

Integrated Action Framework

Towards a safe and climate-adaptive
Maasterras, Dordrecht



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A

Overview & Strategy

This document identifies new joint perspectives and strategies that are translated into smart and integrated requirements to support the development of the Maasterras as a safe and climate-adaptive shelter area.

The content is a result of an evidence-based and exploratory interdisciplinary knowledge integration effort that combines a wide range of disciplinary expertise and captures new integrated and innovative perspectives.

The summarized requirements and strategies defined below reflect an integration of expert knowledge and experience predominantly in electrical energy, water, sanitation, flood safety, crowd management, and disaster resilience.

For the purpose of this document, the strategies and requirements aim to outline the smart and integrated actions that can be easily adopted and secured.

A1 Context

In recent years, the Maasterras has emerged as a focal point for the development of new green and sustainable housing and working areas. Positioned between the railway toward Zwijndrecht, Oude Maas, and the A16, the Maasterras holds a strategic location. In 2021, the architecture firm Mecanoo developed a vision for this area as part of a larger plan for the Spoorzone of Dordrecht in 2040, which includes a project for two to four thousand homes and supporting facilities.

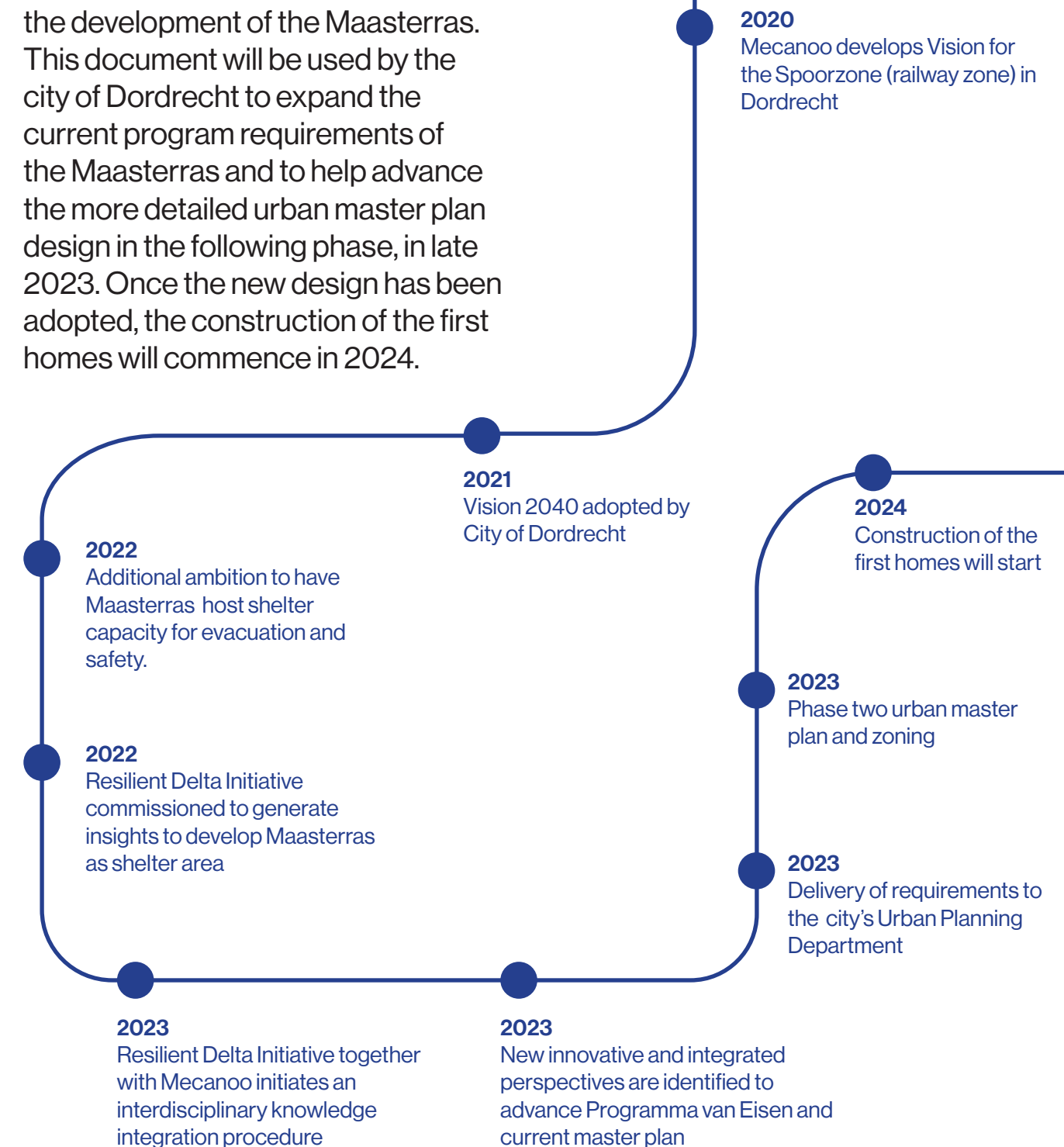
Shortly after, the city of Dordrecht recognized the potential for the Maasterras to function as a shelter area during extreme weather events, such as flooding. Since the majority of the city of Dordrecht is below sea level and prone to flooding, the city aims to ensure access to shelter areas for evacuation and safety during high-risk climate events. The Maasterras is one of the few areas in the city that is on relatively higher ground and would serve as an ideal location for shelter

and evacuation for a portion of the city's residents.

With the additional ambition of a shelter area, the Resilient Delta Initiative was commissioned to bring in the latest academic expertise and insights to create additional program and development requirements for the Maasterras that are innovative and interdisciplinary. To achieve this, the aim was to integrate a wider range of disciplinary expertise through a series of iterative and explorative knowledge and design workshops. The intended outcome was to foster new insights for the city to incorporate into the current Programma van Eisen (program requirements) and to strengthen the current master plan design of the Maasterras led by Mecanoo.

The insights and results that were generated during the knowledge workshops and integration procedure are articulated in this document to serve the city of Dordrecht, Mecanoo, and any other interested parties in

the development of the Maasterras. This document will be used by the city of Dordrecht to expand the current program requirements of the Maasterras and to help advance the more detailed urban master plan design in the following phase, in late 2023. Once the new design has been adopted, the construction of the first homes will commence in 2024.



A2 Summary of Requirements

The program requirements aim to translate integrated and innovative perspectives from expert knowledge into action. The requirements range from interdisciplinary to more disciplinary actions, to enable the development of the Maasterras as a safe and climate-adaptive living and working area. The specificity of the requirements helps to achieve the goal incrementally and integratively, embodying six strategic principles at different scales. The diverse range of program requirements is meant to guide the transformation of the Maasterras and build upon the core development criteria defined by the City of Dordrecht. A total of fifty-one highly specific requirements have been developed (see Annex) of which nineteen are co-identified with the City of Dordrecht that are critical for the Maasterras in enabling development towards a safe and climate-adaptive Maasterras. The program requirements are divided across three integrated domains and reflect a wider range of expertise, related to the safe and climate-adaptive development of the Maasterras. The following is a summary of the type of program requirements within each integrated domain.

Utilities and Service Distribution	Built Environment, Urban Design, Public Space and Landscape	Accessibility, Crowd Management and Communication
1.1 Develop an autonomous micro-grid system in all critical buildings	2.1 Integrate nature-based water management techniques in urban, public spaces, and landscape design	3.1 Connect buildings through second-floor terraces or multi-functional roof gardens
1.2 Dimension batteries and generators according to demand	2.2 Include a helicopter landing pad on at least one building roof within each block	3.2 Create a cohesive visual identity for main routes into the Maasterras using street furniture, lighting, materials, and vegetation
1.3 Install flanged electricity connections on exterior of all public and residential buildings above ground level	2.3 Reduce obstructions in movement by minimising major elevation changes in the public realm	3.3 Ensure wide cardinal and principal street layouts
1.4 Implement above-ground level placement of emergency isolated sewage treatment systems	2.4 Use streets and the road network as dikes from adjacent low-lying block levels	3.4 Establish multi-functional and raised public pavilions at main entry points into the Maasterras
1.5 Separate building black/waste water and convey concentrated pollutants and pathogens to a nearby treatment unit	2.5 Design multi-level and multi-functional inner public spaces, including storage, logistic access points, and above-ground level access to buildings	3.5 Integrate public space, art, landscape design, and recreation along the waterfront, inner public spaces, and public parks
1.6 Place primary electrical system/grid components and mechanical systems above ground at the building level		3.6 Integrate public space, art, landscape design, and recreation along the waterfront, inner public spaces, and public parks
1.7 Separate lower and upper building water systems		3.7 Implement adaptive docking and quay structures that adjust to changing water levels

A3

The program requirements, strategic principles, thematic areas, and integrated domains were developed within the scope of an interdisciplinary knowledge integration process that was informed by academic and professional expertise. The process of knowledge production in this format was explorative and iterative, such as the refinement and increasing clarity of aims and objectives throughout



the process. The explorative and accelerated nature of this process relied significantly of individual integration capacity which is subjective in nature. Therefore the scientific accuracy of the knowledge produced is not guaranteed or significantly substantiated due to a short timeline, appropriation of scientific contribution, and assumptions made throughout the process.

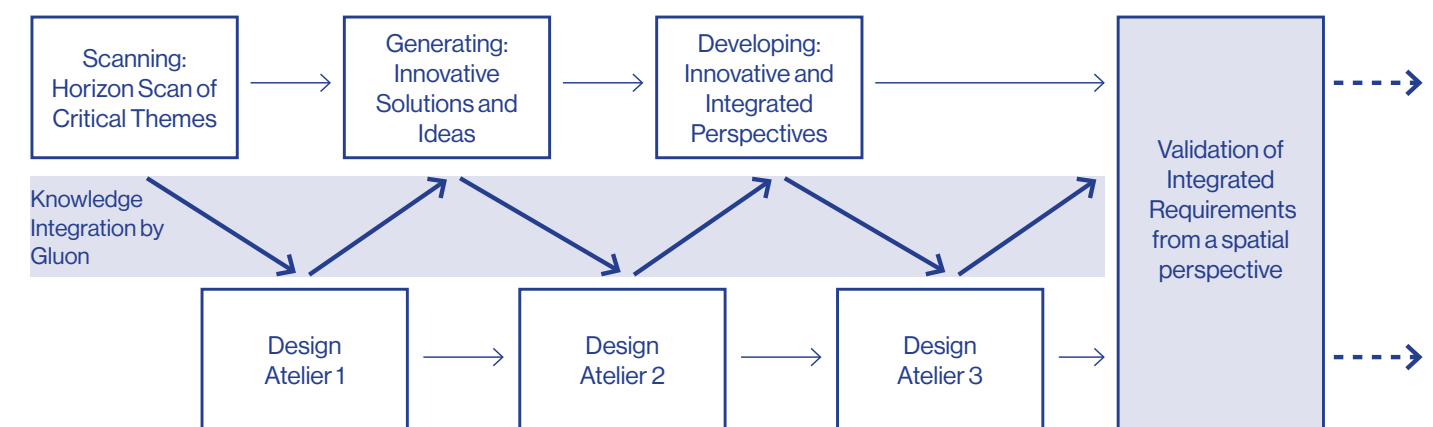
Knowledge integration is a cyclical process of digesting, synthesizing, iterating and reflecting. In this way, natural progression and digressions of certain themes and topics occurred. Therefore certain themes and expertise were not further explored such as social inclusion, citizen preparedness, finance, governance, and economy. This was mainly due to disciplinary biases and limited attention given to these topics during the knowledge and design workshops. Additionally, the demand for smart and practical solutions that were cost-effective influenced the development

of the program requirements which deemed certain innovations such as resource recovery and urban microgrids less attractive due to high investment. Opportunity exists to further develop such topics in a follow-up effort that includes more socio-economic, financial, and real-estate-related perspectives.

The insights, perspectives, and actions suggested in this document aim to steer and guide the future

development of the Maasterras. It is important to take into account that they are informed by expert knowledge that was validated. The novelty of such a knowledge integration procedure explores the value of integrating the experience and knowledge of experts rather than traditional scientific procedures. Therefore, the new joint perspectives and solutions generated should be seen as both inspirational and steering rather than absolute.

Knowledge Ateliers by Resilient Delta Initiative



Design Ateliers by Mecanoo

Figure 1. Interdisciplinary knowledge integration methodology developed by RDi Team

A4 Strategic Principles

The strategic principles aim to steer the direction of the development of Maasterras in a climate-adaptive way without compromising the existing and future demands of safety. The six principles reflect the key insights and perspectives that emerged during the knowledge integration procedure that identified critical notions that must be considered for the development of the Maasterras as a shelter area in the time of extreme weather events such as flooding.

The principles are interconnected and are not strictly linked to individual program requirements, but rather serve as a lens. In this regard, each program requirement is a manifestation of a combination of strategic principles, whether in the urban design and built form, landscape, service and utility systems, mobility, communication and accessibility. The following strategic principles aim to safeguard and stimulate the development of the Maasterras as a safe and climate adaptive shelter area:

1. Embedding long term and integrated perspectives in spatial, environmental and technical measures;
2. Generating simultaneous value for day-to-day and crisis scenarios;
3. Integrating safety and adaptive measures within urban design, landscape and construction;
4. Developing multi-level and multi-functional measures embedded in transcalar way;
5. Building risk awareness and capacity through spatial signals and urban layout; and
6. Instituting a metabolic systems approach to water, energy and people flows.

B

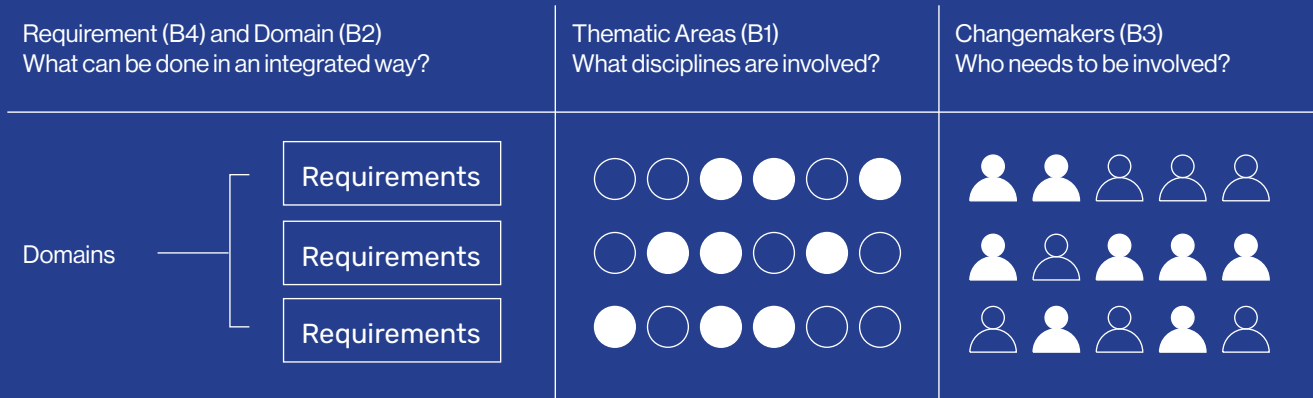
Framework

The integrated action framework is composed of four key components:

- B1 Thematic areas: what disciplines are involved?
- B2 Integrated domains: how to integrate change?
- B3 Changemakers: who needs to be involved?
- B4 Requirements: what actions can be done?

Each plays a significant role in framing innovation for the Maasterras. The four aspects are developed in an integrated way, and informed by the explorative and iterative interdisciplinary knowledge integration procedure that was conducted to synthesise the latest academic and professional expertise into new integrated insights for future area development of the Maasterras.

The following four components come together to compose the integrated action framework:



B1 Thematic Areas

Key thematic areas of development are identified that are informed by the new perspectives that emerged from the knowledge integration process led by Resilient Delta and priorities set by the municipality of Dordrecht in the current Programma van Eisen (PvE) Maasterras, in relation to climate-

adaptive shelter area function. The program requirements intersect the thematic areas to illustrate each requirement's degree of potential interdisciplinarity and aims to prompt collaboration between relative departments within the municipality, and other market parties involved in

Current themes	New themes
Wonen / Living (Liv) Mobiliteit / Mobility (Mob) Maatschappelijke voorzieningen / Social Facilities (Soc) Bedrijvigheid / Activities (building function) Openbare ruimte / Public Space (PbS) Duurzaamheid/Klimaatbestendig / Durability/Climate Resistant (Cli) Overige Milieuaspecten / Environmental (Env)	Logistiek / Logistics (Log) Stedenbouwkundig ontwerp en constructie/ Urban Design and Construction (UdC) Veiligheid en inclusie / Safety and Inclusion (Saf) Communicatie & Bewustwording / Communication & Awareness (Com) Veerkrachtige infrastructuur / Resilient Infrastructure (Res)

B2 Integrated Domains

The program requirements are organised across three integrated domains that were deemed critical for a safe and climate-adaptive Maasterras which reflect three ideal combinations of different disciplinary perspectives. This aims to enable a more integrated approach while specifying the focus for each domain such as renewable energy and autonomous systems within the domain of utility and service distribution. The requirements are actions that focus on operationalizing one or more of the three integrated domains.

Three Integrated Domains:

A. Utility and Service Contribution

- Electricity supply, distribution, and storage
- Renewable energy
- Sanitation and sewage
- Drinking water and purification
- Autonomous utility and service systems

B. Built Environment, Urban Design, Public Space, and Landscape

- Building access and evacuation
- Building program and construction layout
- Elevations and slopes
- Vegetation and (surface) materials

C. Accessibility, Crowd Management, and Communication

- Visual Identity & Signage
- Lighting and Material use
- Temporary Structures, Landscape and Recreation
- Multi-level and accessible mobility
- Street profiles, network distribution, and multi-modal use

B3 Changemakers

It is important to understand who in the development process is required to enable change. This more often involves a group of parties ranging from a wide range of sectors that collaborate on a shared action. For the Maasterras, we identify six changemakers that are crucial in accelerating innovation. Changemakers are those who have a creative approach to solving problems and rely on cultivating

trust and real relationships to unlock social change¹. Several changemakers are identified per requirement/action to demonstrate inter-sectoral collaboration and hopefully spark joint effort in practice.

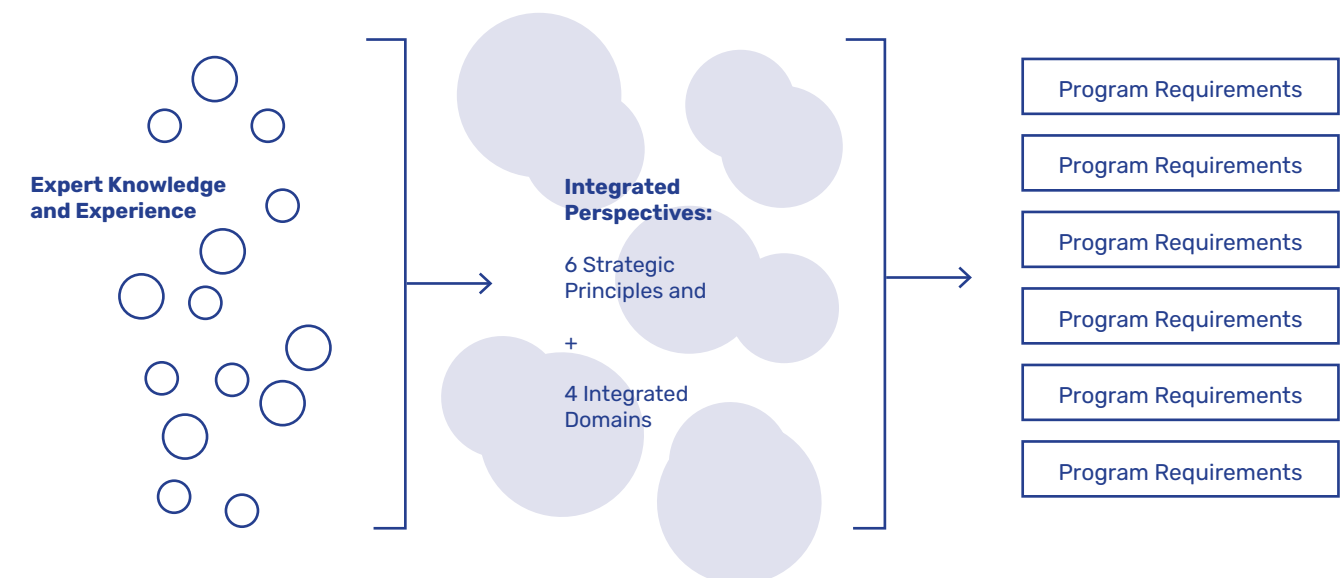


¹ Rahman, R., Herbst, K., & Mobley, P. (2016). More than simply "doing good:" A definition of Changemaker: what children, truckers, and superheroes all have in common.

B4 Program Requirements

The program requirements aim to translate integrated perspectives and expert knowledge into action. The requirements are concrete steps that can be taken toward developing the Maasterras as a safe and climate-adaptive living and working area. The specificity of the requirements helps to achieve the ambition incrementally and integratively, embodying the strategic principles at different

scales. The wide range of program requirements is meant to guide the transformation of the Maasterras and build upon the core development criteria defined by the City of Dordrecht.





Integrated Program Requirements

The integrated program requirements aim to transform the combination of six strategic interdisciplinary principles to smart and implementable action. To inspire future development, designs, and discourse around the Maasterras, fifty-one innovative program requirements (see Annex) have been developed ranging from radical, transformative, smart, and easily adoptable. From this nineteen requirements are co-identified with the city of Dordrecht that are critical for the Maasterras in enabling development towards a safe and climate-adaptive Maasterras.

You can view the expansive, more detailed list of requirements in the Annex. Here you can find the critical program requirements to ensure the development of the Maasterras is safe, climate adaptive and most importantly function as a shelter in the time of extreme weather events in the city of Dordrecht:

C¹ Utilities and Service Distribution

7/19

Program Requirements

- 1.1 Develop an autonomous micro-grid system with the components of renewable energy sources like PV/micro wind turbines, batteries with inverters, and diesel-powered generators to ensure access to electricity
- 1.2 Dimension batteries and generators according to demand and ensure safe and accessible distribution panels, even during flood events.
- 1.3 Place primary electrical system/grid components and mechanical systems above ground at the building level (e.g., sewage, drinking water, and electricity lines) to ensure critical systems are dry
- 1.4 Separate lower and upper building water systems to ensure ground floor taps can be disconnected and bypassed to safeguard the water pressure booster in tall buildings.
- 1.5 Install flanged connections (quick connects) on all public and residential buildings above ground level to connect temporary generators when needed.
- 1.6 Implement above-ground level placement of emergency isolated sewage treatment systems using pressured vacuum systems with on-site vacuum stations to sustain function of building sewage system
- 1.7 Separate building black/waste water and convey concentrated pollutants and pathogens to a nearby treatment unit temporarily post-flood to reuse recycled water for non-potable purposes when the sewage system is not functioning

Thematic Areas

Change Maker

Living	Mobility	Social Facilities	Building Program	Public Space	Durability and Climate Resistant	Environmental	Logistics	Urban Design & Construction	Safety and Inclusion	Communication and Awareness	Resilient Infrastructure	Municipality	Development and Construction	Community and Inhabitants	Societal partners	Business/Private Parties	Service operators
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C2 Built environment, Urban Design, Public Space, and Landscape

5/19

Program Requirements

- 2.1
- Integrate nature-based water management techniques in urban, public spaces, and landscape design to enhance water retention and infiltration.
- 2.2
- Reduce obstructions in movement by minimising major elevation changes in the public realm to allow for broader space usability (e.g., setting up tents).
- 2.3
- Using streets and the road network as dikes from adjacent low-lying block levels to ensure capacity for evacuation and managing evacuees during floods.
- 2.4
- Design multi-level and multi-functional inner public spaces, including storage, logistic access points, and above-ground level access to buildings to facilitate access to outdoor spaces and emergency supplies during crises
- 2.5
- Include a helicopter landing pad on at least one building roof within each block to ensure emergency access to supplies and service

Thematic Areas

Change Maker

Living	Mobility	Social Facilities	Building Program	Public Space	Durability and Climate Resistant	Environmental	Logistics	Urban Design & Construction	Safety and Inclusion	Communication and Awareness	Resilient Infrastructure	Municipality	Development and Construction	Community and Inhabitants	Societal partners	Business/Private Parties	Service operators
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C3 Accessibility, Crowd Management and Communication
7/19

Program Requirements

- 3.1 Connect buildings through second-floor terraces or multi-functional roof gardens to create above-ground access between buildings.
- 3.2 Create a cohesive visual identity for main routes into the Maasterras using street furniture, lighting, materials, and vegetation to make evacuation procedure of inhabitants more effective and efficient
- 3.3 Ensure wide cardinal and principal street layouts to better facilitate large crowds, evacuation, and accessibility for service and emergency vehicles.
- 3.4 Establish multi-functional and raised public pavilions at main entry points into the Maasterras for information, emergency triage, and supply distribution
- 3.5 Implement adaptive docking and quay structures that adjust to changing water levels and visually delineate the edge between land and water.
- 3.6 Integrate public space, art, landscape design, and recreation along the waterfront, inner public spaces, and public parks to raise awareness of flood risks and evacuation procedures.
- 3.7 Make vulnerable water connection points distinguishable (e.g., public water taps, garden house, water taps) to prevent damage during floods.

Thematic Areas

Change Maker

Living	Mobility	Social Facilities	Building Program	Public Space	Durability and Climate Resistant	Environmental	Logistics	Urban Design & Construction	Safety and Inclusion	Communication and Awareness	Resilient Infrastructure	Municipality	Development and Construction	Community and Inhabitants	Societal partners	Business/Private Parties	Service operators
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D

Conclusions

D1 Moving forward

Increasingly we see that technological and engineered focused development will not be equipped to engage with complex socioeconomic, and institutional dynamics as well as ecological uncertainty posed by the climate crisis. To secure the development of the Maasterras as a safe and climate adaptive living and working area, an integrated systems approach is necessary combining a long term perspective with incremental short term actions that goes beyond technical perspectives. This will demand an effort that is innovative, iterative, integrated and relies on the collaboration between a wide range of stakeholders and disciplinary expertise.

This document can be considered to be an initial effort that has identified critical themes, strategic principles and program requirements for spatial development. However, due to time and resource restraints, this evidence-based and exploratory interdisciplinary knowledge integration process has put particular focus on specific themes related technical and spatial perspectives. Due to the scope of the exercise which

was to develop insights for the larger program requirements of the Maasterras and masterplan design, perspectives related to governance, finance, climate risk, economy, politics, social inclusion and equity were widely excluded.

Therefore, we propose that this exercise marks the first step of a longer term effort to generate a wider range of critical insights from, and not limited to, the financial, governance, socioeconomic perspectives. As an unembanked area development in a time of a climate emergency and unprecedented social inequality, it is essential we diversify our perspectives to invoke transformative change and sustain long term impact.

E

All innovative and integrated program can be accessed in the following annex:

Annex

E1 All Integrated Program Requirements

The integrated program requirements aim to translate the combination of six strategic interdisciplinary principles to smart and implementable action. To inspire future development, designs, and discourse around the Maasterras, fifty-three innovative program requirements (see Annex) have been developed ranging from radical, transformative, smart, and easily adoptable.

The framework of requirements is composed of several key aspects. (1) Each program requirement is both specific and reflects the involvement of different thematic areas. This indicates the importance of departments within the city and market parties such as service providers, developers and contractors of coming together and working on a solution in a collaborative and integrated way. For each program requirement, you can understand its added value from the perspective of flood risk and the ideal (3) involvement of changemakers. The requirements are organised across (2) four integrated domains that were deemed critical for a safe and climate adaptive Maasterras. The four domains become three in the critical list of requirements.

Utility and service distribution

1.0	Program requirement	Added value for shelter function
1.1	Location of generators, electricity storage, and transformers is situated above the water safety level in all public and service buildings.	Ensuring access to the electric energy system.
1.2	The location of generators and transformers is placed in rooms that have windows in all public and service buildings.	Ensuring access to energy systems from exterior, for fire safety and connection
1.3	Building batteries are placed in all parking spaces with EV charging for emergency storage of electricity.	Ensuring emergency storage of electricity from charging EV cars and prolongs electricity supply
1.4	The EV charging network is connected to the building's electricity (back-up) generator in all public and service buildings.	Maximizing access to electricity and prolonging supply for critical function
1.5	Connecting rooftop solar grids to backup diesel generators and batteries (with inverters) in all public and service buildings.	Maximizing access to electricity and extending supply for critical functions.
1.6	All utilities and service rooms in buildings adjacent to elevated pathways must be accessible from the level of the bridge or at the water safety level.	For emergencies and extreme water levels, mechanical and service-related systems are accessible at all times since the bridge is above the safety line.
1.7	Placement of at least 2 accessible gender-neutral WCs above the water-safety line in all public and service buildings; allocating WCs on the second floor in all public and service buildings.	Ensuring access to sanitation services for relocating evacuees and inhabitants who have lost access to sanitation facilities.
1.8	All major generators, transformers, and critical energy systems of buildings adjacent to the elevated bridge must be accessible from the bridge level.	Ensuring access to back-up and critical electricity systems for maintenance and safety measures from the elevated bridge.
1.9	Solar energy generation through solar panels on all public and residential building roofs that are connected to the backup generator system.	Ensuring access to electricity during regional blackouts or main grid malfunctions.
1.10	Placement (above ground) of emergency isolated sewage treatment in critical buildings using a pressured vacuum system with an on-site vacuum station that can separate black/wastewater.	Ensuring the proper function of the building's sewage system and black water flow. The recycled water can be reused for flushing toilets and other non-potable purposes.

E1

All Integrated Program Requirements

Built environment, Urban Design, Public Space, and Landscape

1.0	Program requirement	Added value for shelter function
2.1	The secondary entrance capacity at the second or third level of all buildings (minimum 3 meters high) should include fully operable swing windows that can function as openings during floods.	Ensure exterior access to the building during ground floor connection loss, such as when the building is accessible by boats during extreme floods.
2.2	All ground floors of buildings must include a mezzanine, an intermediate floor within the foyer that can be accessed directly from the street through windows functioning as doors on the mezzanine level.	Facilitate building inhabitants' evacuation or entry when the primary ground floor is inaccessible.
2.3	Open floor plans are required on the ground, second, and all podium levels of the buildings.	Allow for flexible program functioning, serving as an emergency shelter, triage center, logistics, and supply hub.
2.4	The roof structure of all buildings should have the capacity for public use occupancy.	"Enable access to public space even during extreme flood scenarios when inhabitants cannot leave the premises.
2.5	The street paving material should be continuous and unobstructed, with 50% permeable surface capacity to allow water absorption.	Provide landing areas for helicopters for emergency and supply distribution purposes."
2.6	Publicly accessible roofs are mandatory for all public, institutional, and facility buildings.	Increase water retention to slow down water build-up and flow, ensuring safe walking and free movement on streets even when street divisions like sidewalks, curbs, and roads are not visible.
2.7	Dedicated space on the ground floor and second level should be provided for service points and logistic connections in all buildings.	Ensure access to the roof for emergency, logistics, and other services during flood-related responses. Extra capacity should be available for evacuees from both within and outside the area.
2.8	All inner public spaces must be situated at the highest elevation plane in relation to surrounding streets and water levels.	Ensure access for emergency, logistic, and utility services when the ground floor is not accessible.
2.9	Inner public spaces should facilitate multi-level functionality, providing a minimum of two elevations accessible from within the building, such as covered bike and moped parking or pavilions for events.	Enable drainage and water flow, increasing the functionality of public spaces during floods.
2.10	All secondary roads and mobility pathways must be higher in elevation than primary connections but lower than the inner public space elevation.	Allow access to part of public space from within the building blocks and use it during floods, for example, the roof of the bike parking or event space.

Built environment, Urban Design, Public Space, and Landscape

1.0	Program requirement	Added value for shelter function
2.11	All primary roads must be at the lowest elevation on the site and gradually connect to the level of the adjacent river.	Facilitate drainage and water flow while ensuring access for emergency, logistics, and service water transport.
2.12	Residential buildings should have galleries and balconies facing inward, while outside facades must remain unobstructed vertically, except for protrusions created by second-level building connections.	Promote social activities and use of public spaces for building inhabitants, enhancing the sense of community during floods.
2.13	Residential buildings' roofs should feature accessible gardens or public spaces.	Provide access to safe outdoor spaces for building inhabitants and enable the possibility to connect adjacent building rooftops.
2.14	Above-ground connections between roof gardens and public spaces on buildings must connect to the building's main or fire circulation; it is recommended to have above-ground building-to-building connections at the podium level +2 storeys.	Improve mobility between buildings for inhabitants and enhance the distribution of supplies and emergency services.
2.15	Distinct main entry points into Maasterras should incorporate recognizable spatial elements, such as public squares, urban art, and landscape features.	Enhance the capacity to triage incoming evacuees and raise risk awareness and response capacity among people.
2.16	The roof structure should have a load/capacity equivalent to the typical building floor structure.	Enable diverse programs and functions on roofs, increasing the functional surface area of buildings.
2.17	All public and institutional buildings should have event spaces or community programs on their roofs.	Decentralize access to community and social spaces, improving conditions for wellbeing and social cohesion.
2.18	Streets should function as dikes, elevated to a minimum water safety level, and surrounding the building ground plane.	Ensure the flow of people and transport within maasterras, the elevated street that can serve as safety areas for evacuees and host temporary programs like shelters, medical tents, and information centers.
2.19	All urban blocks must be encompassed by a raised street condition.	Create flood-resistant building areas, allowing them to remain operational and protect public infrastructure.
2.20	Landscape design and vegetation between raised streets and urban blocks should be flood-resistant and capable of slowing down the flow of water.	Decelerate water flow, improve water retention, and enhance the spatial quality of street dike conditions.

E1 All Integrated Program Requirements

Mobility & Logistics

1.0	Program requirement	Added value for shelter function
2.1	Connections such as through-ways and tunnels are essential to link the major road network with nearby facilities like the hospital and supermarket at Maasplaza.	Ensuring access to supply and services from Maasterras
2.2	A small logistic hub should be strategically placed along the south side of the rail-line to establish a connection with Maasplaza.	Ability to facilitate and manage supply, information and services retained from maasplaza and surrounding services like the medical center
2.3	Both new and existing logistical real estate should have the capacity to function as an emergency landing platform, storage facility, and temporary shelter.	Providing a convenient location for safety and rescue services, with large spaces available for emergency supply and shelter needs.
2.4	Each building block on the ground and second level should have an accessible service point for logistic, emergency, and special mobility needs.	Ensuring accessibility to buildings for safety and rescue operations, mobility-impaired individuals, and logistics access.
2.5	Above-ground connections at least three meters above the ground level should be established between buildings, with a minimum of two connections between building blocks.	Establishing connectivity between buildings for effective evacuation, service distribution, and maintenance purposes.
2.6	Structures or pavilions for emergency triage, service and supply distribution, and information points should be present at all major connections along the perimeter of the Maasterras.	Creating recognizable points for emergency services and incoming evacuees to guide and direct the flow of people.
2.7	Adaptive water-level docking, service, and quay structures should be incorporated along the harbor.	Facilitating access by water-based transport during periods of rising water levels.
2.8	Each inner public space should have logistic and service points, enabling multi-level loading and access.	Ensuring that supply and distribution of services remain functional at the building level.
2.9	Cardinal or principal raised streets must connect the main shoreline to critical entry points along the perimeter of the Maasterras or development area, and must be accessible for emergency, logistic and special mobility	Creating access for water-based transport, connecting the river and inland areas to enable the transportation of people and goods in and out of Maasterras.
2.10	All streets should be car-free and restricted to pedestrian and slow traffic, including bicycles and mopeds, while allowing for last-mile logistics, emergency, and accessibility service vehicles.	Promoting a livable public domain while maintaining access for critical transport and services.
2.11	Parking areas should be located at a maximum walking distance of 400 meters from all urban blocks and outside of the car-free network.	Enabling cars and electric vehicles to be accessed and moved to higher ground in a timely manner in case of rising water levels, ensuring accessible evacuation with moderate distances.

Communication & Awareness

1.0	Program requirement	Added value for shelter function
3.1	Ensure clear demarcation of the water and land edge along the harbor, ensuring visibility during the highest projected water level in a flood scenario.	Minimizes the risk of unintentionally entering land or water by clearly communicating the water's edge for transport purposes.
3.2	Implement color coding of urban furniture (such as benches and bike storage) and street lighting to communicate evacuation routes within the area.	Raises awareness of optimal evacuation routes for both internal and external flows of people and goods.
3.3	Place large water poles along the harbor front to accommodate medium to large ship docking.	Enables medium to large ships to dock conveniently.
3.4	Install multi-functional pavilions at critical entry points into the Maasterras that are also above the water-safety line.	Promotes awareness of safety conditions within Maasterras using attractive and engaging means of communication.
3.5	Communicate water levels through embedded signage along major mobility routes and in public spaces.	Increases exposure to how the living environment can coexist with water, challenging the assumption of 'keeping the water out.'
3.6	Allocate water-related recreation and public space within residential blocks and along the waterfront.	Demonstrates the value of adaptive solutions for water safety over traditional grey solutions.
3.7	Introduce floodable landscapes along the harbor front for risk communication and awareness.	Utilizes the connection to water as a means to raise awareness about various aspects of the environment.
3.8	Demarcate raised streets with recognizable street paving, urban furniture, and color coding.	Presents optimal evacuation routes for both internal and external flows of people and goods in an attractive and integrated manner, incorporating elements from everyday life to foster awareness.
3.9	Ensure distinguishable lighting and color coding for all major urban and public elements along evacuation routes, such as the Zwindrechtbrug, pedestrian bridge, raised streets, and harbor front.	Improves the identity of Maasterras as a safe and climate-adaptive area, building awareness about safety through attractive and widely used elements within the community.
3.10	Make vulnerable water connection points distinguishable (e.g., public water taps, garden houses, water taps), ensuring their visibility during floods to prevent system damage.	Ensures the visibility of vulnerable infrastructure during floods, emphasizing the need for protection and proactive measures.

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The **Integrated Action Framework** identifies new joint perspectives, strategies, and actions to advance the development of the Maasterras as a safe and climate-adaptive shelter area.

The content is the result of an evidence-based and exploratory interdisciplinary knowledge integration effort that combines a wide range of disciplinary expertise and captures new integrated and innovative perspectives.

For the purpose of this document, the strategies and requirements aim to outline a range from easily adoptable to thought-provoking actions.

