

7 Incorporation of Environmental Goals in Regulations in a Legally Binding Land-Use Plan in Iran

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In the course of sustainable urban planning for the Shahre Javan Community pilot area subdivision of the Iranian New Town Hashtgerd, the regulations for the consideration of environmental and nature conservation concerns in the binding land-use plan (cp. Chapter IV 7) are geared towards the legal possibilities represented in the German Federal Building Code (BauGB §9).

The binding land-use plan of Hashtgerd offers justification and explanation of the following goals:

1. Saving water and protection of water resources (saving of drinking water, reuse of graywater, groundwater recharge),
2. Carbon-binding for climate change mitigation,
3. Sufficient supply of public green space in vicinity of residential areas.

7.1 Saving Water and Protection of Water Resources

General assumption: The protection and recharging of groundwater are priorities given the region's semi-arid climate and constantly decreasing groundwater level. Therefore, reducing water consumption and recharging groundwater should be a focus of sustainable planning.

Expert Background:

a) *Graywater recycling by constructed wetlands*

To facilitate the reuse of graywater (shower, sink water, etc.) from surrounding private households, constructed wetlands must be designated and regulated. After the graywater has been purified in the constructed wetlands, it can be reused for the irrigation of public and private, green and open spaces. The use of drinking water for irrigation is prohibited, making the goal to use solely

and leaving the constructed wetlands will need to be measured, recorded, and regulated with water meters to allow for continuous monitoring tracked by a balance sheet. Cleaned surplus graywater from the constructed wetlands which is not needed for irrigation is used to recharge the groundwater. Groundwater infiltration will be decentralized, with water meters automatically registering the amount to allow for calculating total groundwater recharge by day, month, and year.

b) *Water saving maintenance activities*

Irrigation of public green spaces will use mandatory water saving irrigation techniques, such as drip or underground irrigation. Public green spaces will be planted with native and climate adapted (low water consumption) plants—the selection of plants will be regulated by the planting list. Continual maintenance is obligatory, including documentation (in order to adapt the maintenance/irrigation if necessary) and the replacement of dead plants.

c) *Designation of rainwater infiltration areas*

Since 286,499 m² of the project's surface area will be sealed, areas for surface water infiltration will be provided in order to sufficiently mitigate the environmental impact of the urban development project. Erosion from surface water run-off must be avoided, especially on hillside areas. Thus, infiltration areas will be built both above and below hillside edges. Major rainfall run-off will be collected in these areas and funneled to groundwater infiltration points.

graywater for green and open spaces. The constructed wetlands are spread throughout the area, taking advantage of a decentralized design in order to reduce the energy required for pumping. The dimension of each wetland area depends on the population within the catchment area, with 1 m² of wetland per capita. Thus 8,000 citizens will require 8,000 m² of constructed wetland—excluding the area required for technical infrastructure. All water entering

Exemplary regulations for constructed wetlands in a legally binding land-use plan:

Constructed wetlands for graywater treatment need to be closed systems within the designated areas. The basin area should be planted with plants from the following list:

- Iris pseudacorus,
- Juncus ensifolius,

- *Scirpus lacustris*,
- *Typha minima*.

The areas required for technical infrastructure must be planted with shrubs and perennials according to the list of pre-selected plants. Irrigation is permitted only during the establishing phase and only if required. The amount of water flowing into the constructed wetlands will be measured and recorded by water meters at the entrance to the purification tank. Further water meters quantify and record the amount of water required for irrigation, as well as the remaining water used for infiltration.

Note: The planting distance in such a regulation accounts for ca. 30 cm for perennials and between 1.5 and 3.0 m for shrubs. These distances vary depending on the plant size, quality, and the local conditions.

7.2 Carbon Binding for Climate Change Mitigation

General assumption: Decreasing atmospheric carbon dioxide is an important part of climate change mitigation. Thus, increasing the carbon-binding capacity of landscapes in semi-arid regions should be a focus of sustainable planning.

Expert Background:

a) Designating carbon binding areas

Extensive “greening” with native plants (heat adapted and low water consumption) would significantly increase carbon-binding capacity in urban landscapes, in both the vegetation and soil (Batjes 1999, p. 5). Due to the water scarcity in the region of Hashtgerd, it is not possible to use plants with high water needs, even if they can bind more carbon than drought tolerant plants requiring less water. Water availability significantly affects the amount of organic matter plants can create. In the semi-arid climate of the project area, the accumulation of organic plant material—and hence the extent of carbon sequestration—is limited due to low precipitation.

- It is assumed 2.6 tons of carbon can be fixed per ha within 5 years,
- 14.3 t/ha after 20 years,
- 20.9 t/ha after 50 years,
- 29.7 t/ha after 100 years (calculations based on UNPD 2003).

In absolute terms, the potential carbon sequestration in the project area is—in comparison to humid climates—rather low. Nevertheless, this amount is still a positive achievement as compared to levels before the project, the targeted planting of adapted vegetation significantly increases carbon sequestration. It is a complementary measure to reduce the CO₂-content in the atmosphere.

b) Additional beneficial aspects

Multiple nature conservation aims can be achieved at once by combining the designation of areas for carbon-binding and unsealed soils. An extensive planting effort can also be combined with efforts to prevent soil erosion and associated dust generation. Unsealed soil allows for rainwater infiltration and the evaporation of soil humidity, while simultaneously serving as potential habitat for a multitude of plants and animals. Thus, these areas are designated as “areas for protection, maintenance, and development of the natural environment”.

Note: The project area is small in terms of global climate events, and thus, mitigation impact will also be small. However, these regions could be established as demonstration areas, where vocational, professional, and student training, as well as courses for environmental education can take place.

Exemplary regulations for carbon binding areas in a legally binding land-use plan:

- Planting according to the list of pre-selected plants.
- The irrigation of plants will take place only during the establishment phase and only if required.

Note: The planting distance in such a regulation accounts for between 1.5 and 3.0 m for shrubs. The distances vary depending on the plant size, quality, and the local conditions.

7.3 A Minimum Supply of Public Green and Open Space Near Residential Areas

General assumption: Ensure a minimum of 7 m² of public green and open space per capita. The legally binding land-use plan might not provide enough public green and open space within its territorial scope, which could potentially be compensated by areas within a nearby valley to the east.

Expert Background:

a) Quantitative and qualitative criteria

In order to guarantee abundant recreation opportunities in the vicinity of residential areas, public green and open spaces were designated as absolutely necessary in the Shahre Javan Community

pilot area. The 7 m² per inhabitant requirement is drawn from Iranian and German default values for the provision of public green and open space. With a planned population of 8,000 inhabitants, about 56,000 m² of public green and open space will be needed. The minimum size of a single green space is 0.5 ha, with a minimum width of 15 m. The catchment area of the public green and open spaces should have a maximum radius of 500 m. Further, these public green

and open spaces may not be crossed by roads. To allow all population groups (e.g. senior citizens, disabled people, and toddlers) equal access to recreation opportunities, the areas must not be too steeply inclined. The major central park is not sufficient to meet the recreation demand of the residential areas. With an approximate area of 35,098 m², the park would supply only 4.38 m² of public green and open space per capita. To meet the additional demand of at least 20,902 m², the eastern adjacent valley will be designated as a public green and open space providing an additional 65,377 m² (cp. VI 8). The planned eastern street will need to be relocated to allow for this. Altogether, a maximum per-capita value of 12.56 m² is possible, assuming suitability of the additional areas. However, if this possibility should not seem feasible, the necessary amount of green space must be designated within Hashtgerd New Town and in the vicinity of the Shahre Javan Community pilot area.

b) Sustainability of the public green and open spaces

Large lawns or many trees with expansive canopies would not be sustainable. Landscaping should use plants adapted to the climate and prioritize water saving measures. When planning the choice, quantity, and placement of vegetation, not only the semi-arid climate conditions and the shortage of water must be considered, but also relevant

Exemplary regulations for public green and open spaces in a legally binding land-use plan:

- Only native and climate-adapted plants may be used from the pre-selected list.
- The use of drinking water for irrigation is prohibited. Irrigation water must be sourced from the graywater network of the constructed wetlands. The maximum daily withdrawal amount is limited and will be recorded and regulated by water meters (as part of balancing the graywater cycle).
- Water saving irrigation techniques (drip or underground irrigation) are mandatory.
- Continual maintenance (e.g. irrigation, replacement of dead plants) is required, as well as its documentation in order to continually improve the maintenance regime.
- Fountains and water basins must be fed with treated graywater (equipped with water meters for monitoring purposes).

7.4 Spatial Designation of the Regulations in the Binding Land-Use Plan

The exemplary regulations have been applied to public spaces in the Shahre Javan Community pilot area of Hashtgerd New Town. Shown below are examples of a designation plan from the binding land-use plan for the area.



Fig. 137: Exemplary regulations for public green and open spaces related to the above mentioned topics (1. Saving water, 2. Carbon-binding, 3. Supply of public green and open spaces)

economic, ecological, and social needs. When designating green and open spaces, both the regulations and the expert background explained in sections 7.1 and 7.2 above must be considered.

7.5 Conclusion

The explanations given here are intended to give an impression of the German planning and building legislation's (BauGB) scope of action for implementing environmental goals. They should show that it is possible to provide explicit and legally binding designations for green and open spaces in legally binding land-use plans to ensure sufficient areas for recreation and to secure the protection, maintenance, and development of

the natural environment. Regulations for protecting the environment within a legally binding land-use plan require a regulatory depth and degree of precision like that in the German planning and building legislation (BauGB). Hopefully these examples will inspire the development of a legal foundation for environmental protection concerns in the Iranian juridical system.