

How was the Green Infrastructure Manual created?

Between 2014 and 2016, the **Border Environment Cooperation Commission (BECC)** organized 3 large technical exchange forums to identify opportunities and pathways towards urban sustainability. Participating leaders, institutions and experts from border cities and regions of the United States and Mexico, including Hermosillo, recognised Green Infrastructure as an innovative approach to sustainability. In response, special actions to strengthen its implementation were carried out, including training workshops and the creation of inter-institutional networks to support the implementation of Green Infrastructure public policy in the border region of the United States and Mexico. The production of the **Green Infrastructure Manual** was part of a joint effort by BECC and the North American Development Bank (NADB), and IMPLAN Hermosillo was charged of its elaboration.

The development of green infrastructure in Hermosillo took off from urban planning instruments: Green Infrastructure regulations were identified and developed. Training workshop, pilot interventions and design guidelines helped to incorporate them into urban practices.



What is Green Infrastructure?

Green infrastructure (GI) are those constructions of active and passive systems, which use living and natural systems to provide environmental services, such as containing, cleaning, and filtering rainwater, creating habitats for wildlife, providing shade and cooling streets and buildings, among others (BECC 2017).



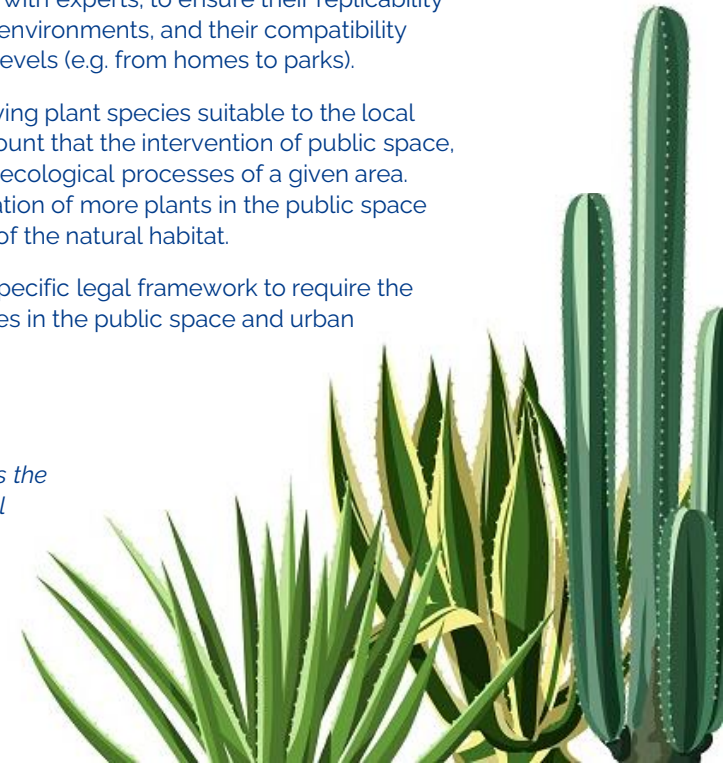
The framework of the Green Infrastructure Manual: Goal

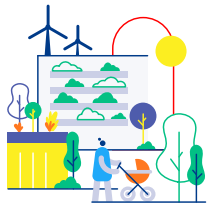
The manual intends to connect Green Infrastructure with strategic planning, participatory management, and adaptation to local ecosystem conditions. It is not only aimed at the public government. It also seeks to transfer basic knowledge for GI implementation at the local and micro urban scale by upskilling local communities for ecological, structural, and visual landscape and greenspace interventions in accordance to local regulations. To achieve this goal, four steps were set:

- 1 Strategic Planning.** Identifying best practices, and the existing provisions of local regulations related to GI and the preservation of green public space, including normative urban planning documents and applicable laws.
- 2 Participatory management.** Analysing the applicability of the proposed GI methods and best practices with experts, to ensure their replicability at different levels, scopes and environments, and their compatibility with different spatial planning levels (e.g. from homes to parks).
- 3 Ecosystem conditions.** Identifying plant species suitable to the local conditions, and taking into account that the intervention of public space, has a significant impact on the ecological processes of a given area. Equally important is the integration of more plants in the public space and ensuring the preservation of the natural habitat.
- 4 Legal framework.** Creating a specific legal framework to require the implementation of GI techniques in the public space and urban development.



Click in the picture to access the Green Infrastructure Manual





What is the Green Infrastructure Manual for?

The Green Infrastructure Manual is a guide for the design and decision making in the incorporation of Green Infrastructure in the public space. It provides guidelines for micro-scale Green Infrastructure design, the fundamentals of a macro-scale Green Infrastructure application methodology and general recommendations to implement it within the local legal and planning frameworks.

MICRO SCALE SCOPE

Developing GI technical design specifications according to the road categories, built environments and urbanization of the areas where it is incorporated.

- 1 Public and private roads: flowerbeds, medians, roundabouts, parking lots and permeable areas linked to the roads.
- 2 Green Areas: Parks, public and private gardens, sports, and public infrastructure.
- 3 Residential environments and urbanization: Gardens, green roofs, green walls, permeable areas.

MACRO SCALE SCOPE

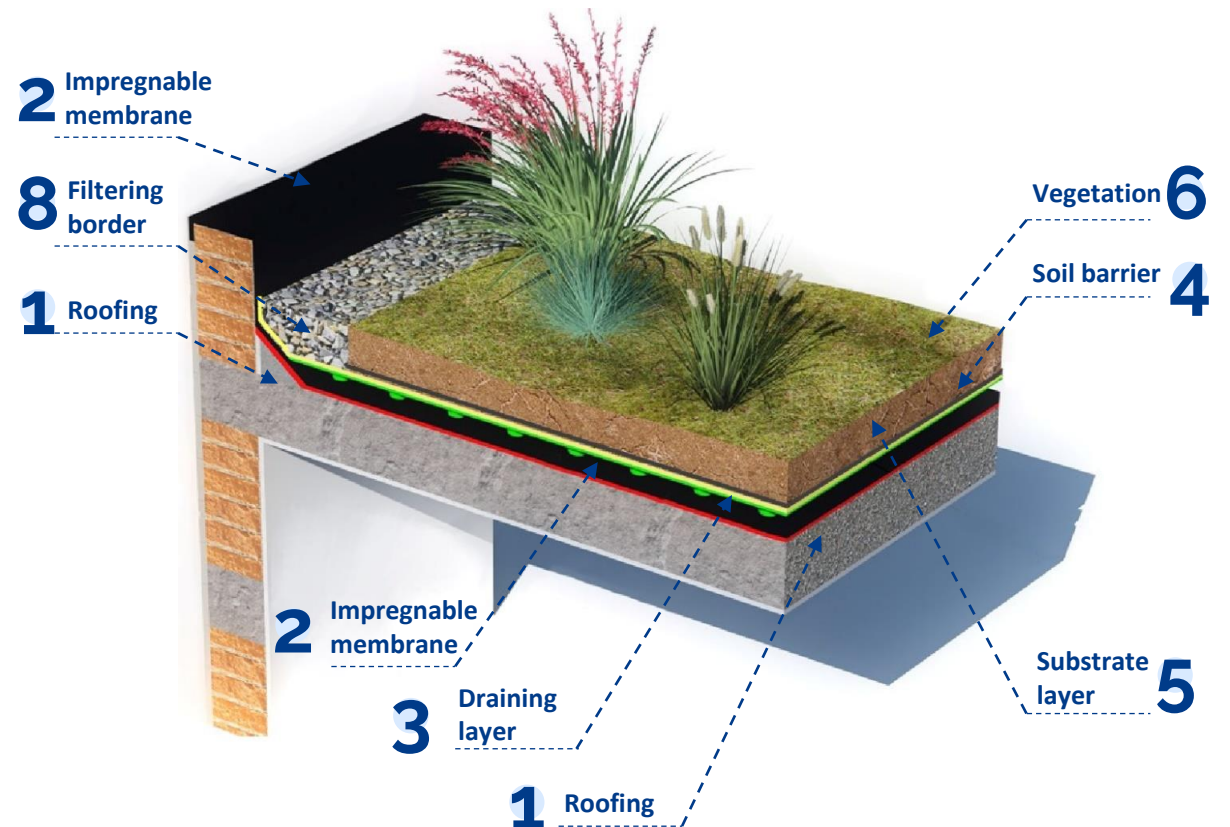
Macro-scale scope: Establishing the fundamentals to assist the design and planning at city scale through strategic planning, participatory management, and adaptation to local ecosystem conditions.

- 1 Urban basins and sub-basins
- 2 Intra-urban Hydrological Elements: Rivers, streams, canals, embankments, conservation areas, biological corridors, protected natural areas, flood zones.

Green Infrastructure Micro-Scale techniques

Green roofs specifications

1. **Roofing:** A roof structure that supports the weight of the system (min. 78 kg/m²) and a slope of min. 2% with a water evacuation system. Dimensions depend on the area.
2. **Impregnable membrane:** Required for long-term performance. Dimensions depend on the area.
3. **Draining layer:** Required to evacuate water and protect both vegetation & building. 25% of minimum porosity & 02 cm of minimum thickness.
4. **Soil barrier:** Prevents clogging of the draining layer. 02 cm of minimum thickness.
5. **Substrate layer:** Required to retain water and nourish the vegetation. 10 cm of minimum thickness. If 20 cm of maximum thickness, extensive, if 20 cm, of minimum thickness, intensive.
6. **Vegetation:** Extensive: Creeping succulents (desert). Intensive: Can house shrubs and trees. Surface depends on the area.
7. **Drainage system:** Required to drain the water from the building. 10 cm of minimum diameter.
8. **Filtering border:** Required to improve water draining. 20 cm of minimum thickness.

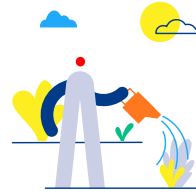


Botanical Catalogue Of Hermosillo

The "Botanical catalogue of Hermosillo" was produced to subject GI interventions to the use of plants suitable for the local climate and help the conservation of native flora and fauna whilst considering climate conditions such as drought or high temperatures. The catalogue provides information about the type of species, uses, water and sunlight requirements, among other characteristics.

The NGO Caminantes del Desierto ("Desert Walkers"), established in 2017, had been implementing the guidelines of the GI Manual and Botanical Catalogue, in close collaboration with the Municipality of Hermosillo. Their projects involve harvesting rainwater and promoting pollinating gardens in public spaces like Panteón Yañez. These projects emphasize the use of native plants adapted to local conditions, particularly water requirements.

Lessons Learned & Recommendations



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- 1 The guidelines of the IG manual must be incorporated into urban design standards and local regulations, thus ensuring its implementation in the long term. This requires strong political support, stakeholder engagement and communication.
- 2 NGOs and community groups are great allies who can implement the guidelines provided by the IG Manual, showcasing its benefits.
- 3 Producing an IG manual requires experimented staff with knowledge of local conditions and existing system. Local vegetation adapted to the environment must be promoted.
- 4 Once included within the local regulations, both the GI manual and the Botanical Catalogue, proved useful in creating public space according to ecological needs, and allow for the assessment of co-benefits on this field, such as the exploration of future urban growth scenarios, the analysis of composition and configuration of land cover, the management of urban heat islands and the examination of the relationship between urban spatial structure, air quality and noise pollution, among others.

Green Infrastructure techniques are classified accordingly to their purpose

Active Systems:

Require external inputs for their maintenance and operation (energy, work, materials) after having been installed or built.

Passive Systems:

Require external inputs only for their maintenance (pruning, irrigation for a defined time, cleaning) once they have been installed or built