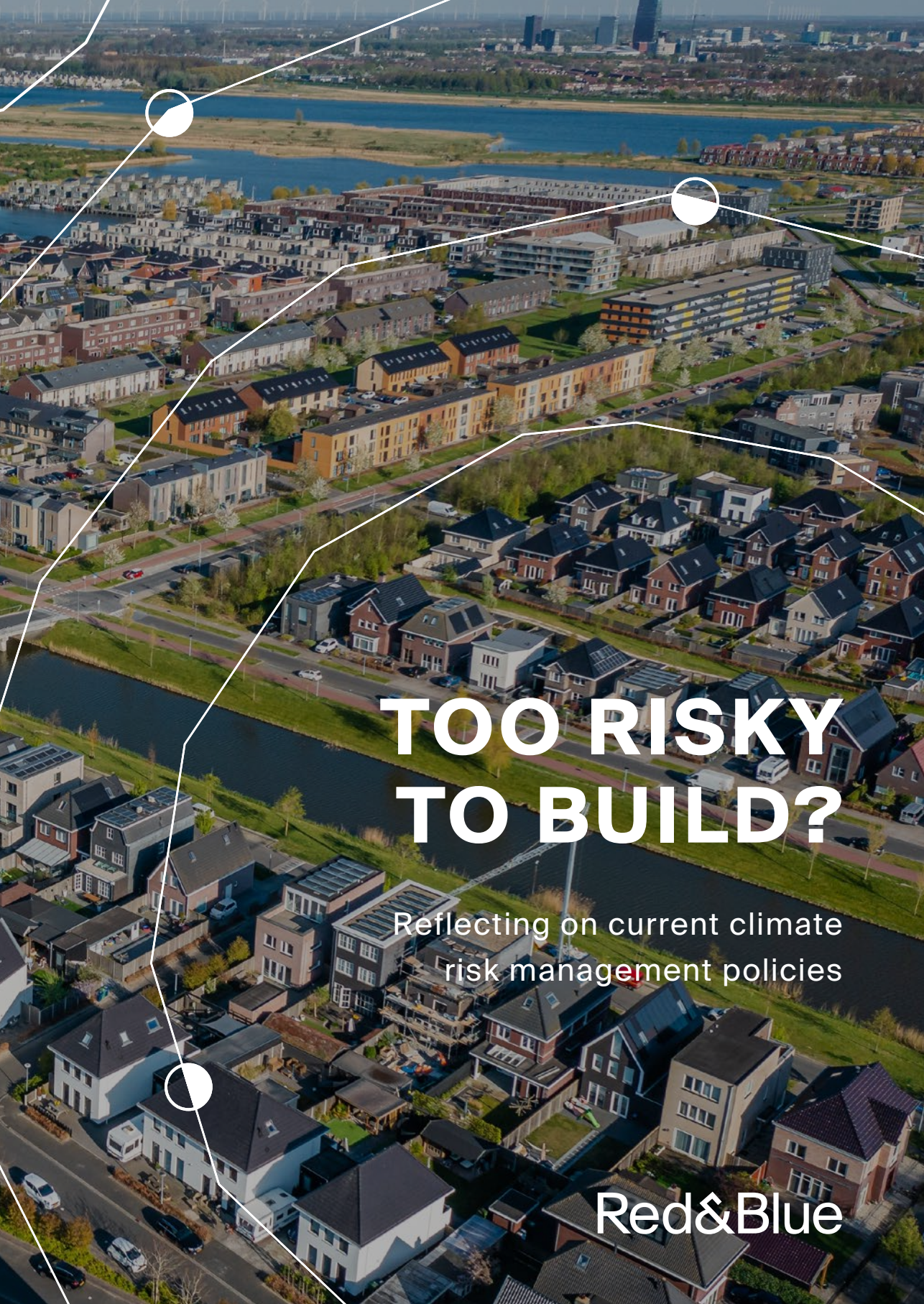


TOO RISKY TO BUILD?

Reflecting on current climate risk management policies

Red&Blue

Index

TOO RISKY TO BUILD?

Reflecting on current climate risk management policies

Overview of the 5-year Transdisciplinary Research Agenda Real Estate Development & Building in Low Urban Evironments (Red&Blue) 2022-2027

Real estate and infrastructure systems are increasingly impacted by physical climate risks posed by sea level rise, heat waves, and other threats like more frequent and intense storms. Such climate risks cause broad and interconnected social, economic, and political concerns about the stability of markets and society at large. The Netherlands is one of the countries where the quality and value of the built environment are under climate-driven pressures, especially in the low lying, vulnerable, yet densely populated areas of the country. Alternative to full retreat scenarios, expected effects of climate change on vibrant cities like Amsterdam and Rotterdam call for spatial investments and innovations from governments, firms, and citizens alike.

To make smart spatial investments and innovations, the complex relationships between climate change, real estate and infrastructure need to be intricately understood.

To do this wisely, the complex relationships between climate change, real estate, and infrastructure need to be intricately understood. The Red&Blue research program aims to develop just that.

This report provides a concise explanation of Red&Blue: a five-year research and impact program that develops and promotes a transdisciplinary perspective on adaptation to climate risk in the built environment. The program brings together scientists and practitioners to co-develop an integrated climate governance strategy for the Dutch delta. It builds on a co-creation process that started in early 2020, and hitherto involves over 50 representatives from key professional and academic organisations active in the fields of area development, real estate finance, climate risk assessment, infrastructure design, spatial planning, law and governance. Hence, the experts involved in Red&Blue represent both the public and private sectors as well as important scales and types of expertise and responsibility.

After launching in Valkenburg in September 2022, Red&Blue is now well underway. This report introduces the program, and is structured in four sections:

- An introduction presenting an overview of the climate risks in the Dutch delta context, real estate development, our motivations to form Red&Blue, the program's objectives, and a summary of research questions to be addressed.
- An overview of our transdisciplinary approach and focus areas, reflecting our efforts to collectively define, understand, unravel, and ultimately tackle this complex challenge.
- The program structure including management strategy, an overview of the work packages and our impact strategy and collaboration plan including corresponding activities and events organised so far.
- Some preliminary insights and products; next research steps, engagement plans and activities in 2023-2024.

1

Introduction

Climate change poses enormous challenges to existing real estate and infrastructure systems and development strategies in the Dutch urban delta. These include climate mitigation and adaptation challenges, related to the decarbonization of our society and energy transition, and strategies to cope with a changing physical environment. We focus on physical climate risks posed, for example, by rising seas, stronger storms, and extreme heat (as shown globally in Figure 1), and how these threats create new or additional strains on our society. We assess potential impacts on our homes and other real estate assets, on our infrastructure and provisioning systems, on the institutional capacity to deal with extreme events, and on financial and societal stability more broadly.

Projections from a 2014 OECD study animate the enormity of the risk exposure in the Netherlands in terms of direct asset values: Amsterdam and Rotterdam alone are estimated to have $128.3 billion and $114.9 billion of asset value exposed to climate risks under current conditions, which could grow significantly to $843.7 billion and $825.7 billion by 2070 based on projected ecological and socio-economic trends.

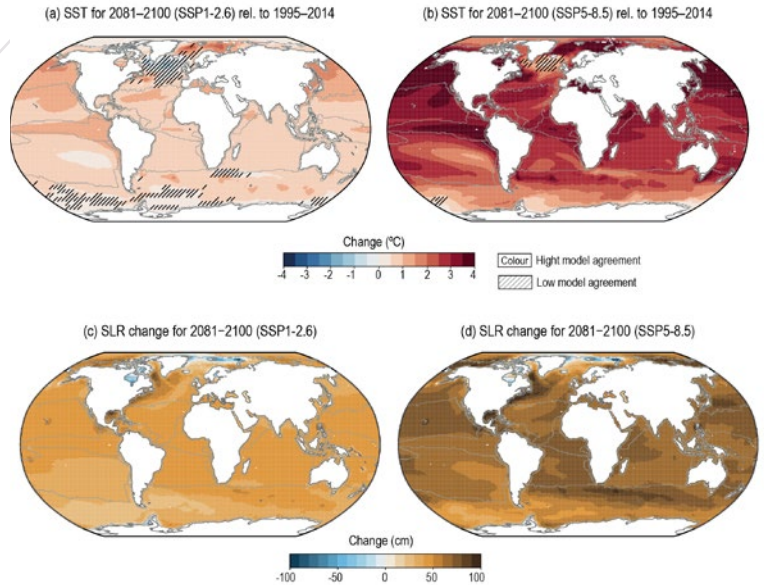


FIGURE 1
Changes in global temperature (a&b) and Sea Level Rise (c&d) projected for different w scenarios (Source: Figure Atlas. 12, IPCC 2021)

FIGURE 2

Aerial view on green neighbourhood in Almere, The Netherlands, surrounded by water and nature. Photo by Pavlo Glazkov, 2022 (Source: Shutterstock)

Climate shocks and stressors will not be equally felt, however. Specific physical processes of environmental change vary between and within regions and development contexts, driven by water and subsurface conditions, among other factors. Also, local communities will have a wide range of pre-existing vulnerabilities and capacities to adapt to environmental change. Homeowners and social tenants in a waterfront neighbourhood may experience more frequent floods very similarly, but will face diverging challenges in dealing with and adapting to those events (Figure 2 shows landscape of a waterfront neighbourhood in Netherlands).

Similarly, many financial institutions will be impacted by the devaluation of real estate due to climate risk, from mortgage lenders and insurance companies who serve homeowners, to the pension funds and other institutions that invest in or develop property. Public sector agencies also share overlapping but distinct duties to manage physical risks through infrastructure, spatial planning, and other risk management and preparedness approaches, moreover. How, when, and to what extent each of these important actors is impacted by climate risk, or is required to act, will vary.

In line with the above-mentioned actors, climate risk will affect a whole network of real estate and infrastructure stakeholders and their relations. Figure 3 gives an overall picture of the interdependent stakeholders (e.g., planners, investors, engineers, residents, regulators) within the real estate value chain (e.g., development, finance, construction, occupancy). They either represent public sector (e.g., national or regional government as regulators), private sector (e.g., brokers as property managers), or both public-private (e.g., urban planners, investors, insurers). These stakeholders are involved at different phases of the development process, in various shapes and sizes with distinct powers, interests, acts and impacts.

The actors depicted in Figure 3 are inter-connected. For example, spatial planners, housing developers, architects, and engineers may collaborate to share their knowledge and expertise on land remediation, sustainable construction, or making spatial plans. Similarly, there is a close relationship between investors, banks, planners and developers in evaluating development proposals and providing financial support to cover associated costs, either as short-term financing or long-term investments.

With respect to the spatial scale, real estate and infrastructure development is considered and explored at different levels (depending on area of interest, development goal, or data availability) ranging from asset and building level to local, regional, and national scales. Such distinct spatial scales may lead to varied plans, regulations, insurance policies, investments, property management strategies, and so on.

As shown in Figure 3, the development process is multi-dimensional involving social, technical, environmental, economic, political, and legal aspects. This multi-dimensionality derives from wide ranges of development phases and corresponding stakeholders in multifaceted areas such as management, finance, engineering, and planning. As an example, construction mostly relates to technical and environmental aspects, while occupancy, and setting up laws and regulations correspond to the social, and legal-political dimensions of real estate and infrastructure, respectively.

Climate risk will affect a whole network of real estate and infrastructure stakeholders.

Our overall picture of real estate and infrastructure dimensions and stakeholders clearly shows the interconnected exposure of individuals, communities, assets and systems to climate risks, and helps to explain why this poses broader social and economic threats to societal stability. Beyond social and physical stakes, there are also significant market risks. Households, financial institutions, and governments rely on the value of real estate to spark economic growth and create wealth.

FIGURE 3

A schematic representation of the multi-dimensional real estate and infrastructure value chain, and corresponding stakeholders and actors involved from different organisational sectors

FIGURE 4

Buildings being reconstructed along the river Ahr in Germany, one year after the flood of July 2021.
Photo by Red&Blue, 2022

1.2 CHALLENGES IN CLIMATE RISK MANAGEMENT

Climate risks—and their management, through new public policies, financial practices, and building codes—could significantly disrupt today's housing-centric approach to spatial planning in the Netherlands. Increasing climate-related building and financing costs, rising insurance premiums, declining property values in vulnerable areas, and other ways in which climate risks can affect real estate markets, could all become apparent in our highly vulnerable delta region. The social and economic unrest caused by these market effects are likely to pose a range of political challenges.

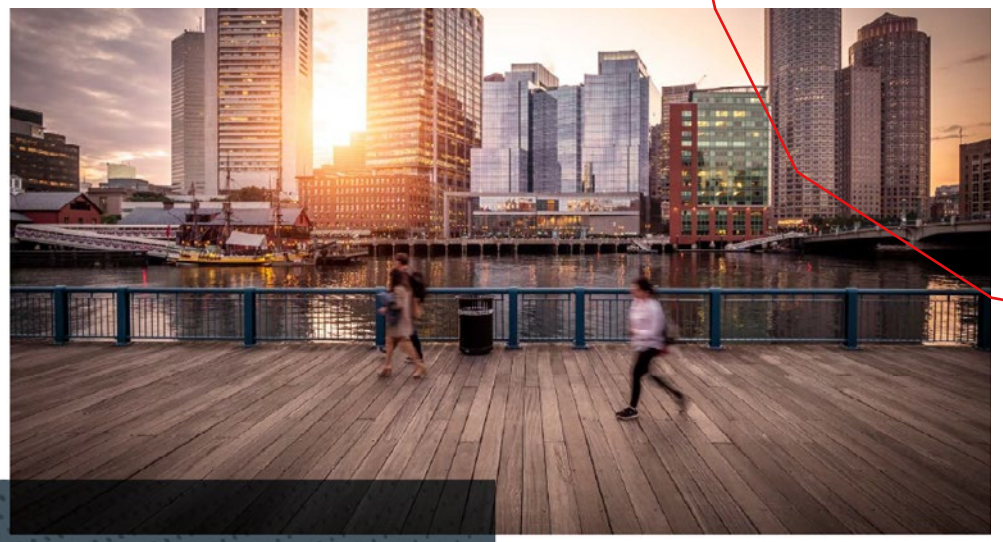
Demand for real estate, remains high due to several intersecting trends and policy decisions inside the country and beyond.

FIGURE 5

Right Above: Flooding after hurricane Sandy in New York City. Photo by David Shankbone, 2012 (Source: Wikimedia Commons)

Right Below: The city of Dordrecht with the Great Church, during spring tide combined with a storm causing very high water levels, wintertime. Photo by Richard de Bruijn, n.d. (Source: R. de Bruijn Photography)

Despite a growing recognition of the physical risks faced in the Netherlands, real estate development and investment largely continues unabated—also in ecologically sensitive areas. Demand for real estate, be it as a home or asset class, remains high due to several intersecting trends and policy decisions inside the country and beyond. As a result, building permits are approved in areas beyond current flood defences, or where water and soil conditions point to significant long-term vulnerability.



CLIMATE MIGRATION AND
REAL ESTATE INVESTMENT
DECISION-MAKING

Urban Land Institute

HEITMAN
A REAL ESTATE INVESTMENT MANAGEMENT FIRM

How do real estate investors understand complex climate risks in the communities in which they invest?

A new resource (Taylor, 2022) from the Urban Land Institute, led by TU Delft affiliated researcher Zac Taylor, highlights investor perspectives on the current state of the field, and proposes analytical strategies for connecting investment decision-making with climate assessment. Photo by anonymous, n.d. (Source: Taylor, 2022)

The Economist

Florida's government subsidises people living in hurricane zones

This props up the property market, which state revenue relies on

Oct 6th 2022 | FORT MYERS, FLORIDA

Share

Florida's government subsidises people living in hurricane zones

Read the full interview with Zac Taylor (Assistant Professor at TU Delft)

Photo by Win McNamee, 2022 (Source: The Economist)

Public officials at higher tiers of government are yet to understand and create the appropriate spatial planning and financial market interventions needed to manage climate risks, although there are signs of shifts in public policy. Institutional real estate investors, re/insurers, and other financial market actors are similarly taking initial steps to manage climate risks, but they largely focus on the performance of their portfolio—not on addressing the underlying exposure of assets and the communities in which they are located.

With respect to institutional responses to real estate climate risks, a range of key Dutch and international public and private actors are on a fast-evolving journey to understand how climate risk-related dynamics will impact our built environment, and how these can be mitigated at a variety of scales. While promising, these emergent real estate climate risk management practices remain limited in scope. They tend to be fragmented along industry and sector lines, and often remain focused on narrowly defined performance goals. Hence, a broader, collective, and more integrated view of climate risks and their management remains crucially needed. At least three interrelated problems explain this state of affairs.

- First, a foundational baseline of knowledge related to physical climate risk has yet to fully develop. The lack of such a baseline impairs transparent, interoperable, joined-up, and inclusive decision-making. In other words: key actors concerned with climate risks are not working from the same level of understanding, or with a shared problem definition and established toolkit.

- Second, and by extension, individual actor-centric strategies that optimize risk exposures at asset, development, or portfolio-scales may have unintended and maladaptive consequences – both for these individual actors and society more broadly. As a simple example, consider a single asset designed or retrofitted to be "flood proof". Absent larger scale interventions to manage flood risk at a neighbourhood or regional level, the asset may be inaccessible on flooded roads, or devalued due to area economic decline, respectively. Figure 5 shows two examples where assets are not accessible due to flood events.

- Third, and finally, the potential second- and third-order effects (e.g., rising housing unaffordability, or climate migration), and the interactions between distinctive climate risks and management approaches, are not well understood. The assessment of complex climate risks, their management and potential second- and third-order effects are still missing today – in the Netherlands, Europe and beyond.

1.3 OUR MOTIVATION TO LAUNCH RED&BLUE

In December 2021, Mayor Femke Halsema of Amsterdam called on the new Dutch cabinet to set up a national climate think tank. Like most of the Randstad area, the capital is very sensitive to the effects of climate change. This sensitivity stretches far beyond the physical risk of flooding, extreme heat, and land subsidence. What would happen, for example, if international (re)insurers and financial institutions label our country as a "high-risk area"? Existing buildings and infrastructures would sooner or later be written down, which would hit Dutch capital and creditworthiness hard – potentially before a single flood ever happened. The consequences for households and companies, for banks and pension funds, and therefore for our society, would be profound. The above example only approaches the problem from an economic point of view. The same month as Mayor Halsema's plea, Delta Commissioner Peter

What would happen if international (re)insurers label our country as a high-risk area?

Glas sent advice on housing construction and climate adaptation to the Ministry of Infrastructure and Water Management. Glas concluded that “the cost-benefit ratio for climate-adaptive construction in urban areas is positive and can be seen as no regret”. The Commissioner’s letter came at the right time.

The coalition agreement that followed established that water and soil conditions should guide the further spatial development of the Netherlands. Over the next four years, climate adaptation and area development will be inextricably linked – and the challenges and opportunities more compelling.

In addition to the above-mentioned calls, a working group organized under the authority of the Dutch National Bank was recently asked to develop an understanding of the impacts of climate change on financial institutions, and to consider how finance can help to tackle adaptation challenges in the Netherlands. Similarly, institutional real estate investors and asset managers, including Dutch firms with thousands of assets in the Netherlands and abroad, have taken steps to assess and manage the physical climate risk exposure within their portfolio by investing in risk reduction measures at the asset-level, or by exploring whether to shift investment or discount projected returns from current or potential assets in high-risk areas.

As the Delta Commissioner stated: “Climate developments potentially affect all existing and future uses (including housing) in the low-lying areas of the Netherlands, the floodplains along the major rivers and the areas outside the dikes along the large waters”. If we do not include climate adaptation in the planning of area developments, sooner or later these projects will be unviable. Because, the commissioner continued, “new investments in these areas can increase the future damage burden and/or adjustment costs”— to residents and municipalities, but also to society at large. New development and investment strategies will need to be developed and supported by robust collaboration and new scientific insight. It is becoming increasingly apparent that "we" will otherwise pass on significant costs to future generations.

How, then, can stakeholders come together to assess these challenges, understand the state of current scientific and practical knowledge, tackle unanswered questions, and co-create strategies that promote integrated, equitable strategies for climate risk management in the built environment? We believe we need transdisciplinary knowledge and collaboration to tackle these multifaceted challenges. How can we achieve this?

What can real estate and infrastructure climate risk management look like in the Netherlands?

See a report, and full presentations, from the expert meeting at TU Delft that kicked-off this research co-creation process at Gebiedsontwikkeling.nu

Photo by Sander van Wettum, 2020 (Source: Gebiedsontwikkeling.nu)

In March 2020 in Delft, we invited a broad range of stakeholders to consider what real estate and infrastructure climate risk management currently, or could, look like in the Netherlands. Through a series of presentations and open discussions with over fifty stakeholders (see Figure 6), we took stock of many of the existing scientific and practical knowledge gaps related to climate adaptation. In the two years that followed, we held four additional group discussions and extensive one-on-one meetings with scientists, policymakers, real estate investors, housing providers, and other societal stakeholders, bringing on new perspectives and institutions in the process.

If we do not include climate adaptation in the planning of area developments, sooner or later these projects will be unviable, particularly in low-lying areas.

Over the course of these interactions, we came to collectively pinpoint specific issues that represent key knowledge levers, or points where knowledge can be particularly influential in sparking action. We distilled these insights into a knowledge agenda with concrete research questions, which are discussed in the following sections. This co-creation process revealed the extent to which a shared vocabulary is needed to define, debate, and analyse real estate and infrastructure climate risk management issues.

FIGURE 6
Expert meeting in March 2020 in Delft. Photos by Sander van Wettum, 2020 (Source: Gebiedsontwikkeling.nu)

Interview with Prof. Ellen van Bueren about the Red&Blue program

Read the full interview with Prof. Ellen van Bueren (the Red&Blue Program lead) by Bouwinvest.

Figure by anonymous, n.d. (Source: Bouwinvest.nl)

Industry, government, and academic institutions do not simply arrive at a common climate governance agenda: they often understand key concepts – often using the same words – in different ways. This has crucial ramifications for how we define and address shared problems. For example, terms like "climate risk", "value", and "resilience" prompted frequent discussion about their precise meaning. The co-creation process enabled moments of translation and reflection among collaborators, and this search for a common vocabulary as a basis for analysing and creating climate risk management strategies which is the central feature of our approach.

Real estate and infrastructure climate risk management is also politically charged and potentially conflictual.

Our knowledge exchange and dialogues have illuminated a clear need for safe, open spaces for dialogue and exchange between stakeholders. Real estate and infrastructure climate risk management is not only technically complex and siloed by discipline and industry, but also politically charged and potentially conflictual. Even the well-intentioned and prudent institutional choices about how to manage risks have the potential to create inequitable societal impacts, which need to be recognised and addressed openly and early. These potential challenges, and the priorities and ambitions of a broader set of stakeholders, must be elevated in the dialogue. Similarly, the challenge of translating uncertain climate science into actionable insight for high-cost, high-stakes real estate and infrastructure investments, or for shaping far-reaching spatial policy and land use decisions, needs to be addressed head-on by providing a shared platform where stakeholders can unpack knowledge and debate responses.

RED&BLUE OBJECTIVE

The overarching objective of Red&Blue is to promote integrated climate governance strategies that collectively enhance longer-term equity and resilience within the real estate and infrastructure systems of the Netherlands.

To this end, the consortium will cultivate common understandings, shared vocabularies, and identify ways to align strategic interventions that facilitate a societal shift towards (more) integrated climate governance and collective transformation.

RESEARCH QUESTIONS

We have identified seven sets of questions that, together, point us towards the objective of this project.

1. What are the most pressing physical risks facing the Netherlands? What is the likelihood and impact of consecutive or compounding risks? And what are clear, transparent methodologies that we can all use to evaluate and manage these evolving risks?

2. What is the economic value of real estate exposed to physical climate risks in the Netherlands? Where do these risks accrue spatially and over time, and which types of real estate and users are most vulnerable to devaluation?

3. How are key real estate, finance, and infrastructure stakeholders currently managing physical risks? Are these strategies sufficient – and sufficiently integrated? What unexpected societal challenges might emerge because of these strategies, and how can they be mitigated?

4. How do spatial patterns of real estate climate risk exposure intersect with existing and potential social equity concerns? How do we assess and address the social dimensions of resilience within new real estate and infrastructure strategies?

5. How do current spatial and environmental policies, hazard mitigation standards, investment regulations, housing measures, and other relevant legal frameworks address climate risk? What are the limits, tensions, gaps, and opportunities to refine these governance arrangements?

6. What engineering strategies and tools exist to mitigate climate risks? How do we best combine and leverage diverse engineering approaches within institutional planning, design, development, and financing strategies?

7. How do we develop shared problem-definitions and co-create joined-up risk management strategies? How do we maintain a frank and safe space for exchange, while also being inclusive and engaging a broader set of stakeholders and closely related thematic issues, like the energy transition and circularity?

2

Trandisciplinary Approach and Focus Areas

The co-creation process and our preliminary discussions with key stakeholders led us to adopt a transdisciplinary approach — that is, two-way exchange between a diverse set of academic and societal experts — that engages tactically at key points of leverage and influence within the Dutch policy, planning, development, infrastructure management and real estate investment systems. Our transdisciplinary approach seeks to enhance both scientific excellence and collective capacity to promote a broader shift towards integrated and equitable physical risk governance strategies. Working alongside consortium members, we have prioritised seven focus areas with research questions. For each set of questions, we also explore what our outcomes might look like, how they would be beneficial for targeted stakeholders, and why it can help us achieve our broader ambitions.

FOCUS AREA 1: PHYSICAL CLIMATE RISK ASSESSMENT

This focal area will unlock new insights into state-of-the-art physical climate risk modelling and mapping techniques relevant to the Dutch context. In collaboration with climate scientists, stakeholders can expect to arrive at a deeper understanding of the compound and consecutive physical climate risks facing the Netherlands and their institutions, with a focus on actionable risk analysis techniques that can be adapted to specific spatial and institutional contexts.

These insights can deepen existing real estate-finance institutional capacity to assess and address climate risks, for example when building out in-house technical capacity, or when evaluating third-party risk assessment approaches. For public bodies, these insights can inform decisions regarding the appropriate climate scenarios to incorporate within decision-making processes, and the data needed to support robust long-term investment. Over time, these insights can facilitate the mainstreaming of transparency and comparable physical climate risk assessment methods and standards which can be applied throughout the real estate and infrastructure planning and delivery processes.

FOCUS AREA 2: ASSET VALUE-AT-RISK MAPPING

Using physical risk assessments and asset-level price data at national scale, we aim to identify existing and potential geographies of exposure where real estate asset values are, or may come to be, at risk. This mapping exercise will help us to understand where risks are likely to be spatially concentrated and on which time horizon, and what may be the socio-spatial effects due to changes in asset valuations.

By overlaying insights about potential physical climate risk scenarios, data about real estate and infrastructure systems, and property values, we can better assess the existing and potential geography of real estate value-at-risk in the Netherlands and look for evidence of climate-related price effects in the market. This data can inform further research on urban areas that are already subject to, or more likely to experience, price effects, including assessment of the social and spatial impacts of real estate market disruption and potential place-appropriate adaptation strategies.

FOCUS AREA 3: REAL ESTATE-FINANCE STRATEGY ASSESSMENT

Within this focus area, we will analyse the climate risk management strategies of real estate-finance institutions and how well-integrated they are with emerging urban- and regional-scale adaptation strategies. Current and emerging real estate-finance climate risk management practices can be shared, assessed, and refined with new insights from the asset-, area-, portfolio-, and regional systems-levels, working through applied urban use cases drawn from existing area development projects and sites in participating cities like Amsterdam, Dordrecht, and Rotterdam, and other communities in the Provinces of North and South Holland. This assessment can help public and private institutions to recognise barriers and opportunities to advance their internal institutional-level practise, and to co-define the necessary governance arrangements that can support effective collaboration and coordinated response.

FOCUS AREA 4: INTEGRATED CLIMATE RESILIENCE INDICATORS

We will link physical risk assessments with relevant socio-economic-ecological vulnerabilities and societal values.
Adapting available public data sources and including new qualitative and quantitative data, will enable us to develop indicators and tools that facilitate more inclusive deliberation and decision-making at different levels, e.g., asset, portfolio, and urban systems. Social and environmental vulnerability and inequity must be better integrated within real estate and infrastructure climate risk management practices, which are today predominantly driven by economic considerations generally linked to property valuations and associated financial risks. Transdisciplinary analytical frameworks and strategies for integrating existing statistical data with rich qualitative insights from frontline communities can help produce actionable resilience indicators. This can support investors and other institutions seeking to meaningfully align their environmental, social, and governance (ESG) strategies with place-based needs and opportunities in the built environment.

FOCUS AREA 5: ALIGNED GOVERNANCE ARRANGEMENTS

This focus area will assess laws, planning tools, and policy-making procedures to identify how investments in real estate and infrastructure can improve societal climate resilience (e.g. Kim and Olshanksy, 2014). In addition, this will clarify the current and potential distribution of responsibilities for physical risk management in real estate and infrastructure systems. We will assess the extent to which we need to develop and test new or reformed governance arrangements that can align stakeholders and address limits and opportunities linked to integrated interventions.

Greater understanding of how existing policy and governance arrangements assess and assign responsibility for addressing specific climate risks is crucial. By evaluating the current governance landscape, real estate and infrastructure stakeholders can reflect on key barriers and opportunities for policy and coordination innovations that facilitate action. Stakeholders will also be able to test new hypothetical arrangements and their effects through serious gaming exercises. These research interventions can promote a stronger understanding of where strategic reforms within the existing governance landscape can be most productive.

FOCUS AREA 6: CLIMATE ADAPTIVE ENGINEERING APPROACHES

Here we aim to identify and optimize suites of technical building, infrastructure, and financing solutions and to link them to decision-making pathways for integrated climate risk governance. In addition to evaluating the technical effectiveness of solutions and their combinations, we will consider equity, ecology, uncertainties associated with physical climate change impacts, and so forth.

Stakeholders need access to decision-support tools that help them to identify, assess, and combine various "hard" and "soft" technical risk management solutions given urban area- or building-level contexts and constraints. These insights can help stakeholders to refine their existing asset design, planning, and maintenance approaches, and more effectively leverage their capital, time, and other scarce resources while also keeping an eye on larger shared values, like those related to equity and ecology.

FOCUS AREA 7: KNOWLEDGE EXCHANGE AND CAPACITY BUILDING

By convening regular stakeholder forums, we will facilitate knowledge exchange and capacity building among societal partners participating in the consortium, and beyond. This will be supported by artificial intelligence techniques, intended to help consortium leads to pinpoint how stakeholder discourses evolve, revealing topics that are prioritized or those that are absent – and to, in turn, facilitate interactions that return to our core objective and shared values. Knowledge exchange will also be fed by research in practical urban use cases in the Greater Amsterdam and Rotterdam regions, enabling a two-way link between research and specific institutions, projects, and community insights and activities.

FIGURE 7

Photo by Eric Fecken, n.d. (Source: Red&Blue)

3

Program Structure

3.1 GOVERNANCE OF THE RED&BLUE PROGRAM

To support Red&Blue's management, we designed a framework that illustrates inter-relations across project management team and the work package researchers. The supervisory board, chaired by the project leader, is at the core of the governance structure and, responsible for implementing the research program. The daily management of the consortium is ensured by the project management team consisting of a general project manager, supported by a financial manager and a communication manager.

The advisory committee (see Figure 8) is comprised of leading Dutch and international experts from both science and practice. The committee works in alignment with the Red&Blue agenda and is responsible for supervising the consortium at a strategic level. This responsibility involves reviewing the overall progress of the program, and identifying opportunities to elevate the scientific and societal impact of research activities.

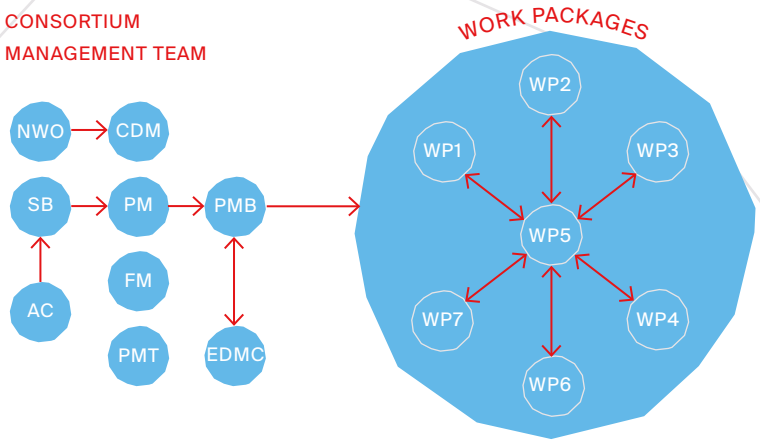


FIGURE 8
Red&Blue Management Framework

LEGEND

SB	Supervisory Board
AC	Advisory Committee
CDM	Communication and Dissemination Manager
PM	Project Manager
FM	Financial Manager
PMB	Project Management Board
EDMC	Ethics and Data Management Committee
PMT	Project Management Team

3.2 WORK PACKAGES & IMPACT PLAN STRATEGY

Corresponding to the focus areas mentioned in section 2, the Red&Blue program is structured with seven Work Packages (WPs) – see Figure 9. The first four WPs are largely focused within a specific disciplinary domain (e.g., economics, law, governance engineering) but will receive inputs or generate outputs from/to other WPs. WPs 5-7 provide the ground for the former lines of analysis to come together, both conceptually and practically, through a range of collaborative and outreach activities. This structure and strategy stems from the fruitful insights derived during extensive interactions, including group and bilateral dialogue and knowledge exchange during the proposal development process.

Red&Blue aims to embed research activities and use case insights to stimulate transformations in the real estate climate risk management approaches of a wide range of public and private institutions and actors. Our three-layer impact plan strategy includes the following layers:

LAYER 1 – INTERNAL CONSORTIUM EXCHANGE

This layer focuses on the facilitation of knowledge exchange between scientific and societal partners within the consortium. This includes Red&Blue Lab days (8 days/year of co-working) planned between the scholars and researchers, monthly research-related thematic meetings, and urban use case research activities. So far, we have organised the first five labs in 2023 as detailed below:

LABS

Figure 10 shows some pictures of the five labs held in January-June 2023. During these monthly events, Red&Blue research teams from different WPs were given the opportunity to share their research progress, plans, questions and challenges, to exchange their knowledge on various topics, and to explore further collaborations along the way.

In the 1st lab hosted by TU Delft and SKG (January 2023), PhD and Postdoctoral researchers got to know each other, their research, and the wide range of stakeholders from various sectors involved in the program.

Different topical areas and questions were discussed and reflected on in this lab as follows:

- Necessity of proper data management to make research data as public and accessible as possible for researchers, also considering data confidentiality.
- Application of AI-techniques to keep track of stakeholder's behavioural change along the project lifetime.
- High willingness of the Red&Blue practice partners for collaboration and integrative discussions with others, a tendency not often seen outside of the Red&Blue framework.
- Challenges in understanding stakeholders as there are many actors with diverse relations, powers, interests, concerns, actions, and impacts. How can we better understand these actors and relational dynamics?
- Who is missing in the consortium? Who else would we like to engage with, and how can the consortium pave the way for productive exchange and useful engagement?

The 2nd lab (February 2023) — combined with the Red&Blue Co-Applicant Meeting — was hosted by the AMS Institute focusing on the urban use case studies in the Amsterdam and Rotterdam regions. In this lab, researchers and academic teams from each WP exchanged knowledge on the following areas:

- Urban use case selection in Rotterdam and Dordrecht cities, and criteria to be considered for the Amsterdam case studies such as their political, environmental, technical, social, and economic characteristics.
- The specific challenges that need to be addressed in the urban use cases. What types of urban cases are defined and addressed in each research work package?
- The high importance of bridging fundamental research insights and field of applications via selected urban use cases, and keeping interactions with practice partners.
- The necessity to build an interface with the other ongoing societal debates and professional conversations, like the energy transition, smart urban mobility, circularity in urban regions, and digitalization.

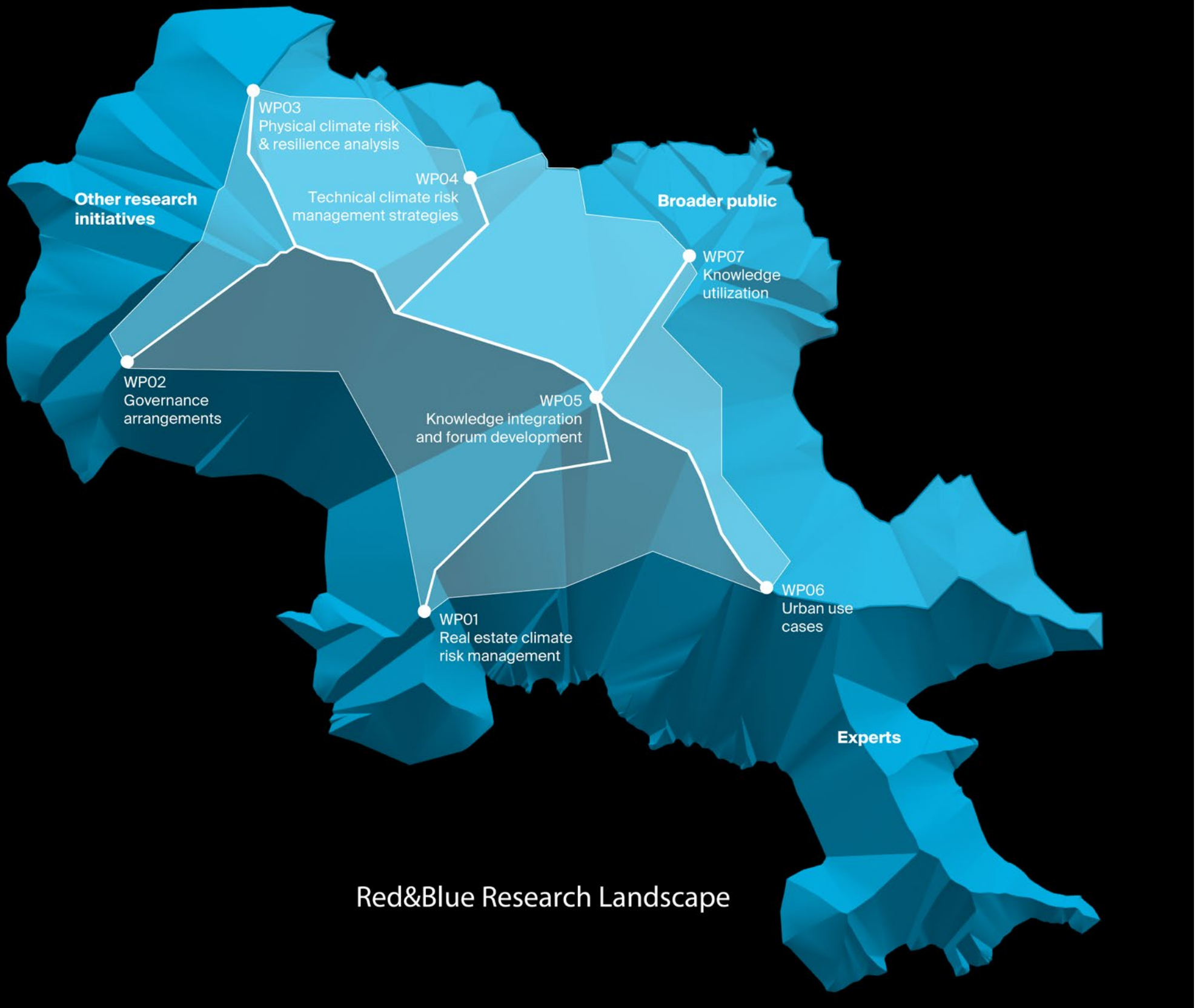


FIGURE 9
Red&Blue WPs and their inter-relations

FIGURE 10
Red&Blue labs in January - June 2023. Photos by Red&Blue, 2023

The 3rd lab (March 2023) was hosted by the Deltametropolis Association in Rotterdam. In this lab, researchers gave updates on their work progress and shared their research questions, and insights on each other's work. This was followed by a role-play stakeholders mapping, and a joint session with some of the consortium partners in practice. Some of the main discussion points, questions, and observations were the following:

- There is data scarcity in real estate finance and its relation to climate risk. This particularly makes, vulnerability assessments of physical climate risks (posed by e.g., hail and windstorm) challenging. In addition, there is also a question of how climate risk can be translated to financial risk (e.g., credit risk)?
- Provision of information on climate risk may affect sales prices as well as buyer's reactions on the real estate market. This is currently under investigation by some researchers, who explore to what extent flood risk awareness in both protected and un-embanked areas in Dordrecht may affect relevant markets.
- How is the built environment protected against climate risk in a multi-layered governance system like The Netherlands? What are the effects of policy decisions throughout these layers on the real estate market?
- How can we make two-way transdisciplinary and cross-actor exchanges as smooth and effective as possible? How to enhance the productivity of such collaborations and exchanges? How can knowledge integration approaches and AI techniques assist?

In the 4th lab hosted by the Municipality of Dordrecht (April 2023), research projects focusing on Dordrecht urban areas were presented by research fellows and representatives of the Municipality of Dordrecht. These presentations and follow-up discussions among the team led to the following points:

- Red&Blue can be instrumental in terms of raising awareness and clarifying responsibility of stakeholders who need to take care of flood impacts, as it considerably affects house prices and the real estate sector.
- The city of Dordrecht is planning a shelter area for evacuation of people in case of severe floods. The ambition is to combine this with building 10,000 new homes in the city, some of which requires a complex transformation of industrial zones to residential areas.

- 66% of the buildings in Dordrecht are in areas prone to land subsidence. The questions to address are:
  - To what extent are buildings prone to land subsidence?
  - Who is (relatedly) responsible to take action?
  - Who are the owners of vulnerable houses and who are their mortgage lenders?
  - What is the role of the municipality in mitigating the risks involved?
- Application of the knowledge integration methodology for the Maasterras-Dordrecht case study shows that the methodology helps bring knowledge into action and fosters a productive dialogue between a wide range of disciplinary expertise. The process is two-folded including both generation and digestion of knowledge.

The 5th lab (June 2023) was hosted by Resilient Delta Initiative (RDI) in Rotterdam. This lab focused mostly on Merwe Vierhavens (M4H) as one of the selected urban use case areas in Rotterdam. During this lab, researchers were given informative presentations on long term planning process and transformation of M4H in historical perspective, and collaborations between Municipality and Port authority for jointly developing the M4H area. In addition, researchers shared their insights on various Red&Blue communication and engagement activities and discussed how to collectively make this process more dynamic during the project (e.g., website management, newsletter, podcast, visual narrative, LinkedIn Group).

FOCAL POINT MEETING #1

In March 2023, the 1st Red&Blue Focal Point Meeting was hosted by Bouwinvest Real Estate Investors in Amsterdam with the theme "Climate Risk Mapping and Asset Valuation". In this expert meeting, 18 partners from different fields of expertise in research and practice exchanged their views on the topic of climate risk modelling for the built environment. The aim of this expert meeting was to better understand the challenges and solutions in developing real estate climate risk assessment models and decision-making information.

The dialogues and discussions in this meeting were embedded mainly within the following topical areas:

- Distinct risk perceptions and climate risk approaches, and the need for standardization
- Global challenges in relation to data availability, applicability and reliability
- Actionability of climate risk data
- Necessity of facilitating public-private knowledge exchange
- Climate risk impacts on human-social equality
- Multiple spatial scales in risk assessment. A report including the outcomes of these discussions and knowledge exchanges was published on the Red&Blue website.

LAYER 2 – TECHNICAL AND EXPERT ENGAGEMENT

Here, we aim to connect research and practice by linking internal consortium and external parties. Activities include the development and dissemination of thematic reports corresponding to each focus area, expert-focused capacity building workshops, an annual integrative forum event (symposium), and a Dutch policy-practice oriented symposium.

ANNUAL SYMPOSIUM 2022

The first Red&Blue Annual Symposium and Integrative Forum Meeting was held in September 2022 in Valkenburg (see Figure 11). In this event, a keynote presentation was given by IPCC scientist and Red&Blue Advisory Board member Marjolijn Haasnoot. Her keynote was followed by two rounds of panel discussions featuring real estate-finance institution stakeholder perspectives, transdisciplinary reflections from researchers, and field excursions in Valkenburg and the nearby Ahr Valley in Germany – areas deeply impacted by floods in summer 2021. At this launch event, real estate finance institutions reflected on the urgent need to create standardized, and shared climate risk assessment frameworks, methodologies, and data.

RED&BLUE AT THE SKG ANNUAL CONFERENCE 2023

In March 2023, the Red&Blue program was presented by the lead team of the urban living labs at the Annual SKG Conference in Amersfoort. In the Red&Blue session entitled "Climate Adaptation & Area Development", the team hosted participants and key experts from various public and private sectors including municipalities, banks, real estate investors, universities, consultancy firms, and so on.

In this session, three key speakers from municipalities of Amsterdam, Rotterdam, and Dordrecht gave insightful presentations highlighting climate risks, related challenges, existing/potential solutions and plans to cope with these risks in the three cities.

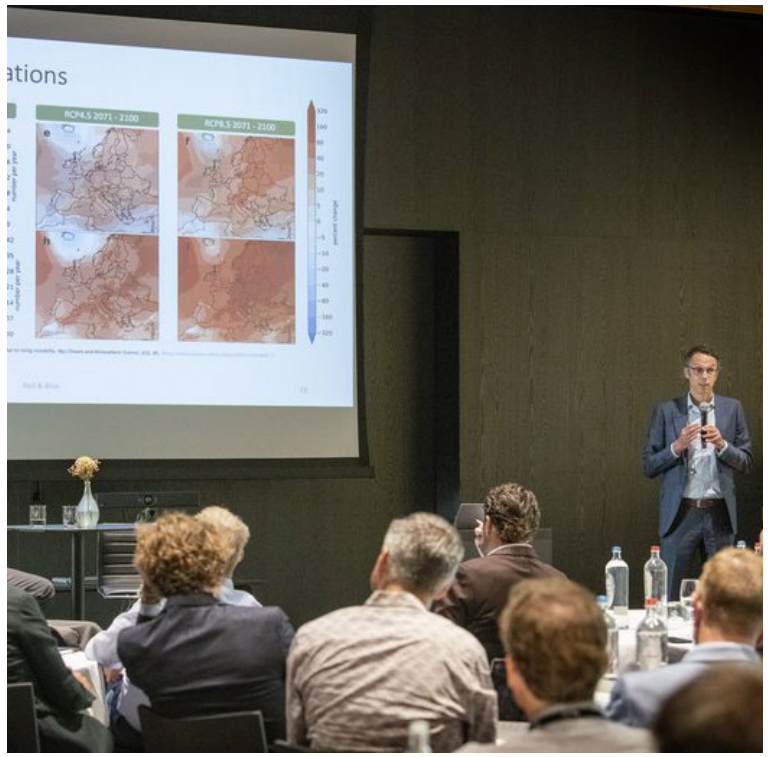


FIGURE 11
Red&Blue Annual Symposium (Kick-off event) in September 2022 in Valkenburg. Photos by Simon Pugh, 2022 (Source: Gebiedsontwikkeling.nu)

FIGURE 12
Red&Blue Annual Symposium in September 2023 in Amsterdam.
Photos by Red&Blue, 2023

For example, the City of Amsterdam presented one of its key planning approaches which focuses on making a balance between innovation, ecosystem and infrastructure. This highlighted the urgency for building trust and scaling-up through collaborations between partners like knowledge institutes, private sector businesses, and government bodies. Part of the discussion led by the Municipality of Rotterdam were about living in outer dike areas exposed to flooding, or in areas with heat stress, a high rate of land subsidence and/or high ground water levels — as is seen in some neighbourhoods of Rotterdam today.

Physical climate risks are not explicitly factored into real estate valuation approaches today.

This session was continued with an informative workshop engaging all participants, to discuss and exchange knowledge on a key question: should we (continue to) build on low-lying areas or not? An applied research article was published presenting the outcomes of this workshop on the online platform *Gebiedsontwikkeling.nu.*

ANNUAL SYMPOSIUM 2023

The second annual Red&Blue symposium was held on September 8 and opened by Professor Ellen van Bueren (Red&Blue program co-lead) highlighting the program impact pathway by unpacking three concentric spheres of influence that guide Red&Blue programmatic activities: (i) control: within the project consortium and core stakeholders, (ii) influence: across all professional stakeholders in key sectors, and (iii) interest: across broader civic audiences in the Dutch delta.

Following the introduction, two keynote speakers Jeroen Aerts, Professor of Water and Climate Risks at VU Amsterdam, and Marco Hoogvliet, a leading expert in urban (ground) water and soil systems at Deltares shared insights on the latest developments in creating actionable climate science in the Dutch context. Aerts cited flood risk as a key threat for the Dutch financial sector, but also pointed out that physical climate risks are not explicitly factored into real estate valuation approaches today. He stressed that behavioural risk plays a big role in damage reduction. Thus, behavioural risk needs to be considered when choosing adaptation measures, and raising risk awareness is an important factor for any adaptation action. Hoogvliet observed that an overload of climate risk information may cause indecisiveness in practice today. Looking at climate risk development over time, Hoogvliet mentioned that making tough decisions about (large-scale) adaptation measures builds trust and helps to prevent unmanaged responses to climate risks.

"Behavioural risk plays a big role in damage reduction".

The symposium continued with a panel discussion featuring three practitioners: Lisette van Doorn, Derk Welling and Josja van der Veer. According to Van Doorn, there are notable discrepancies between data sources, leading bigger players in the investment sector to develop their own tools – and potentially leaving smaller actors with less insight. Welling added that everyone should be informed about climate risk and should have easy access to the relevant data and trustworthy assessment outcomes. This way, actors can have a transparent understanding of the exposure and approaches to manage it. Van der Veer underscored the importance of considering the socio-economic effects of climate risk in decision-making processes. “These need to guide our decisions as a city, which we need to make together with the public”.

Following the panel discussion session, representatives from each of Red&Blue’s seven work packages provided a short introduction to their work and progress in the first year of the program. These presentations were followed by an inspiring afternoon from Paul Gerretsen, lead of the Deltametropolis Association. Gerretsen stated that a total of 90 billion euro of public investments has been allocated to the national spatial programs for the coming years, which include three domains: ‘soil and

water', 'energy and economy', and 'cities and regions'. In terms of collaboration capacity, there is room yet to improve productive ways of working between national and lower teers of government. From a political point of view, Gerretsen highlighted that more insights on the scope and depth of spatial planning challenges are needed, and this is also the case from a social point of view. The program continued with two rounds of "impact tables", focused on the five core integrated impacts that the Red&Blue program seeks to advance over the 5-year term of the program and beyond.

"There is a lot of room yet to improve productive ways of working between national and lower tiers of government."

The symposium was closed by valuable feedback from the Red&Blue Advisory Committee members on the progress of the project, and some advice on the second-year agenda. ''Red&Blue is a good example of a much-needed research program to promote solutions and actions against climate change'', said by Winston Chow, Associate Professor of Urban Climate at the Singapore Management University, and newly elected Co-Chair of Working Group II of the Intergovernmental Panel on Climate Change (IPCC). He added that ''From a transdisciplinary point of view, this program is really great in terms of bringing different stakeholders together. It is very important to maintain community relationships, and to keep it strong. The results of this project will have many impacts in the future''. Following his feedback, Eveline van Leeuwen, Professor in Urban Economics and Scientific Director of the Amsterdam Institute for Advanced Metropolitan Solutions reflected on the importance of taking into consideration different needs, expectations, and sense of urgency among partners, and advised the partners to "find joint solutions to cope with such differences''.

LAYER 3 – BROADER SOCIETAL AUDIENCE

This impact layer promotes public awareness and reflection about real estate and infrastructure climate risk governance above and beyond academic and technical audiences. This includes facilitation of thematic public events, broader societal conversations in the selected urban use cases, workshops, and other outreach activities. "Rotterdam Architecture Month 2023" was the first venue where an event in this category was held.

RED&BLUE AT THE ROTTERDAM ARCHITECTURE MONTH

In June 2023, the Red&Blue team organised a public session in "Rotterdam Architecture Month" event focusing on unpacking the challenges of urban development in Rotterdam's un-embanked areas. The session included a panel discussion with invited experts from different disciplines, and hosted more than 60 participants who were engaged in an interactive discussion and knowledge exchange. The main aims of this session were to: (i) foster a deeper collective understanding of the interplay between urban development and flood risk, specifically tailored to concrete real-life examples in Rotterdam; and (ii) identify innovative flood risk adaptation strategies and solutions in urban settings.

The exchanges and discussions during this session led to the following key points:

- Difficulty in estimation of the area development impacts on the value of future buildings
- Distinct differences between area development versus asset development logics
- Different risk perceptions and acceptance levels among citizens
- Growing willingness for development of multi-functional interventions, and flexible flood risk management strategies in short- and long- term time spans
- Necessity to have a shared responsibility between stakeholders for collective flood risk management in risky and un-embanked areas.

The themes and questions outlined in this chapter is representative of what the Red&Blue program aims to produce: new research and interaction between scientists, professional experts and broader audiences that facilitates integrated climate risk management in the Dutch urban delta. In our first year of the program, we have focused as much on the "what" as on the "how" around our core theme. This is also our strategic vision: fostering a way of working collaboratively to co-design, test, validate, and scale-up understandings and interventions in climate governance and area-based adaptation strategies.

FIGURE 13
Red&Blue public event at the Rotterdam Architecture Month in June 2023. Photos by Red&Blue, 2023

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Ⓓ Dialogue

Too Risky to Build?

Unpacking the Challenge of Urban Development in Rotterdam's Unembanked Areas

4

Preliminary Insights, Products & Looking Ahead

While the Red&Blue project is still in its early stage, the research teams are pleased to share some preliminary publications and products as below:

PEER REVIEWED PUBLICATIONS

- “Interrupted rhythms and uncertain futures: Mortgage finance and the (spatio-) temporalities of climate breakdown” - Zac Taylor et al, accepted for publication in the Journal of Urban Affairs (May 2023); in press
- “Financing “Climate-Proof” Housing? The Premises and Pitfalls of PACE Finance in Florida” - Zac Taylor & Sarah Knuth, accepted for publication in the Journal of Urban Affairs (July 2023); in press

BLOGS, EDITORIALS, AND APPLIED RESEARCH

- "Climate Change is for Real (Estate)" (2023) - Abdi Mehvar, Tom Daamen, Zac Taylor, and Ellen van Bueren (2023). Redblueclimate.nl
- “Klimaatadaptatie tussen angst en hoop: programma Red&Blue van start” - Paul van den Bragt and Tom Daamen - Gebiedsontwikkeling.nu
- “Red&Blue: waarom betrouwbare beoordelingen van klimaatrisico’s in vastgoed nog ver weg zijn” - Tom Daamen, Abdi Mehvar, Zac Taylor and Ellen van Bueren - Gebiedsontwikkeling.nu
- “RED&BLUE: met elkaar de risico’s van klimaatverandering in beeld brengen” - Kees de Graaf and Bouwinvest - Gebiedsontwikkeling.nu
- “Klimaatverandering versterkt gentrificatie én financiële onzekerheid in gebiedsontwikkeling” - Japser Monster - Gebiedsontwikkeling.nu
- “Klimaatverandering en het duivelse ruimtelijke dilemma” - Martine van den Boomen - Gebiedsontwikkeling.nu
- “Where’d my Neighbour go?: Collective Reflections on the Self and the Neighbourhood in Discussions on Climate Gentrification” - Theresa Audrey Esteban and Mahardhika Sjamsoe’oed Sadjad - LDE Blog
- “Samen Sterk: Op zoek naar alternatieven voor dijkversterking langs de benedenrivieren onder zeespiegelstijging” - Ties Rijcken, Cees Oerlemans et al. - Deltalinks

COMPLETED MASTER'S THESIS PROJECT

- "The effects of floods on residential property values" - Linde van der Ven, supervised by Ellen van Bueren, Martine van den Boomen, Zac Taylor

OTHER PRODUCTS

- "Overstromingsgevaarzonering" ArcGIS viewer released by Deltares (WP3)

Looking ahead, we are developing and refining our plans and agenda for the coming years in accordance with Red&Blue's three-layer impact plan strategy (see previous chapter). In terms of capacity development, currently 13 PhD and Postdoc research fellows are actively conducting their research projects within the seven WP teams. We aim to expand our research community by recruiting more researchers, such as in the areas of artificial intelligence, and real estate finance to enrich our team in the near future.

Currently 13 PhD and Postdoc research fellows are actively conducting their research projects within the seven WP teams.

Building links with education is also on the Red&Blue agenda. The scientific collaborators aim to develop internal and external Red&Blue-related lectures, graduate supervisions, and so on. In addition to research and education development, we are extending the Red&Blue consortium by building a partnership with and connecting to other relevant institutions and create links with parallel research initiatives on climate risk and adaptation. ING Bank, Resilient Delta, Climate Adaptation Services (CAS), and the Dutch Green Building Council (DGBC) are the latest partners that joined the consortium. In close collaboration with other WP members, we also keep exchanging our ideas on what other (types of) stakeholders can potentially bring to the program.

Laying and strengthening our foundation for collaboration is the core of the Red&Blue agenda for 2023-2024. This will be pursued by convening new Red&Blue Labs, Focal Point Meetings, an Annual Symposium, Workshops, and working/engaging with different stakeholders in urban use cases in an increasingly focussed way.

We also keep exchanging our ideas on what other stakeholders can potentially be interested in joining the Red&Blue program.

In September 2023, the 2nd Annual Symposium was co-hosted by Vrije Universiteit of Amsterdam and Waternet AGV (see chapter 3) aiming to bring together the whole consortium to:

- Strengthen relations and collaboration
- Inform on research progress and targets
- (Re)align planned research with societal needs and developments
- Concretize the research outputs and deliverables.

Actionability was central to Annual Symposium 2023, aimed to better understand the implications of climate science for climate governance and real estate and infrastructure decision-making. The Symposium included an inspiring program that marked a full first year of the project. Next to the keynotes summarized in the previous chapter, it included varying interactive sessions across disciplines and across the academic and professional fields that are part of the consortium.

A "knowledge integration reflection" workshop was co-organised with the methodology team of Resilient Delta Initiative (a collaboration between TU Delft and Erasmus University Rotterdam) in late September 2023, a few weeks after the Red&Blue annual symposium. In this session, the Red&Blue academic collaborators jointly explored the knowledge production process with other TU Delft and Erasmus University researchers, by reflecting on and honouring the existing efforts of this challenging task. Main objectives of this session included:

- Reflecting on the process of knowledge integration in Red&Blue
- Mapping existing efforts of knowledge integration and building a shared language around key concepts
- Identifying personal and work package position in the knowledge production process
- Making steps towards finding the most important integrated products of Red&Blue.

In parallel to the above-mentioned engagements with researchers and expert/technical professionals from various fields, Red&Blue is currently planning thematic public events that connect consortium research with parallel societal debates around key urban transition topics in Dutch society today. This is combined with the ambition to create a Red&Blue "Visual Narrative" of urban climate risk and resilience research intended for public audiences.

As part of the communication and outreach strategy, the Red&Blue website is being developed as a public platform providing information about the program to all visitors. Its aim and structure includes news, and items as well as an overview of our consortium partners. In addition, the website gives updates on research and published articles, highlighting past and future events/activities, and provides an opportunity for visitors to subscribe to the newsletter or even get involved in the program through their institutions.

The 1st Red&Blue newsletter was published in June 2023, introducing the program, research teams, upcoming events, and preliminary publications. For the comming years, social media channels like a LinkedIn group, and podcasts, are communication paths by which the team will be developing and facilitating active engagement and dialogue with broader audiences.

FIGURE 14
High water in Rotterdam. Photo by Eric Fecken, n.d. (Source: Red&Blue)

WOULD LIKE TO KNOW MORE OR JOIN RED&BLUE?

Please let us know and write an email to:

redblueclimate@tudelft.nl

or visit our website

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Links to the Figures and Call out Boxes:

Figure 2 Glazkov, P. (2022). Modern green neighbourhood in Almere, The Netherlands, surrounded by water and nature, city built on reclaimed land (Flevoland polder). Aerial view.[Photograph]. https://www.shutterstock.com/nl/image-photo/modern-green-neighbourhood-almere-netherlands-surrounded-2193766411

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Figure 6 Van Wettum, S. (2020). Drie-Lenzen-Model moet klimaatrisicomanagement aanjagen [Photograph]. https://www.gebiedsontwikkeling.nu/images/nhedrrgrnTP9Cq7Hcu82GnfgJpE=/8574/fill-560x315/Expert_Meeting_19.jpg

Figure 11 Pugh, S. (2022). Klimaatadaptatie tussen angst en hoop: programma RED&BLUE van start [Photographs]. https://www.gebiedsontwikkeling.nu/artikelen/klimaatadaptatie-tussen-angst-en-hoop-programma-red-blue-van-start/

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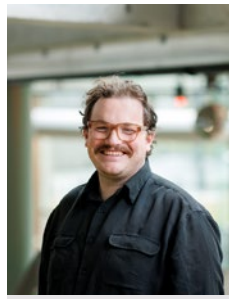

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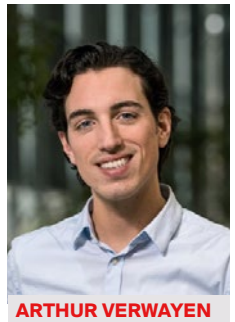


ARTHUR VERWAYEN

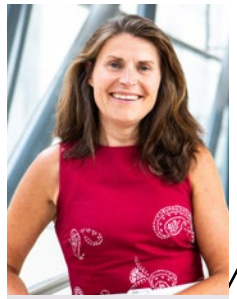
Researcher and Coordinator at SKG

Tom Daamen: The Netherlands needs a strong knowledge base and a vital science-policy-practice network to understand and develop a strategic response to the effects of climate change in the built environment and its implications for human well-being and prosperity in the Dutch Delta—and beyond. The Red&Blue project should deliver just that.

INTERNATIONAL ADVISORY BOARD

HENK OVINK

Special Envoy for International Water Affairs for the Kingdom of The Netherlands at IenM



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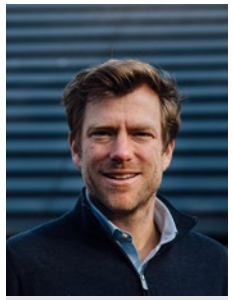
Associate Professor of Urban Climate at Singapore Management University

Winston Chow: The strong assessment towards effective adaptation done in the Red&Bliue project, via inputs from multiple stakeholders in the Dutch Delta, will enable a high degree of climate resilience that will persist and will be an important example for other climate-vulnerable coastal cities

ACADEMIC COLLABORATORS WP 1



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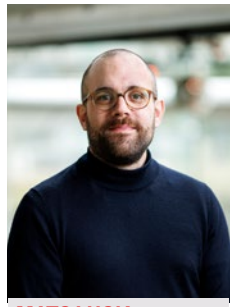
Professor of Real Estate Finance & Economics at Maastricht University



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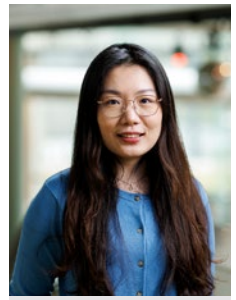

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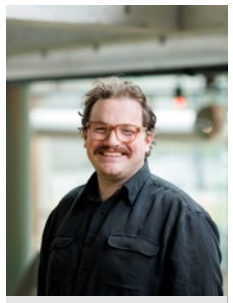

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PhD Candidate at Maastricht University

Mats Lucia: By pointing out the potentialities but also the tensions emanating from the key role finance plays in climate adaptation, this research aims to deliver tools of understanding for Dutch society to prevent climate adaptation from feeding into socio-spatial inequalities.

Nils Kok: Fundamental research by leading Dutch universities is needed to better understand the impact of climate risk on the real estate market in the Dutch Delta. Red&Blue is enabling this research, with real-world impact ensured through collaboration with and knowledge dissemination to investors, policy makers, and think-tanks.

Wieke Pot: By organizing dialogue and interaction, by making explicit the voices of those less listened too but very much affected (e.g., socio-economically vulnerable citizens, future generations, non-humans), and by identifying what institutional rules and responsibilities can or could be changed for more climate-resilient outcomes of decision processes.

ACADEMIC COLLABORATORS WP 2

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Assistant Professor in Governance of social-ecological technical systems at Wageningen University & Research

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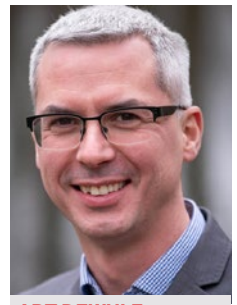
Professor of European and National Environmental Law at Utrecht University



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RICHARD POMPOES
PhD Candidate at Wageningen University & Research

MARLEEN VAN RIJSWICK
Professor of European and Dutch Water Law at Utrecht University

Frank Groothuijse: My research shows what legal instruments governments have in their toolbox to establish and actually implement policy intentions concerning climate risk management of real estate, how they can use and coordinate these instruments more effectively and how this toolbox could be optimized, taking into account the rule of law.

Lilian van Karnenbeek: My research reviews the various legal instruments that can be used to implement climate adaptation policies. The research shows the number of legal instruments that can already be used to create a climate-adaptive Dutch Delta but also explores possible new ones. I also focus on why actors choose particular instruments over others and the consequences of these choices.

Richard Pompoes: I hope that through my engagement with the knowledges and practices of actors already living and working with climatic risk daily – so, by learning from the concerns, wisdoms and institutions that they have devised and adapted to – I can uncover avenues for transformations toward more equitable climate futures.

ACADEMIC COLLABORATORS WP 3

TINA COMES
Professor in Designing Resilience at TU Delft, and Professor in decision-making and digitalisation at Maastricht University

MARCO HOOGVLIET
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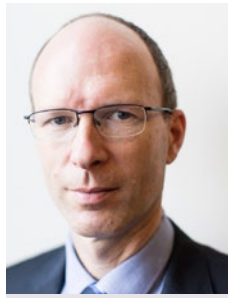

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ACADEMIC COLLABORATORS WP 4

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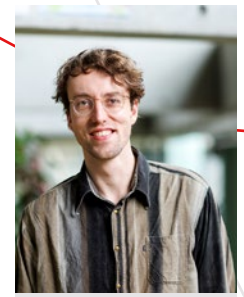
MARTINE VAN DEN BOOMEN
Researcher and Lecturer in Asset Management at TU Delft & Hoogeschool Rotterdam

TIES RIJCKEN
Postdoctoral Researche in Hydraulic Engineering at TU Delft



CEES OERLEMANS
PhD Candidate in Flood Risk at TU Delft, and HKV

Matthijs Kok: Risk informed decision making is crucial if we look at the future of society. But risk are everywhere, and especially in a changing climate this is a challenge to assess the risk, that is the probability of unwanted events and its consequences. Also, investments in public infrastructure to reduce the flood risk need to be taken into account if we want to assess the risk of real estate. And also the scale of the investments is important: are measures taken on a local scale or on a regional scale?

Martine van den Boomen: My research is geared towards raising awareness. Flood risks have always been there. Making risks more explicit will give society ground for informed decision making. Moreover, it will allow for developing appropriate risk mitigation measures to keep our urban delta liveable. It will benefit house owners, tenants, investors, constructors, insurance companies and governments.

Tony Hung: My research is about measuring resilience of social urban systems against natural hazards. By understanding what and how we are vulnerable to and our inherent capabilities to adapt or overcome disastrous events, change-makers can improve on where we fall short in society.*

Ties Rijcken: My research is about integrated flood risk management with a focus on infrastructure solutions and policy development. I also study polder water and peak rain events and the way housing, buildings and infrastructure can cope with this. I especially study effectiveness of measures on different scale levels, often concluding that for many risks, measures on the building level are less effective than higher system levels.

Cees Oerlemans: My/Our research enhances the livability and economic vitality of the Netherlands by developing methods and a tool for designing long-term flood adaptation strategies. These strategies enable us to effectively address uncertainties related to climate change and explicitly consider feedback loops between flood risk and urban development in decision-making.

Maria Fonseca Cerda: My research focuses on evaluating physical climate risks, including wind and hailstorms, and their impact on real estate. Identifying hazard-prone regions and analyzing the hazard-loss relationship will allow for precise loss estimations under future climate scenarios. This will also allow for an assessment of the effectiveness of adaptation strategies.

ACADEMIC COLLABORATORS WP 5

TOM DAAMEN
Associate Professor in Urban Development Management at TU Delft, and Director of SKG

ABDI MEHVAR
Postdoctoral Researcher in Climate Risk & Resilience at TU Delft

CATHOLIJN JONKER
Professor of Interactive Intelligence at TU Delft

PRADEEP MURUKANNAIAH
Associate Professor in Interactive Intelligence at TU Delft

EDGAR GIRONES
Postdoctoral Researcher in Sustainability,Climate Risk Management at TU Delft - NLP

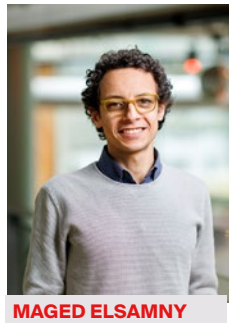
Pradeep Murukannaiah: We use Artificial Intelligence (AI) to facilitate well-informed decision-making and to build capacity for integrated solutions for climate risks. We use AI to facilitate the co-design and co-development of solutions, e.g., by identifying stakeholders' values, summarizing discussions, and synthesizing relevant information about the Dutch Delta from a variety of sources.

Abdi Mehvar: The Red&Blue knowledge integration approach aims to create a much-needed foundation of shared and accessible knowledge about climate governance strategies for the Dutch delta and beyond. By development of a safe and open space for dialogue and exchange between multidisciplinary stakeholders, this knowledge base supports transparent and integrated climate adaptation decision-making

ACADEMIC COLLABORATORS WP 6

ELLEN VAN BUEREN
(Co-Lead) Professor of Urban Development Management at TU Delft

GERBEN MOL
Program Developer of Climate Resilience Cities Research and Valorisation at AMS Institute



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Postdoctoral Researcher in Urban Development at TU Delft

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Lecturer in Civil Engineering & Water Management at Hogeschool Rotterdam

SARA VERMEULEN
PhD candidate within the section Ethics/ Philosophy of Technology at TU Delft

Ted Veldkamp and Audrey Esteban: Building trust with stakeholders is important to the Greater Rotterdam Living Lab. Through our kennis carousels, we foster relationships not only with Rotterdam and Dordrecht, but also with the RED&BLUE research fellows whose findings could potentially help our partner cities in building climate adaptation strategies. Our work as coordinators is critical in maintaining conversations between and among stakeholders, as well as in charting a course that is equitable and just for residents.

Maged Elsamny: By bringing researchers and societal actors to work on climate risks, the Red&Blue has already deviated from the business as usual and created a safe environment for all stakeholders to share experience, and knowledge. This allows for opportunities to mainstream climate adaptations in the development plans of our cities.

ACADEMIC COLLABORATORS WP 7

PAUL GERRETSEN
Director of Deltametropolis Association

ALANKRITA SARKAR
International Project leader at Deltametropolis Association

SAMUEL HARTMAN
Project Officer at Deltametropolis Association

SHAILAJA SHAH
Project Officer at Deltametropolis Association

INEKE LAMMERS
Impact manager at SKG

TOM DAAMEN
Associate Professor in Urban Development Management at TU Delft, and Director of SKG

ARTHUR VERWAYEN
Researcher and Coordinator at SKG

Samuel Hartman: By analysing which actors play what role in context of the Red&Blue program, it becomes possible to both interact with the right actors which deepens our research and to engage a broader audience amplifying the impact of the Red&Blue program. This will support the effort to change the system towards broader liveability and economic vitality in the Dutch Delta.

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Monique Schols-Bemer (Maastricht University)

Marcus van Leeuwen (Regieorgaan SIA)

Ernst Harting (TU Delft)

Anne Bruggen (Resilient Delta)

Nikki Brand (Resilient Delta)

We are open to connect and see how we might collaborate, learn from each other or exchange knowledge with regards to the research program.

Societal Partners

Bouwinvest
apg
Gemeente Amsterdam
Provincie Noord-Holland
ARCADIS
CUSHMAN & WAKEFIELD
ING
waterschap amstel gooi en vecht
vesteda
Dordrecht
City of Rotterdam
DGBC
Deltares Enabling Delta Life
Ministerie van Infrastructuur en Waterstaat
Verbond van Verzekeraars
Climate Adaptation Services
Urban Land Institute
vereniging delta metropool
provincie Zuid Holland
SKG
Sustainable Finance Lab
PGGM
Resilient Delta

Colofon

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ABOUT THE PROGRAM

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Sparking transformation in the built environment requires new and combined knowledge from a range of disciplines and domains. Thus, the Red&Blue program is built upon different focus areas and disciplines such as economics, governance and law, urban planning, knowledge integration, climate vulnerability, and engineering. Corresponding to these disciplines, the program is structured with seven Work Packages (WPs). The first four WPs are largely focused within a specific disciplinary domain, but will receive inputs or generate outputs from/to other WPs. WPs 5-7 provide the ground for the former lines of analysis to come together, both conceptually and practically, through a range of collaborative activities.

Our shared purpose is to create a common language, shift understandings, build collective governance capacity, and promote systems-changing spatial strategies that guide urban re/development and investment in Dutch delta settings.

RED&BLUE

Red&Blue (Real Estate Development & Building in Low Urban Environments), is a five-year transdisciplinary knowledge agenda and impact program focused on the development of integrated real estate and infrastructure climate risk strategies for the Dutch delta and beyond.

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Red&Blue