region is located within the river Rhine flood plains and has shown a high economic growth. In consequence, multiple demands and needs towards the landscape are continuously growing: protection and development of river landscapes, nature protection, recreation and tourism, transport, climate change adaptation and mitigation, as well as urban expansion.



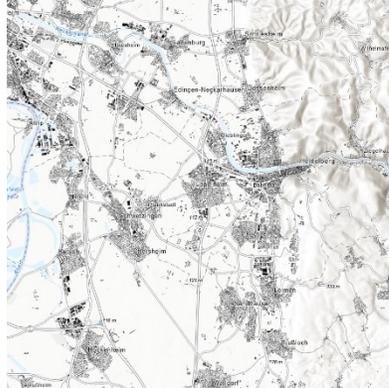
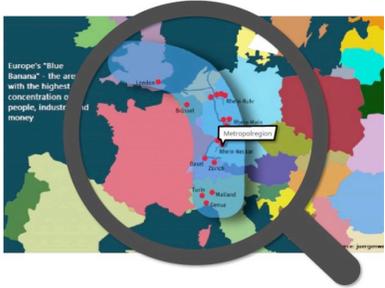
Requirements:

- City claims that designated settlement areas (only high-density / mixed use) are sufficient to increase the population by 15% until 2035
- “Bahnstadt” (Rail City) providing 200ha mixed use for 10.000 ppl living and working
- Access to the river and flood protection
- Accommodation of 12 Mio. tourists pa
- Protection of high quality arable land
- Connectivity of biotopes and habitats
- Green corridors between Mannheim and Heidelberg creating multi-coded green infrastructure
- Reduction of CO2 emissions by 95% until 2050 in comparison to 1990
- Climate: protection of “fresh air” corridors

Innovations:

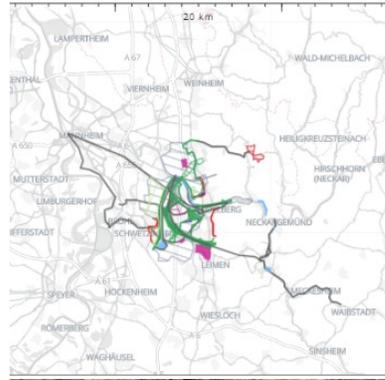
- GRN 4 2035 Linear Vegetated Corridors as Linear Parks
- GRN 7 2035/2050 Connectivity for Resiliency
- GRN 15 2035 Climate Change Adaptation
- IND/COM 1 2035 Industry 4.0
- MIX 1 2035 Mixed Use Development
- MIX 12 2035 Innovation Districts
- MIX 14 2035 Compact Sustainable Neighborhoods
- AGR 1 2035/2050 Organic Agriculture
- AGR 5 2035/2050 Agrotourism
- TRA 2035 4 Passenger Rail Corridors
- TRA 2035 7 Electric Vehicles
- TRA 2035 13 Bikeshares and E-Bikes Redefining Biking

HSWT, Germany

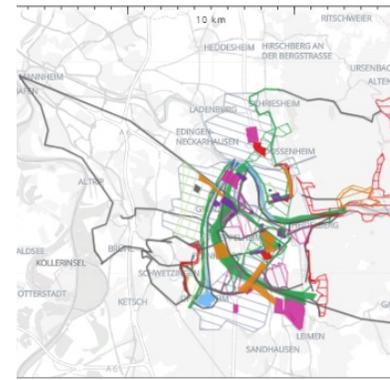


Project location

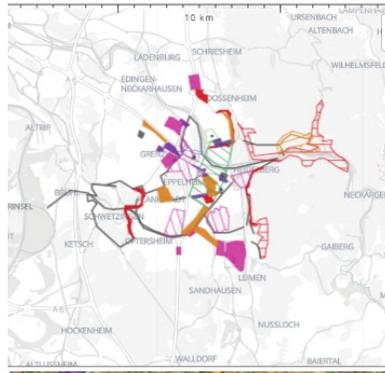
Current 2020



Early adopter 2035



Early adopter 2035



Late adopter 2035

Geodesign systems

- Water infrastructure
- Agriculture
- Green infrastructure
- Energy infrastructure
- Transportation
- Industry, Commerce
- Low density housing
- Mixed, high density
- Institutional
- Historic, Cultural

Heidelberg Green Belt



During the process, two “factions” evolved with the “early adopters” focusing on green infrastructure including tree planting and water landscapes versus the “late adopters” first developing industry, energy, housing and commerce before investing into green infrastructure.

The early adopter scenario 2035 is focusing on multi-coded landscapes overlaying agricultural and recreational uses along a “green belt” zone between Heidelberg and Mannheim. The ecological value of the zone is further increased through tree planting and an artificial lake in the south of the area.

The late adopter scenario 2035 focuses on the development of clean energy, mainly solar pv and biomass, as well as new high tech industries in IT and life sciences. New high density housing areas are also zoned although the City disagreed arguing that the existing housing designations will be sufficient to accommodate the population growth.

Geodesign process

The project followed the general geodesign principles as layed out in Steinitz (2012). However, due to the constraints of the real-world collaboration with the City of Heidelberg some adjustments were necessary:

During the workshop, it was decided to focus on the negotiation process at the cost of the 2050 scenarios due to time constraints. Key stakeholder groups were represented by students in a roleplay, representing business, young people, government and environmental protection. First phase included the preparations of the constraints maps. In the second phase, design diagrams were created using and testing the new geoforage online tool, provided by Hrishu Ballal from www.geodesignhub.com.

After the workshop, a feedback session was conducted identifying recommendations for future workshops, e.g. redefining the role of the evaluation maps and giving more time for the a prior diagrams.

Final Negotiations										
SDG	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0

SDG 2020

Government + Environment										
SDG	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0

Early Adopters 2035

Sustainable Development Goals				
1: No Poverty				
2: Zero Hunger				
3: Good Health and Well-being				
4: Quality Education				
5: Gender Equality				
6: Clean Water and Sanitation				
7: Affordable and Clean Energy				
8: Decent Work and Economic Growth				
9: Industry, Innovation and Infrastructure				
10: Reduced Inequality				
11: Sustainable Cities and Communities				
12: Responsible Consumption and Production				
13: Climate Action				
14: Life Below Water				
15: Life on Land				
16: Peace and Justice Strong Institutions				
17: Partnerships to achieve the Goal				
Most benefit	Benefit	Neutral	Detriment	Most detriment
3	1	0	-1	-3

Late Adopters 2035

Business + Young People										
SDG	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0

Final Negotiations										
SDG	WAT	AGR	GRN	ENE	TRAN	IND	INST	RES	flex	flex
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0

Negotiated design

Early adopter SDG

First of all, it should be noted that Heidelberg is already well on track fulfilling most of the SDG goals. However, prosperity and growth are likely to increase the competition for the few remaining open spaces. Therefore, the early adopter group (environmentalists and government) focus on the protection of natural resources and multi-coded blue-green infrastructure including tree planting such as SDGs 7, 11, 13 and 15.

Late adopter SDG

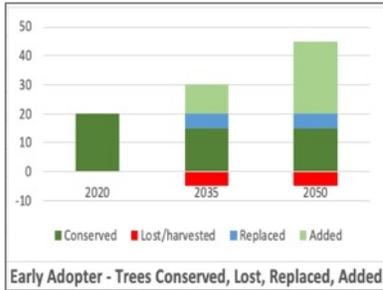
The late adopter group (business and young people) first emphasized the further development of clean energy, affordable housing, environmentally benign transport and high tech industries (SDGs 7, 9, 11, 12) instead of environmental protection through the designation of protected areas. Climate action is included here too and there were arguments across the group of young people regarding the prioritization of sustainable growth versus ecology.

Negotiated design SDG

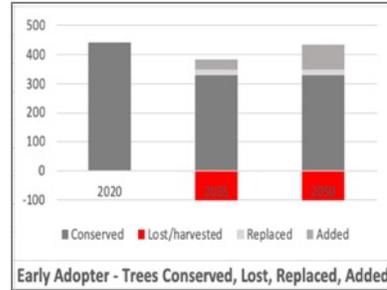
Since Heidelberg is starting from a high level fulfilling most the SDGs and there was considerable overlap between the early and late adopters. Therefore, the assessment of the final negotiations is rather beneficial.

Project-level assessment

Project tree numbers

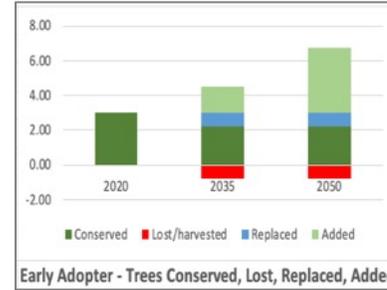


Project carbon capture

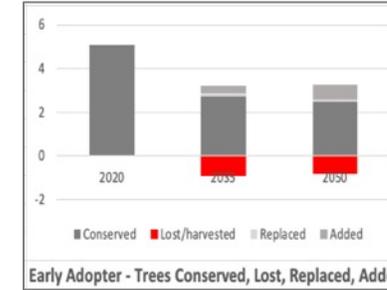


National-level assessment

National scale trees

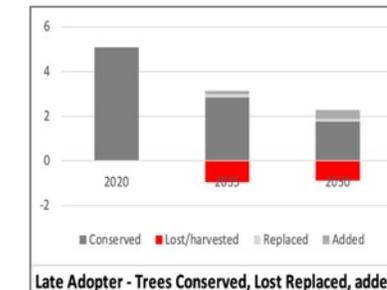
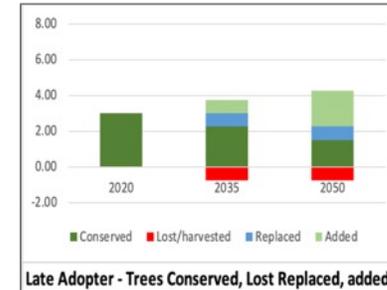
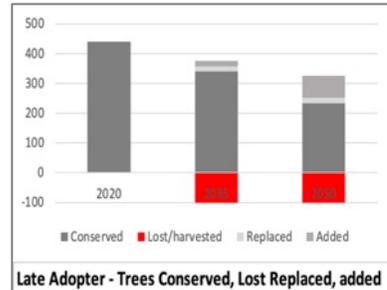
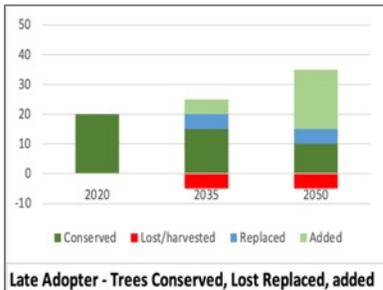


Carbon per capita



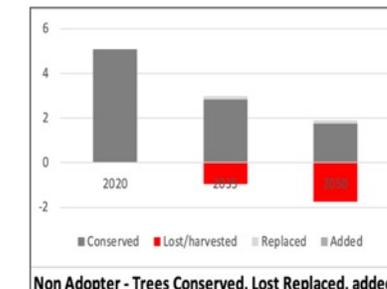
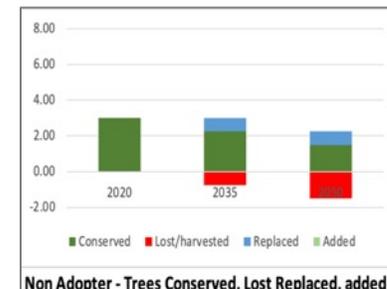
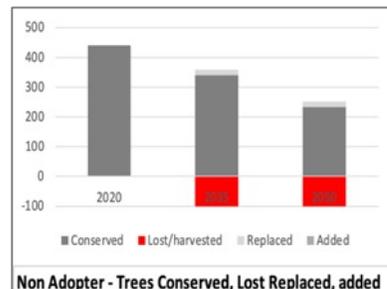
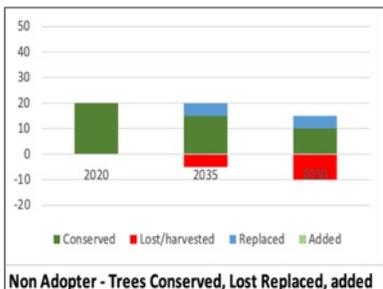
It was not possible to assess the tree planting and carbon sequestration per capita on a project-level, let alone national level, in any scientifically sound way. However, some numbers at national level to provide at least some context:

Early adopter scenario



- 11,4 Mio. ha or 32% of Germany are covered by forest, i.e. about 90 billion trees
- Baden-Württemberg, the province of the case study area is covered by 38% forest
- Forest areas have increased by 0,4% or 50.000 ha since 2010.

Late adopter scenario



Main challenges in forestry are climate change, droughts and in consequence high losses through mountain pine beetle and storms. Therefore, forest planing is mainly the replacement of forest stands with more resilient species.

Non adopter scenario

Restorative landscape

Today's restorative landscapes are a growing trend related to health and sustainable environments in cities. In restorative landscapes, the main focus is on the relief of stress, mental health and enhancing overall well-being of the community. In Heidelberg, due to its well-known hospitals and the extraordinary nature, the development of restorative landscapes is recommended.

These landscapes can be implemented in the form of various recreational and restorative places such as **Botanical gardens**, **Sensorial garden**, **Medicinal plants gardens** and **Garden therapy parks**, in which people can have different experiences in order to maintain mental health and enjoy nature. Conditions in the river basin of Heidelberg provide suitable conditions for planting a variety of plants for the development of restorative landscapes in this region.



Meadow Orchards

While a garden is known as an outdoor area containing many types of plants, usually for food or ornamental purposes, an orchard is an area of land for the cultivation of fruit or nut trees. Traditionally, orchards were planted at low densities of 100 to 200 trees per ha. The German word “**Streuo Obstwiese**” can be translated as meadow orchard and describes the area, where fruit trees are planted. It is an extensive form of cultivation and it’s including around 3.000 different types of fruit. In addition to the nutritional benefits, urban vegetation in orchards increases the property values, improve privacy and provide also many environmental benefits.

They sequester carbon dioxide, produce oxygen, reduce pollution and provide a habitat for more than 5.000 animal and plant species. Furthermore, a meadow orchard has some benefits for the community and the interaction: it is a neighborhood green space, which provides the opportunity for community gardening, gatherings and engagement. People can work together, harvest and enjoy the fruits, herbs and vegetables.



Man-made water landscapes

Man-made **artificial lakes** are important water sources in many countries around the world. The stored water can be used for irrigation, drinking water or to produce energy. Artificial lakes have great advantages such as:

- Quick and easy access to a water source
- Provision of drinking water
- Increased protection from flooding events
- Increased potential for sustained agricultural irrigation
- Production of energy (hydropower)
- Storage of water for use during low-flow periods
- Increased fishery possibilities
- Ecological habitats



Canals are also artificial waterways constructed for irrigation, drainage, river overflows, water supplies, communications, and navigation, or in connection with power generation from hydroelectric dams/artificial lakes. They also have great advantages which mostly are similar to an artificial lake as below:

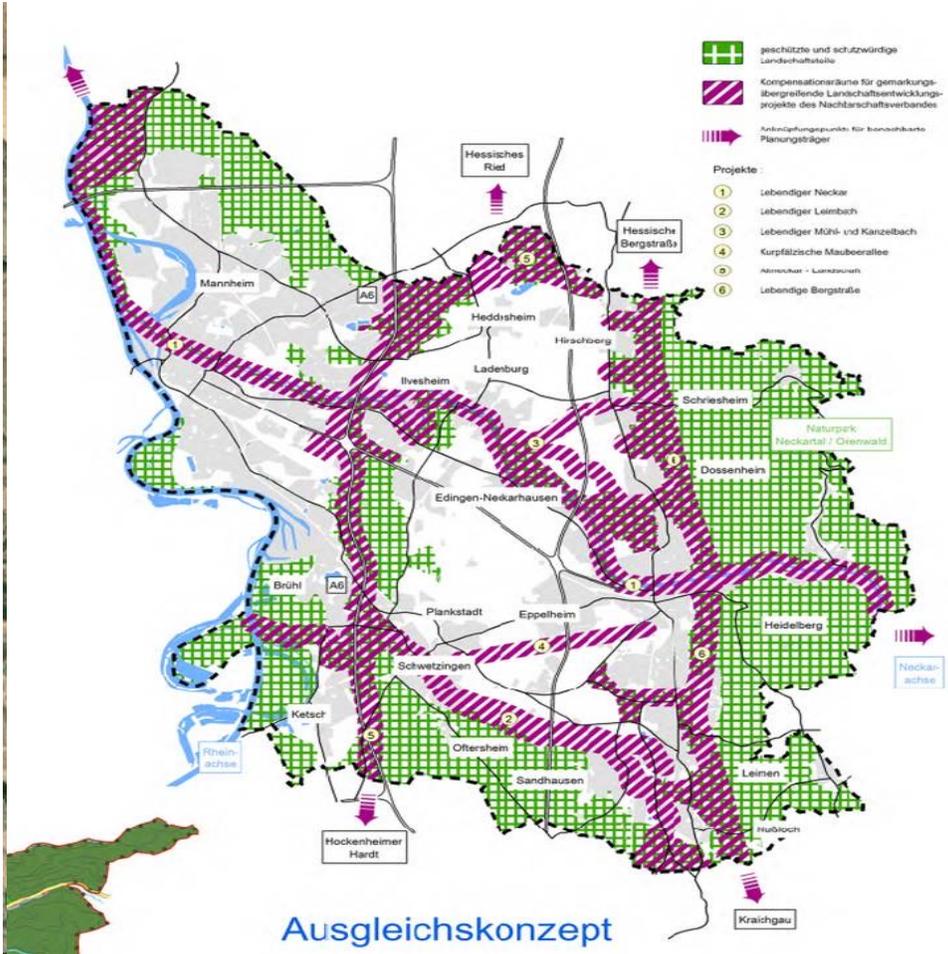
- Un-irrigated wastelands can be developed by canal irrigation, which would increase the quantity of biomass in the area.
- Economic development can be expedited by avoiding dangerous droughts.
- Canals are fed by rain water received by rivers, and the water is used for irrigation. Production of crops needing more water, such as the green belt with fruit trees which has been proposed next to the canal is also possible through canals. As compared to un-irrigated soils, higher productivity per hectare is also possible due to canals.
- Canals are multi-purpose where apart from irrigation hydro electricity generation, navigation, drinking water supply and fishery development is also done.
- Canals are also becoming a source of tourist attraction these days.

Project participants

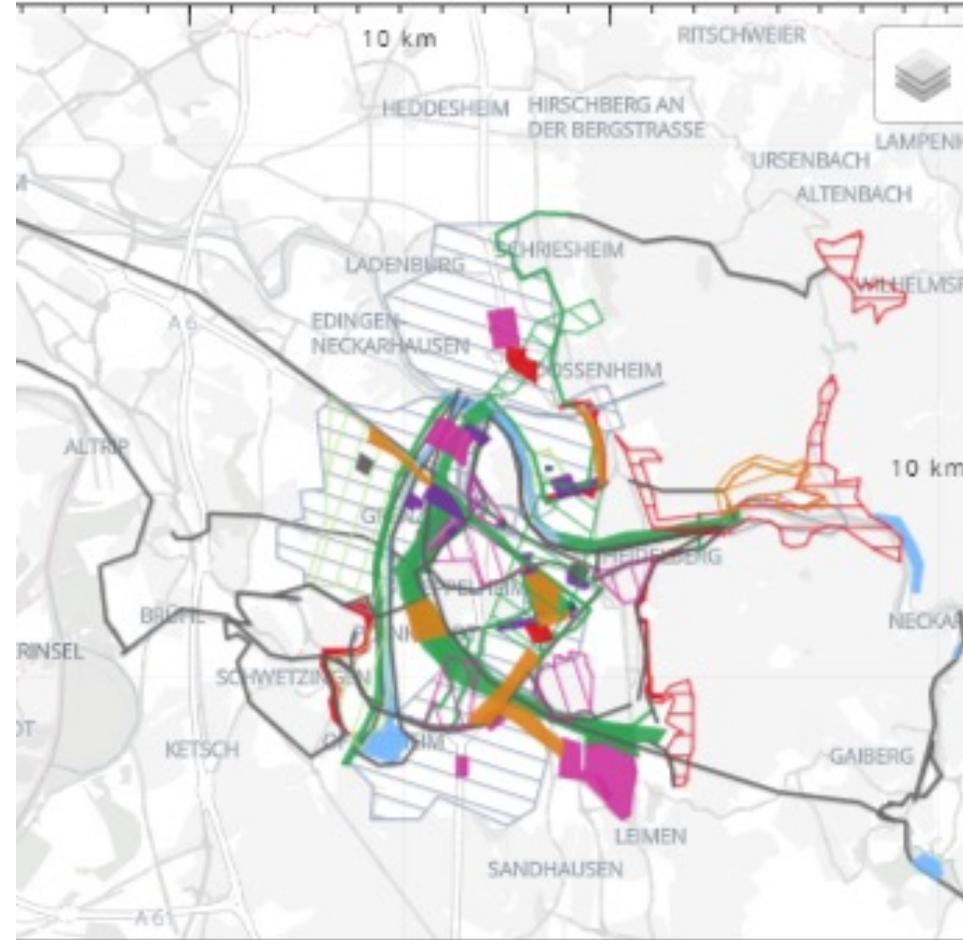
- Students: Stewardson-Blackwell Ethan, Nik Raftar Pegah, Hormozi Athena, Samani Ghodsieh, Shchalkunova Anastasiya, Shayestehpour Taha, Kadić Aida, Kiso Naida, Pandit Tejashree, Maksoud Paul, Morris Karen, El Khoury Rachelle, Miller Luke, Lallouche Imad eddine, Louka Marco Adel Helmi, Elsherif Mahmoud Mohamed Ibrahim, Murugan Kanimozhi, Prianka Zareen Kashfee, Afroze Farhana, Zubair Amal, Pichler Theresa, A.P, Krishna, Beladiya Sachinkumar, Dash Simanta, Niloy Robaet, Halimi Feryal, Uttur Arati, Samsatli Tamer, Draghici Bogdan, Egorova Alena, De Weert Sonja, Namvarrad Niusha, Begum Noorjahan, Biabani Haniyeh, Fernando Dasith
- City of Heidelberg: Planning Department, Ulrike Lohe and colleagues
- Educators: Olaf Schroth, Hrishi Ballal

Supporting material

- Funding sources
 - ERASMUS+
- Sources of data
 - U. Lohe (2020). Auswahl von Grundlagen. City of Heidelberg, Planning Department und Planungsgruppe Nachbarschaftsverband HD MA.
 - City of Heidelberg, Planning Department und Planungsgruppe Nachbarschaftsverband HD MA (2020). Flächennutzungsplan.
 - City of Heidelberg, Planning Department und Planungsgruppe Nachbarschaftsverband HD MA (2018). Landschaftsplan.
 - Schutzgemeinschaft Deutscher Wald (2020).
- Key software used:
 - www.geodesignhub.com
 - www.geoforage.io
 - ESRI ArcGIS Desktop
 - QGIS



Current 2020 situation



Negotiated plan

Important features in negotiated or recommended plan: Core part of the concept is a multicoded blue-green belt corridor separating the City of Heidelberg from the urban agglomeration of Mannheim in the West.