Case Study Report

Wonderful Resilience

Creating hope for an uncertain future

Kristina KNAUF, MVRDV, the Netherlands
Halina ZARATE, MVRDV, the Netherlands
Jessica CULLEN, MVRDV, the Netherlands

Abstract

Resilience needs consent to reach scale. Bold, audacious, and daring design can be a powerful tool to motivate stakeholders to engage in building resilience and ensure their commitment and participation in long-term adaptation. When we think of resilience, we think of pragmatism, and restraint. However, we believe that "beauty and wonder" are crucial ingredients of every successful urban adaptation strategy, as they catalyse the will to change. Using six principles, MVRDV endeavours to transform vulnerabilities into drivers for optimistic, robust and daring designs, challenging communities, investors, developers, and stakeholders to co-create an adaptive urban future that works in concert with nature. The Case Study illustrates several lessons from the comparison of two projects. These inform our practice, and commitment to creating scalable solutions for resilient environments that foster consensus through surprising and intriguing solutions using "wonder" to motivate adaptation towards a sustainable future.

Keywords

Resilience, Architecture, Urban Design, Adaptation, Sustainability, Participatory design.

1. The starting problem: the quest for climate action through rational adaptation

We face unprecedented global crises. A widespread imbalance in global climate systems results in more extreme events, severely affecting the world's most vulnerable populations. Oscillating between deluge and drought, we witness urban communities increasingly struggling to stay safe, healthy, and prosperous.

Current resilience discourse is regarded as a challenge of strategic problem-solving focused on systemic technical and nature-based solutions. However, if "an urban environment should appeal to all senses" (Sim, 2020), a purely rational approach fails to incorporate a highly influential variable: human psychology. While resilient planning processes support basic human needs, they ignore human desires as an unaffordable luxury in the eyes of an austere future.

However, resilience needs commitment fuelled by hope and love rather than logic. The challenge, therefore, is to address, interpret, and leverage the desires, cultural habits, hopes, and future dreams of people whose cooperation and commitment are essential to making long-term adaptation successful. "Beauty and wonder" might seem frivolous and out of place in the pragmatic field of resilience, but their power and potency lay precisely in their provocative qualities, and their innate ability to spark and prolong the will to change. They challenge and excite the imagination of the public, stoking the fires of the collective force needed to enable long-term adaptation. In as much as resilience is an environmental, technical, political, and economic issue, it is a social and subjective one. Quoting novelist Amitav Ghosh, in *Architecture as Measure*, Neyran Turan argues that the climate crisis "needs to be seen as a crisis of culture and thus of the imagination" (Turan, 2019), if we are to genuinely build a better, more robust and sustainable existence.

The ambition to enable communities to transition towards a positive future is fundamental to MVRDV's design approach. In the case study that follows, we place two MVRDV projects side by side: Bastide Niel, a 35 ha master plan for a brownfield transformation currently in development in Bordeaux, France, and Resilient by Design, a regional resilience strategy for the San Francisco Bay Area. Their comparison demonstrates how our six-principles for "wonderful resilience" can incite and accelerate the cultural shift required to build resilience.

2. Explanation of the context: a tale of two scales

2.1 Introduction

What is the value in comparing two different projects? Building resilience is not only dependent on socio-political and economic contexts but also on temporal and spatial scales (Chelleri, Waters, Olazabal, Minucci, 2020). The following comparison is based on: scale, time, status, client, funding, stakeholder involvement, governance and local planning cultures. It seeks to highlight how the context influences possible approaches to resilience.

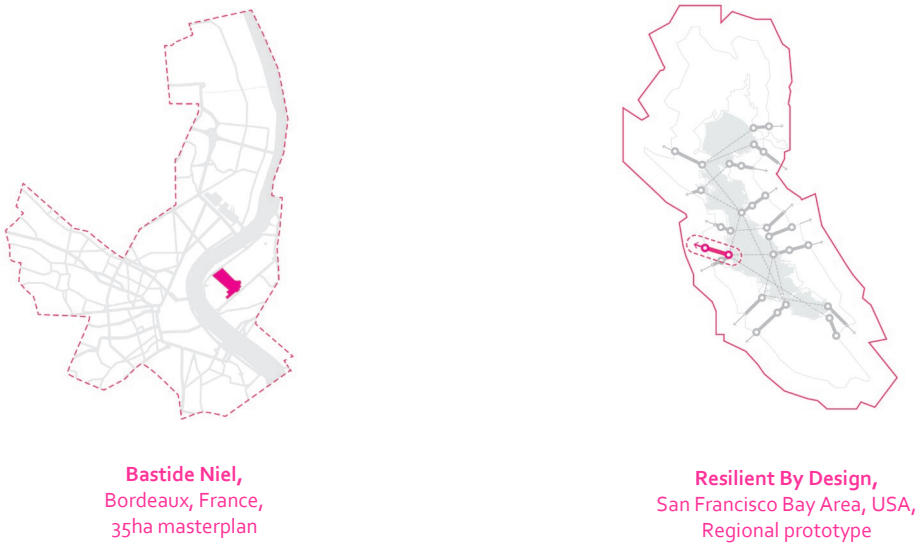


Figure 1. Location maps highlighting focus of project scales. Source: MVRDV.

2.2 Bastide Niel, Bordeaux

Based on the successful concept “intimate city” presented in the tender, MVRDV was commissioned in 2010 by the Municipality of Bordeaux to develop a masterplan for the transformation of a former military barracks and rail yards site (35 ha) into a vibrant neighbourhood as an extension of Bordeaux’s city centre opposite the river Garonne. Due to its location in the river floodplain, the development was required to be resilient, providing flood protection and abundant green. The proximity to the UNESCO-protected city centre demanded an architecturally sensitive approach, integrating the requirements for density and daylight exposure, while maintaining the historic morphology of the site. The legal planning framework governing the development, ZAC (Zone d'Aménagement Concerté), allows public authorities to develop the site consistently, aided by supervision based on building guidelines whose development was part of the masterplan commission.

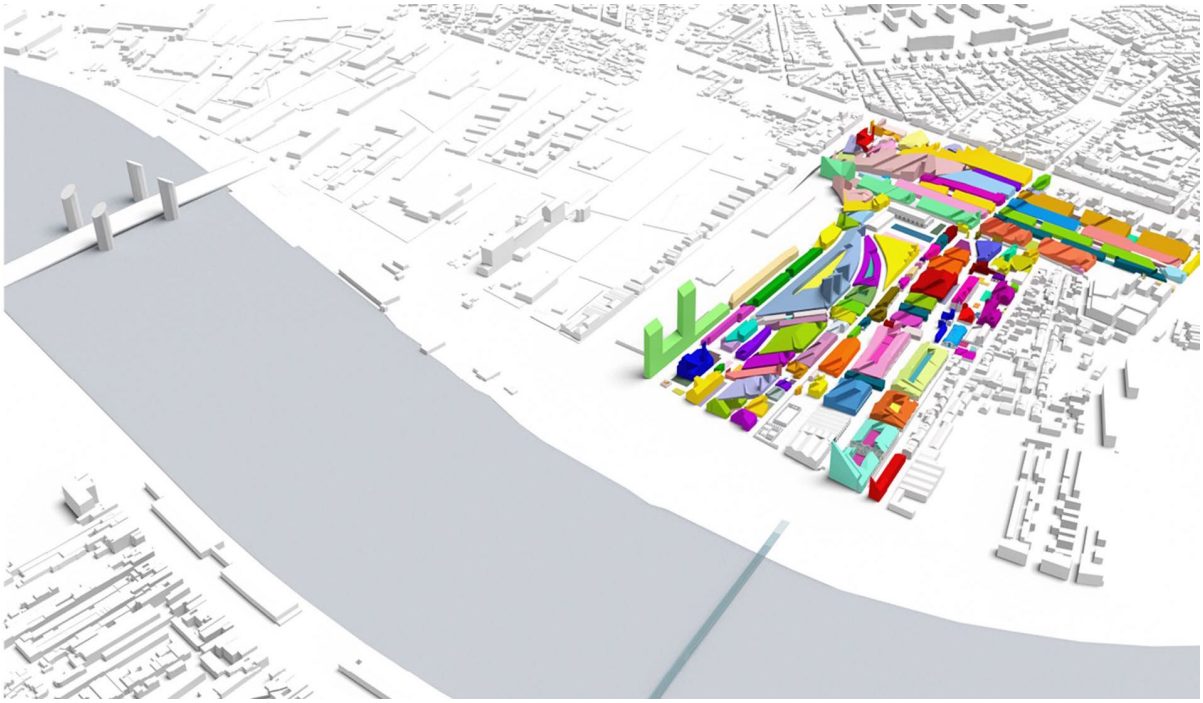


Figure 2. Proposal for the transformation of the ZAC, Bastide Niel, Bordeaux. Source: MVRDV.

2.3 Resilient by Design, San Francisco Bay Area

Resilient by Design (RBD) was a one-year long, privately-commissioned competition organised by an NGO between 2018 and 2019 and funded by, amongst others, the Rockefeller Foundation. It involved ten multidisciplinary, international teams who developed pre-disaster strategies for the climate adaptation of the Bay Area, while addressing equity, affordability as well as ongoing "stresses" on the urban systems. In order to find integral links between these broad topics, MVRDV formed a consortium with HASSELL, Deltares, Goudappel Coffeng, Lotus Water, Frog Design, Civic Edge, Idyllist, Hatch, and Page & Turnbull, combining knowledge of urban design, water management, civil engineering, heritage, governance, mobility and digital communication. Initially studying the entire region, the design teams developed design proposals for, and with concrete communities in the second stage of the competition.

Figure 3. Resilient By Design, San Francisco. Source: MVRDV, Hassell+.

2.4 Conclusions on different contexts

The comparison of the two project contexts reveals some universal conclusions:

- While different project scales offer different opportunities to build resilience, the benefits of linking them are often not (yet) considered in planning processes.
- While top-down processes can generate a steep learning curve regarding technical and spatial feasibility of resilience measures, stakeholder engagement processes provide crucial insights in their "desirability" and socio-economic feasibility. However, planning processes need to allocate sufficient time and management for the collaboration to identify mutual benefits.

- An individualistic planning culture and/or lack of integral governance is found in various project contexts, possibly impeding the realization of integral, scale-transcending resilience projects.
- As investments in resilience often do not generate direct returns of investments (Henriquez, van Timmeren, 2017, p. 244), their qualitative/quantitative impact needs to be visualized to motivate implementation

Even though environmental conditions and technical issues urban communities are facing are often comparable, differing scales, times, and socio-economic factors highly influence the approach to and success of any resilience effort. Therefore, MVRDV stresses the importance of "wonder" not only as a spatial feature, but also as a means of stimulating collective desires that bridge governance and social gaps in the long-term, highlight invisible links in scale and time, and imagine unexpectedly feasible solutions for resilience.

Bastide Niel

Resilient By Design

Scale	Project size	M - neighbourhood scale, 35ha	XXL - regional scale & L - municipal scale
	Main focus of resilience concept	M - neighbourhood scale, 35ha	XXL - regional scale
	How did scale influence the resilience approach?	The scale of the site offers the opportunity to implement and test innovative spatial and technical resilience measures in single buildings but also smaller networks of urban environments. Due to its size and thus gradual realization, feedback loops, design adaptation and -optimization are possible.	The study area comprises a regional scale, supporting the translation of systemic resilience strategies into feasible, yet adaptable prototypes for local actions.
Time	Project start	2010	2018
	Project duration	10 years +	1 year
	Project status	under construction	concept / masterplan proposal
	How did time influence the resilience approach?	The project began when climate change had not achieved a critical mass of awareness in planning and design practices, therefore water buffers might be underdimensioned on long-term and the approach to sun exposure and amount of green is currently being reviewed to reduce urban heat, driven by a recent change of political agenda	RBD began in 2018, when the effects and correlations of climate change were increasingly visible, so the need for integral resilience was evident. The duration of the project was relatively short seen its ambition to include XXL and L scales, extensive stakeholder engagement, multidisciplinary co-design and securing of funding for implementation within the competition timeframe. Therefore, the approach focused on resilience awareness and visions rather than execution.
Client & Funding	Type of client	Public, PPP in implementation stage	NGO
	Funding of design process	Public	Foundation
	Funding of project development	Public	–
	How did client & funding influence the resilience approach?	Funding for both, planning process and project development, was secured and driven by socio-economic demand (housing) with clear financial returns. As local, national and European agendas have to be considered by the public sector, the municipality/mayor being the client fostered the implementation of innovative resilience solutions.	Funding for the competition process was mostly provided by foundations. This enabled a new type of planning process, aiming to bridge current administrative boundaries, cultural and legislative gaps obstructing integral collaboration for resilience. Implementation was not secured and relied on mostly private sector funding, facing high risks of investments without guaranteed financial return and hampering cross-sector collaboration. The integral resilience principles therefore needed to be broken down into more singular, comprehensible projects.
Stakeholders	Main stakeholders involved	Municipality, Mayor, private "executor" in PPP, citizens marginally	Organizers, Advisory board, local organizations, authorities, communities
	Timing of involvement	Public: constant, private executor: implementation, citizens: events	Organizers & board: in presenations, communities: research & design stage
	How did stakeholders influence the resilience approach?	The recent change of Mayor influenced the project greatly. A new political, "green" agenda lead to revisions of the masterplan, ensuring additional green, porosity and cooling through adaptations of the sun cuts of the building envelopes. The legal framework of the ZAC entails a majority of public ownership of the site. With the exception of one private owner, few other stakeholders are influential other than the public sector.	RBD operates in a borderless scope, across jurisdictions, with diverse communities directly affected and involved. The multitude of stakeholders requested for a broad participatory approach to resilience, focussing on social issues and their links with envrionmental issues. The engagement process occupied most of the timespan of the project and beyond, making the need for inclusion and empowerment evident.
Governance/ Planning culture	Drivers of urban development	Public sector	Private sector
	Legal planning frameworks	ZAC	No integral regional planning
	How did governance/culture influence the resilience approach?	Even though driven by the public sector, an individualistic approach to resilience is present: requirements for flood protection are made on ZAC level, with responsibility to not affect neighbouring plots. Collaboration to improve larger systematic issues is not commonplace. Therefore, the approach for this site is not considering site-external systems. The top-down nature of the ZAC development allows for relatively straightforward implementation.	Similar to Bordeaux, the local culture and governance is built on individual actions/separate expertises with little cross-sector collaboration. This makes the implementation of integral projects that contribute to systemic resilience difficult. The lack of regional governance

Figure 4. Comparison of project contexts. Source: MVRDV.

3. A two-tier approach: local action meets systemic prototypes to generate wonderful resilience

3.1 Introduction

How can MVRDV's resilience strategy identify unusual correlations and transform vulnerabilities into drivers for optimistic, robust, and daring designs? Creating a desirable and adaptive urban future that works in concert with natural systems, our approach is based on six principles, combining a strategic, technological approach to resilience with "wonder-factor(s)" ensuring long-term engagement and commitment of stakeholders.

MVRDV's six resilience principles include the following:

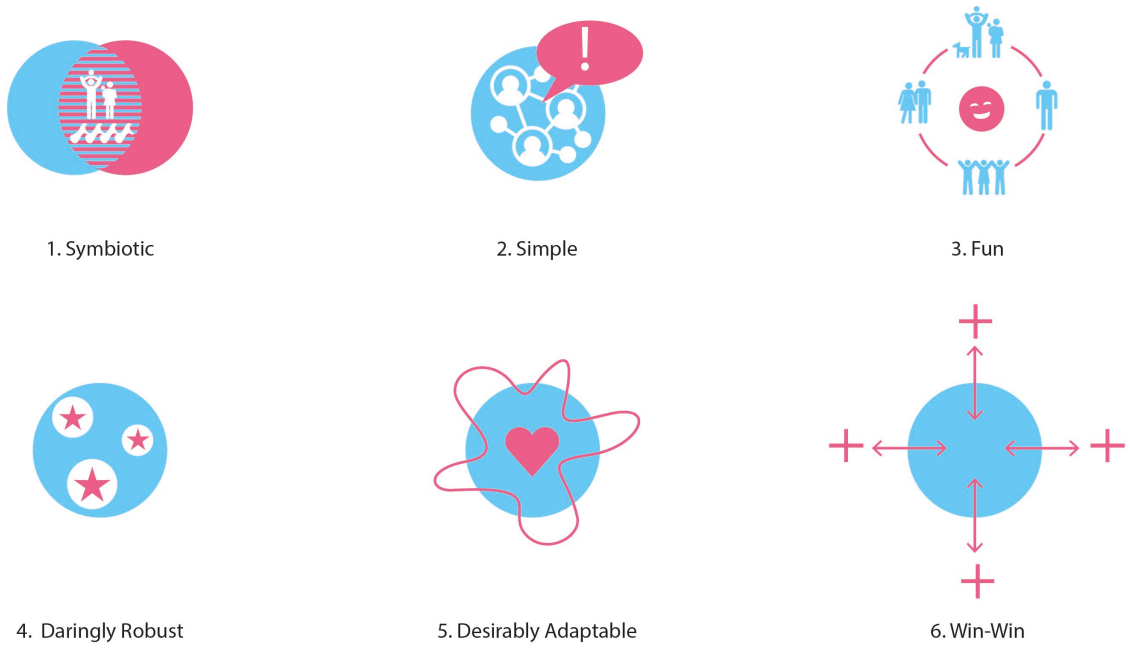


Figure 5. Principles for wonderful resilience. Source: MVRDV.

3.2 Bastide Niel, Bordeaux

MVRDV's 35 ha comprehensive development plan for Bordeaux's Bastide Niel's former barracks and rail yard in the city centre demonstrates resilience through a symbiosis with natural systems, as the plan embraces 100 year flood events, refurbishes existing buildings, and lifts new constructions above ground level. An extensive system of water buffers under the new buildings ensures a safe and liveable neighbourhood on the floodplain, without blocking the natural flows of the river system.

In addition, urban microclimate and insolation is a main driver for the identity of the design. Sun-cuts define the volumes of the building envelopes drawing daylight to the street level and ground floor, re-creating the intimate qualities and structures of the old city. The diversity of building envelopes are safeguarded in the master plan guidelines and supervision, resulting in unique architecture that visually highlights the interrelation of light and shadow, as well as identity and climate comfort. The public space concept seeks to include a large diversity of species and improve biodiversity while maximising leaf surface for neighbourhood cooling. Citizens have been involved in this climate-driven design through public space installations and events addressing urban climate.

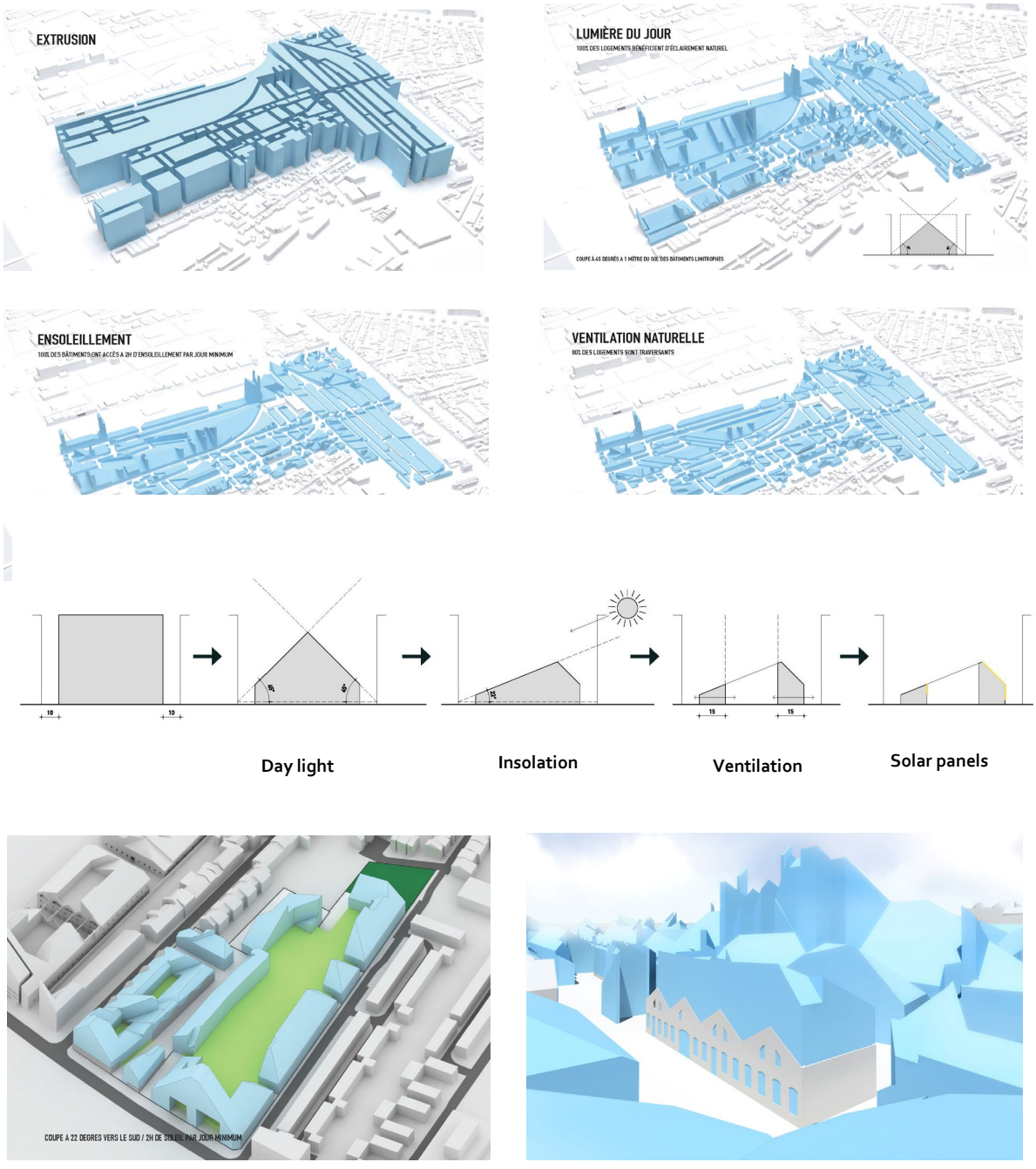


Figure 6. Step-story of design concept: volumetric deductions of site-specific conditions, leading to sun-cut building envelopes (intimate city concept) Source: MVRDV.

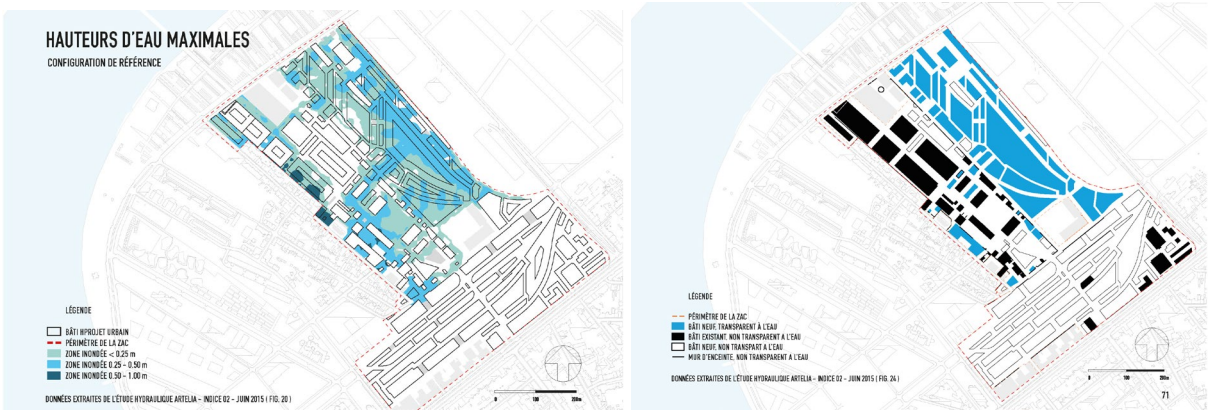


Figure 8. Map of predicted flood events (left), map of built flood protection types (right). Source: MVRDV.

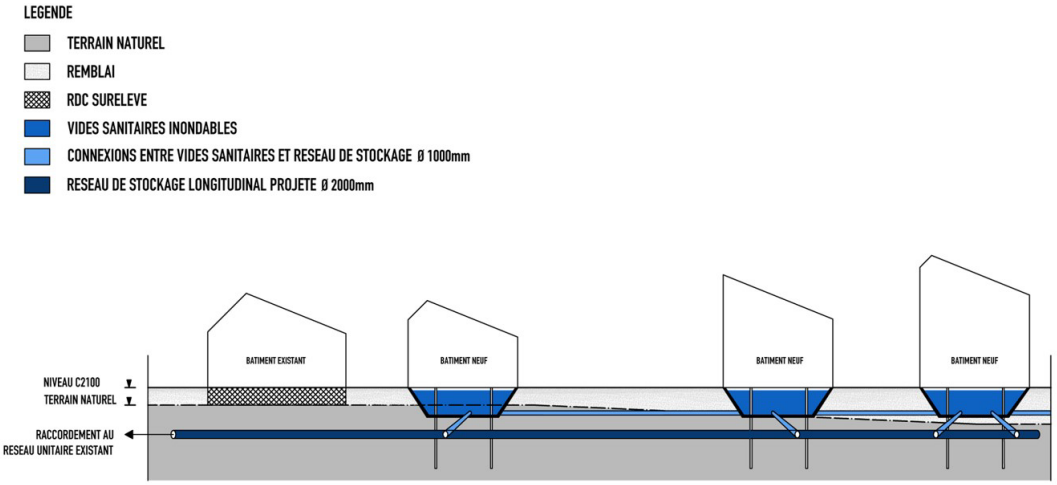


Figure 9. Concept section: protected existing buildings, "flood-transparent" new buildings. Source: MVRDV.

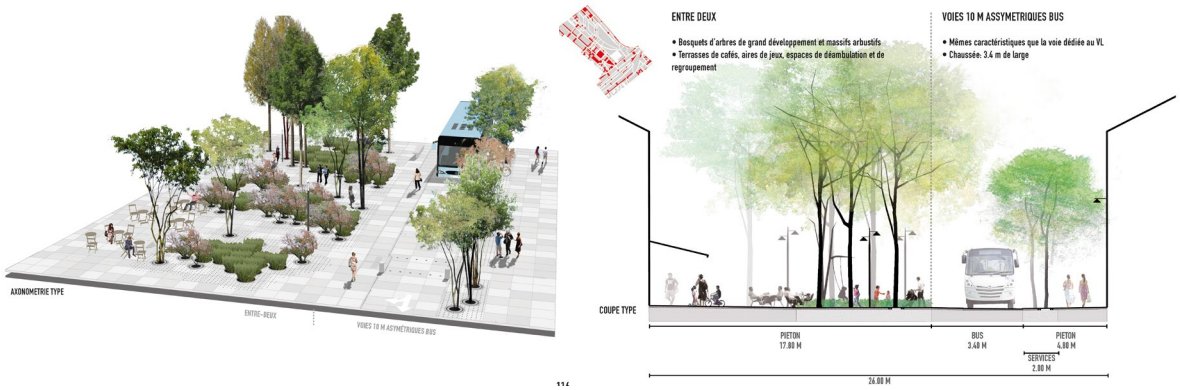


Figure 10. Public space concept fostering permeability and biodiversity. Source: MVRDV.

Figure 11. Intimate city concept impressions. Source: MVRDV.

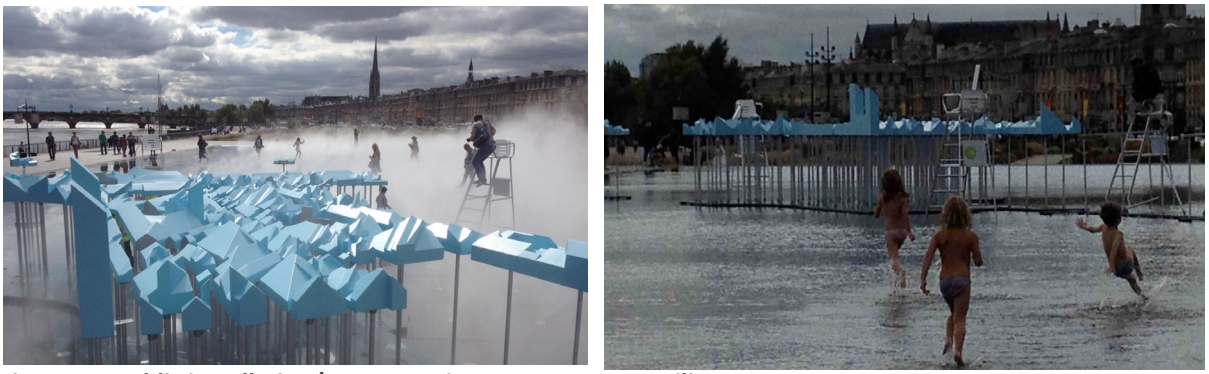


Figure 12. Public installation/event to raise awareness on resilience. Source: MVRDV.

3.3 Resilient by Design, San Francisco Bay Area

One of the conclusions revealed during the research stage of the Resilient by Design process was that the Bay Area's loop system is too fragile to offer robust and efficient emergency response and mobility. This, in combination with other stresses on the urban system, causes vulnerabilities in emergency response, and impedes the sustainable and coherent adaptation of communities.

The proposal "Connect and Collect" therefore designs robust alternative links for this system, with a prototypical design for a section of the city along a street or creek, connecting urban communities to the waterfront. On each end of these connections, multifunctional and adaptive public spaces - "Collectors" - integrate water management solutions, community facilities, transport hubs and safe emergency response structures. Adapted by several communities, the "Connect and Collect" principle enhances resilience on a regional scale, broadly coordinating preparedness through integrated design solutions, improving physical and social resilience, while providing both daily and emergency functions for affected communities.

The highly participatory process of this competition aimed at facilitating customisation of this prototype with concrete communities, supported by events, online platforms and AR tools for visualisation and co-design of ideas.

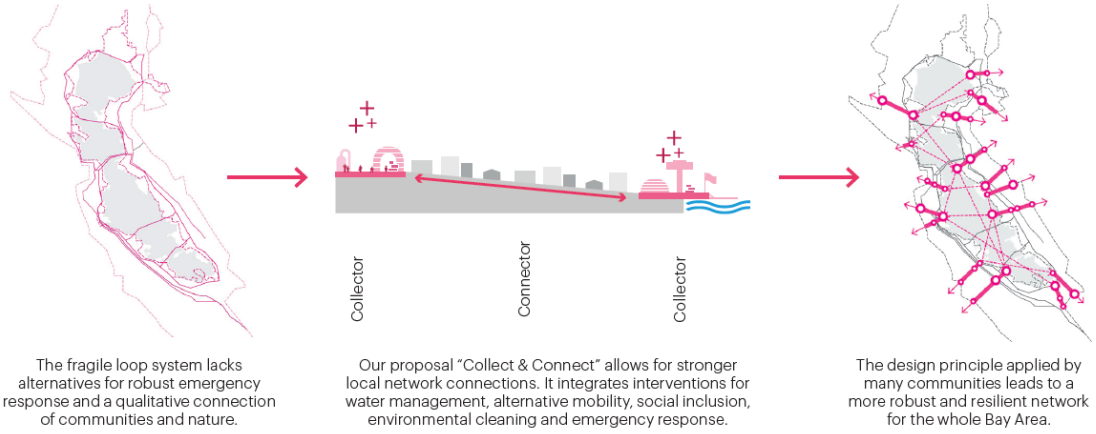


Figure 13. Collect+Connect concept for a robust regional system. Source: MVRDV.

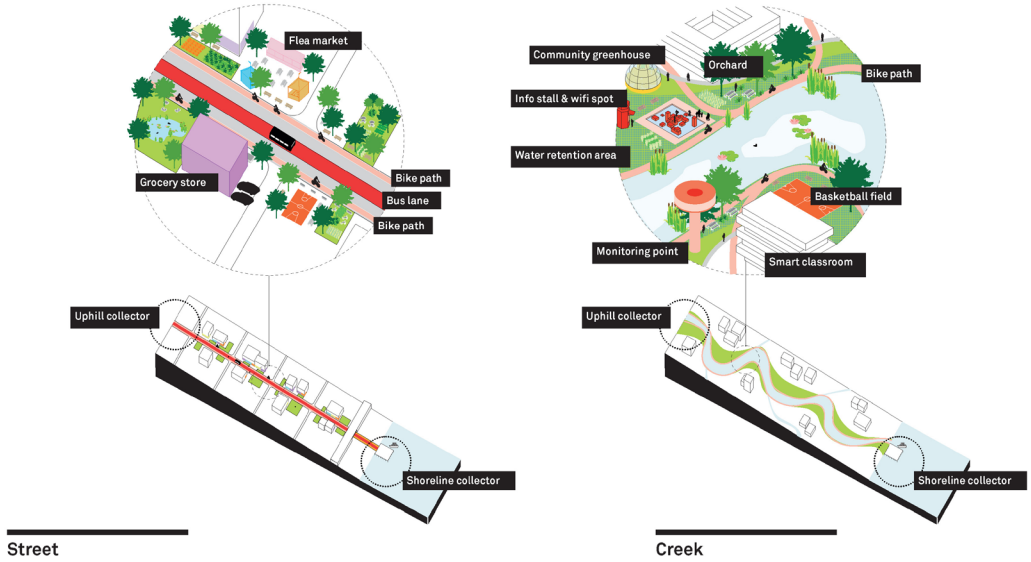


Figure 14. Concept for "Connectors"- spatial interventions along streets or creeks. Source: MVRDV.

Figure 15. Collage of possible transformation of a creek. Source: Hassell+.

Figure 16. Concept for double use of Collectors. Source: MVRDV.

Figure 17. Research stage community dialogue. Source: MVRDV.

Figure 18. Community engagement events. Source: Hassell+.

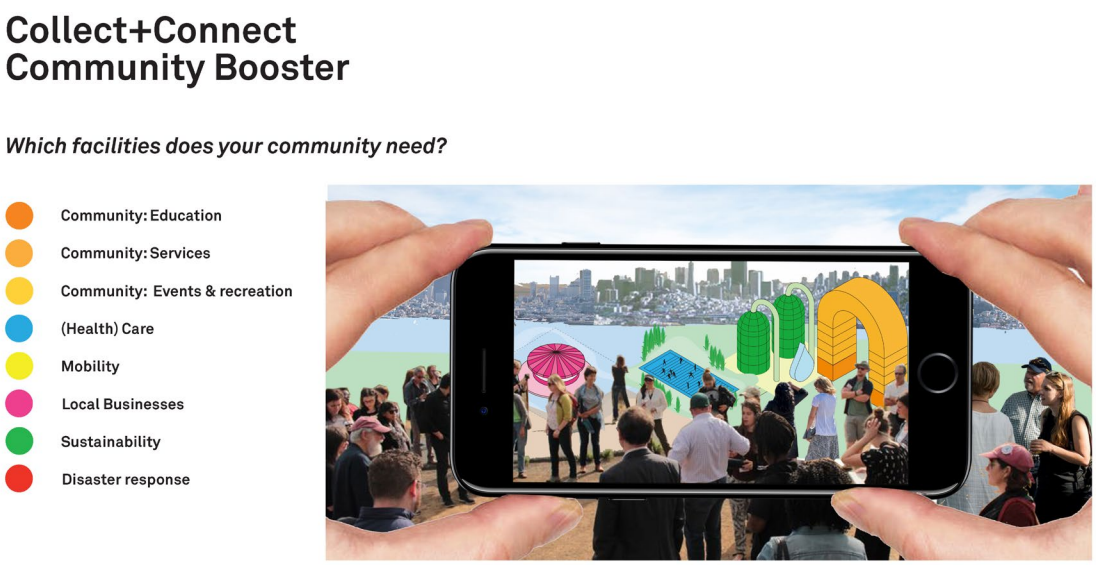


Figure 19. A mobile-app tool helps local residents, city officials, and community-based organisations communicate their interests in an interactive way to support community-driven design. Source: MVRDV.

Figure 20. Initial catalogue of potential community amenities to inspire co-design and AR tool. Source: MVRDV.

3.4 Conclusions on different approaches

Whereas Bordeaux presents a straightforward design and implementation of resilient solutions due to its delivery framework, the large scale and lack of comprehensive governance for RBD results in a prototypical and participatory approach rather than a fixed design.

In terms of design, Bordeaux has a clear identity addressing climate adaptation through built structures and public space design. Its site-focused approach to flooding is limiting but can be exemplary for other developments in individualistic contexts.

On the large scale, RBD focuses mainly on blue-green infrastructure and mobility to create a robust framework. Its concrete design and programming, as a carrier of local identities, as Bastide Niel is able to articulate, however remains open. The "wonder" in this approach might therefore lie in the scale-transcending simplicity of the prototype and its co-design-driven customisation.

Alongside local stakeholders, both scales need to create a 'wonderful' identity at a micro-scale, which can be "plugged in" to the larger network strategy.

4. The results of the projects: international dialogues versus continuous adaptation in implementation

4.1. Introduction

What outcomes have been achieved? How have our "wonderfully resilient" projects enabled longer-term resilience? How have we influenced planning culture and governance? How have we inspired municipalities and other stakeholders to consciously adapt and prepare?

4.2. Bastide Niel, Bordeaux

The City of Bordeaux has approved the Bastide Niel master plan. The first buildings and public spaces have been realised, and the storage system for stormwater constructed. Meanwhile, the plan is being further adapted to suit emerging needs, including those made urgent due to more awareness regarding climate change and urban heat island effect on public health, as well as those implemented through shifting political agendas. In this case, the "green agenda" of the latest mayor supported this revision. This demonstrates that constant optimisation of a master plan is possible even while in progress. As MVRDV is both supervisor of the plan and the architect in charge of some assignments, constant optimisation is possible while a coherent guidance ensures that the "wonderful" features of the plan are safeguarded in its implementation.

Key lessons learned

1. Master plans can quickly become obsolete if the design fails to incorporate additional spatial buffers and flexibility in built elements
2. Basing the identity of the design on climate conditions can raise awareness and be a strong carrier of "wonder", but can also be a liability if the conditions change
3. Ensuring the survival of initial "wonder" qualities throughout the design, planning, and implementation process demands long-term commitment; a supervision role of the designer is favourable
4. Implemented projects offer an opportunity for learning, generating feedback loops that can accelerate the cultural shift in building practice and industry, so a constant monitoring and evaluation during and after implementation is essential

Figure 21. Water storage implementation. Source: MVRDV.

Figure 22. Realised development. Source: MVRDV.

4.3. Resilient by Design, San Francisco Bay Area

The remaining HASSELL team has elaborated the Collect & Connect concept in their proposal "Resilient South City", which creates public green spaces along South San Francisco's Colma Creek and continuous access to the waterfront. The proposal intends to reduce the impacts of flooding, mitigate vulnerability to rising sea levels, restore native flora and fauna, and offer public amenities along a continuous blue-green corridor to support a healthy lifestyle. The team continues to work with the community, especially local schools on higher ground, as sites of water collection, treatment, and reuse, while making schoolyards available for community recreation and potential disaster sheltering. These beacons of resilience will be connected to Colma Creek via corridors for water and cycling, creating a resilient local network also beneficial for surrounding neighbourhoods.

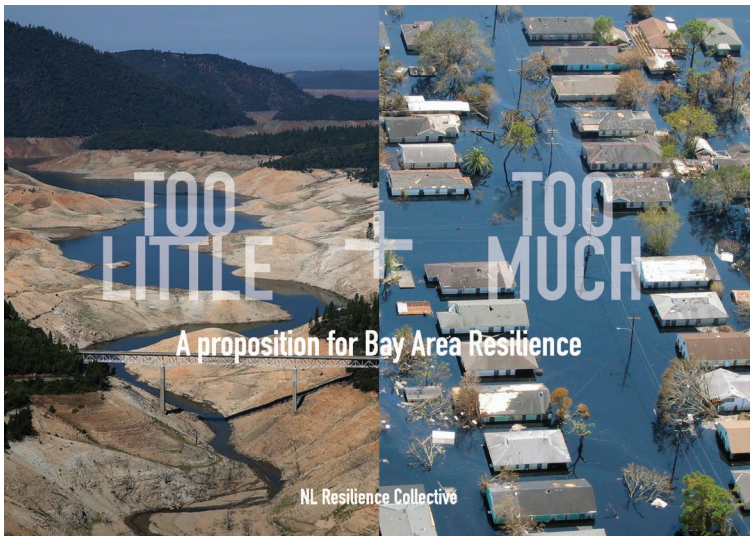
Though largely a theoretical body of work, the Resilient by Design Challenge has drawn international media attention. As a spin-off, MVRDV and other Dutch firms collaborated to develop recommendations for regional resilience of the Bay Area. The publication *Too Little + Too Much*, summarises these recommendations and illustrates the potential of integral planning tools for Bay Area resilience.

Furthermore, the Connect & Collect concept has proven universally applicable in other coastal projects of MVRDV.

Key lessons learned

1. Social equity is a key driver in building resilience, and a close relationship with local communities should be integral from day one
2. The project timeline should be sufficient to allow for meaningful engagement
3. Communities must be able to see themselves reflected in the designs, engaging them and inspiring an optimistic view of the future is crucial
4. Investments in urban resilience naturally come with the risk of gentrification, so counter socio-economic strategies must be ensured
5. Just as physical elements of the project, social aspects need dedicated funding streams
6. Local leaders and regional agencies must collaborate to create visions and guidelines, cultivate buy-in, and leverage resources to support integral climate actions
7. Integral processes and articulated win-wins at a systems level can be difficult in the U.S., compared to The Netherlands where projects benefit from cross-funding potentials
8. It is difficult to make a case for resilience measures that do not demonstrate reliable returns of investments, so there is an urgent need for strategies to demonstrate added value

Figure 23. Images of final competition proposal. Source: Hassell+.



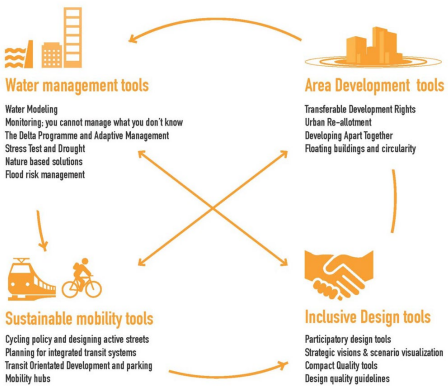


Figure 24. Images of *Too little + too much*. Source: MVRDV.

4.4. Conclusions on project results

Speed of deployment varies with scale. Measurable results are reached faster with a smaller scale and top-down approach, as shown in the Bordeaux project. However, due to their "speed" and risk of change of governance, they are more volatile and prone to obsolescence as it is hard to argue for "unknown" space and investment in projects within a relatively short horizon for stakeholders. Larger scale strategies like Resilient by Design enable definition of clearer, more holistic and long-term goals and requirements for long-term buffers and robustness.

As two fundamentally different projects, one a competition concept, the other a master plan, both projects contribute to a cultural shift towards a resilient future with MVRDV's six principles. The most important commonality is the relevance of long-term commitment of all stakeholders and close collaborators, including designers. The design materialises the dream in which they have all invested, because in doing so, "we recognize the needs of people in urban spaces, taking care of the environment with protection, comfort and pleasure in mind" (Sim, 2019). We build wonder into our designs, and love them so the project grows into a shared dream to achieve its "wonderfulness." This is essential to the resilience effort.

5. The broader project impact: practical lessons and a shift in (design) culture accelerating wonderful resilience

5.1. Introduction

The comparison of the two different projects leads to conclusions on their potential impact, both externally (on urban systems, stakeholders, and the professional discourse) and internally (on MVRDV's design methodology).

5.2. Bastide Niel, Bordeaux

Bastide Niel achieves numerous objectives. Regarding its external impact, it provides much needed new housing close to the city centre, strengthening Bordeaux's inner city community, and supporting future growth without displacement. Furthermore, it stimulates the general public's curiosity due to its unique design, drawing attention to the need for climate adaptation. For the public sector, it serves as a showcase for the political agenda and "wonderful" lifestyle in concert with nature. With top-down governance, the project offers an opportunity to test and learn from concrete, feasible solutions, and leverage these in other relevant projects. It can therefore serve as an exemplary project regarding climate adaptation in the professional discourse, accelerating the cultural shift needed in the way we design and build cities.

As for Bastide Niel's internal impact on MVRDV's approach to resilience, it demonstrates a positive step in working with a symbiotic approach. Analysing its performance according to our 6 principles, it could however lack long-term robustness and attractive adaptability of the buildings after realisation. This conclusion leads us to strengthen our attention to these two principles in other projects, e.g. in Caen, where generous, additional buffers are an essential, "wonderful" feature of the master plan.

Figure 25. Caen project incorporating additional buffers along plot perimeters. Source: MVRDV.

5.3. Resilient by Design, San Francisco Bay Area

Though as yet unrealised, Resilient by Design serves as a strong example for hazard responsive, research-led design on multiple scales and with multiple stakeholders, both externally and internally. It provides direction for addressing resilience in contexts and countries without a PPP-culture, and further stimulates the public and professional debate on the topic of resilience. Local communities gained greater awareness about vulnerabilities and the possibilities of inclusive planning through experiencing public participation and co-design for climate action. Internationally, MVRDV has been invited to elaborate and discuss the RBD proposal in several publications and conferences.

Additionally, the competition raises significant awareness concerning the lack of integral, regional planning and governance in the wider Bay Area. With public presentations of our integral approach to resilience, e.g. of publications such as Too Little + Too Much, and a dialogue with the local administration, we hope to continue to influence political agendas to focus on climate action beyond fixed administrative cycles, and secure the necessary public-private partnerships that make this a reality.

The RBD process has influenced MVRDV's approach to resilience considerably. It has highlighted the need for an integral approach, more effective methods for engagement, scale-transcending empowerment of all stakeholders, and, thus, "wonder" in any design for future urban environments(MVRDV, The Why Factory 2020).

Figure 26. Images of media covering Resilient by Design: AZURE, RUMOER, SCALI URBANI. Source: MVRDV.

Figure 27. Photos of presentation of *Too little + Too much* to California State Senator Weiner and Assembly Member Bonta during Global Climate Action Summit 2018 in San Francisco. Source: MVRDV.

5.4. Conclusions on project impact

Both, discourse and action are necessary for resilience. Therefore, we see the two projects as valuable stepping-stones for local communities and planning professionals in their quest for resilience. They show that the "wonder factors", as highlighted pink in Fig. 28, are relevant ingredients to stimulate dialogue and experimentation.

As MVRDV has the ambition to help generate collective action that can propel a complete cultural shift in the way we live within, design, and govern cities, our quest to build resilience is in constant development and needs to accelerate. To this end, we are developing a rubric to evaluate our own projects' resilience. We believe this will accelerate a "cultural shift" in our work as we strive towards 100% resilient projects in the near future.

Figure 28. MVRDV's evaluation of the performance of projects according to the "6 wonderful resilience principles". Source: MVRDV.

6. References

Chelleri, L.; Waters, J. J.; Olazabal, M.; Minucci, G. 'Resilience trade-offs: addressing multiple scales and temporal aspects of urban resilience', Sage Journals [online]. Available at: https://journals.sagepub.com/doi/full/10.1177/0956247814550780 (Accessed: 8 October 2020)

Lewsen, S. (2020) "Protection services - Designing for CLIMATE Resilience," AZURE Magazine, Vol. 36 - No. 283 NOV/DEC 2020, pp. 52-57.

MVRDV; The Why Factory (2020) Manifesta 13 Marseille: Le Grand Puzzle. Berlin, Stuttgart: Hatje Cantz Verlag.

Henriquez, L. and van Timmeren, A. (2017) *Under pressure: Water & the city*. 1st edn. Delft and Amsterdam: Delft University of Technology (TUD) and Amsterdam Institute of Advanced Metropolitan Solutions (AMS).

Sim, D. (2019) Soft City, Building Density or Everyday Life. First Edition. USA: Island Press.

Turan, N. (2019), Architecture as Measure, New York, Barcelona: Actar Publishers.