

An aerial photograph of an urban area, likely Dublin, Ireland, showing a river and flood defences. The image is overlaid with large, semi-transparent white text. The background shows a mix of industrial buildings, residential areas, and green spaces, including soccer fields. A blue line representing a river or flood defence runs through the center of the image.

# Irish rivers 2040

Designing Ireland's 'next generation' flood defences

Flumina  
Hiberniae  
2040



creative  
industries  
fund NL



**Irish Supervisory team Flumina Hiberniae**

Office of Public Works  
Cork City Council  
Dublin City Council  
Fingal County Council

**Dutch Team Flumina Hiberniae**

REDscape Landscape & Urbanism (lead)  
Dingeman Deijis Architects  
Palmbout Urban Landscape  
Van Paridon de Groot Landscape architects

**Co funded by**

The Creative Industries Fund NL.  
<http://stimuleringsfonds.nl/en>



**Irish supervisory Committee representatives**

Mark Adamson (chief engineer, OPW)  
Eamon Walsh (engineer, Cork City Council)  
Gerry Glabby ( ecologist, Fingal County Council)  
Gerard O Connell( enginer, Dublin City Council)

**Dutch Design Team representatives**

Patrick Mc Cabe ( landscape architect, REDscape Landscape & Urbanism)  
Dingeman Deijis ( architect, Dingeman Deijis architects,  
Marcel Van der Meijs (urban deisgner, Palmbout Urban Landscape)  
Ruut van Paridon (landscape architect, Van Paridon de Groot Landscape architects)

Cover image: Visuals from Camac (REDscape).

**Legal**

This report contains several images and graphics based on creative representations. No legal rights can be given to these representations. All images have been accredited. Where the source is not clear, all efforts have been made to clarify the source.

Document name: Irish Rivers 2040, designing Irelands'next generation flood defences.  
Date: September 2018  
Client: Office of Public Works, and The Creative Industries Fund, Fingal County Council, Dublin City Council, Cork City Council.

Prepared and compiled by REDscape Landscape & Urbanism.  
[www.redscape.ie](http://www.redscape.ie)



## 1. Introduction

8 - A design led approach

## 2. Background

10 - The cost of flooding  
10 - Flood protection as a National Investment opportunity  
10 - Comparing the Irish and Dutch Approaches to Flood Protection  
10 - Anticipating Changing European Policy

## 3. How the project worked

12. The living lab project Flumina Hiberniae 2040  
12. Workshops, breakout sessions and presentations

## 4. The current flood protection approach

14 - The Current Process for selecting and delivering flood protection  
14 - Evaluation of the Current Process for selecting and delivering flood Protection

## 5. What is a design led approach?

16 - Design thinking versus scientific thinking  
16 - A design led approach to flood defences - the Dutch Method of water management  
16 - Translating the organisational issue in terms of theory  
19 - Why it is worth investigating?  
20 - Benefits to the organisation.

## 6. Project Case Studies

22 - Cork and Dublin regions- developing a toolbox of options  
Overview of Case studies  
24- Case study 1. Defending the coast at Burrow, North Dublin by Van Paridon de Groot Landscape Architects  
28 - Case study 2. Revitalising the Camac, by REDscape Landscape & Urbanism  
32 - Case Study 3. Flood protection Cork City by Dingeman Deijis Architects.  
36 - Case study 4 . Transformation of Cork Docklands - defending the docklands and creating a phased development, by Palmbout Urban Landscapes.  
40- Case Study 5. Coastal defenses at Sandymount – the multifunctional dike, by REDscape Landscape & Urbanism.

## 7. Recommendations Dutch design team

44 - Recommendations

## Appendix

*“Design is  
not just what  
it looks like  
and feels like.  
Design is how  
it works.”*  
—Steve Jobs

# Flumina Hiberniae 2040

---



Irish team representatives discuss options at the workshop in Dublin Castle.



*“Between 1998 and 2009, floods in Europe have caused some 1126 deaths, the displacement of about half a million people and at least 52 billion euro in insured economic losses.”*

- European Environment Agency



The changing patterns of climate are expected to have a profound effect on the Irish rivers, with significant shifts in water patterns including increased flooding events, periodic droughts, contaminated water supplies and exacerbated water quality issues. There is a clear need to address these issues urgently.



Flooding in the Shannon Basin, 2016

The scale of this challenge is so large and the level of investment so considerable, that there is an emerging consensus that 'new thinking' and new approaches are necessary. The timing is right to evaluate the opportunities that are available. This project sets out to contribute to the general discussion and to explore a new design-led approach that can deliver strategic solutions with long-term benefits.

## Drawing On The Dutch Experience

The Dutch have a long-established reputation for designing with water and have adopted alternative approaches to water management over time. The 'Dutch method' uses a highly integrated design approach and seeks to promote sustainable values and long-term aims for flood protection. For this project, a group of Dutch offices were specially selected and invited to share their expertise in finding new strategies and solutions to flood

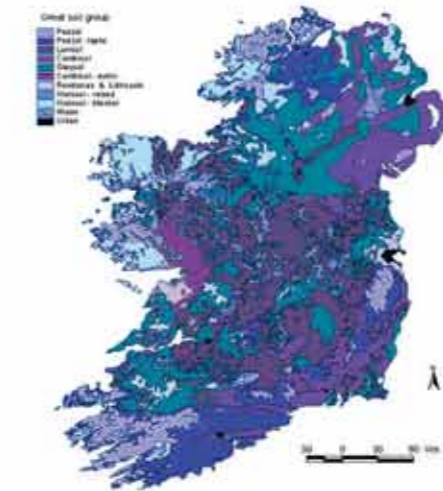
protection for Irish river systems. Although this project offers the team the challenge of an entirely new landscape with a unique set of conditions, the 'approach' remains the same.

During a series of workshops, Irish and Dutch experts met to explore the benefits of a design-led approach in which the diverse requirements of an area, location or region can be integrated into a single vision. The results of this research can be used to showcase the approach through case studies; to policy makers, engineers, designers, planners, environmentalists and other concerned professionals.

## Exploring A Design-Led Approach

The report examines the potential of a design-led approach as a leading strategy for river water management in Ireland. The aim of the report is to highlight the potential of design-led methods as a means of implementing the European Water Directives for flood protection and water quality in Ireland.

In 2004, the Irish Government adopted a policy for flood risk management that had a broader focus in terms of approaches to managing flood risk, which included a shift in thinking from conventional flood protection to also including 'prevention' and 'preparedness'. The new policy has also revised how flood risk management measures should be appraised and designed to consider potential broader benefits and impacts, such as for water quality and community enhancement. This provides the platform for a design-led approach and for a move towards Integrated Catchment Management, which can bring together strands of water policy and the achievement of wider benefits in a broad approach to planning, in which all land and water management issues within the catchment area are considered. This approach, although relatively recent to Ireland, is well established in the Netherlands. Our research is about applying the Dutch experience to the Irish situation in order to develop demonstration case studies combining flood protection, amenity enhancement and water quality management.



Soils of Ireland



River and lake system of Ireland

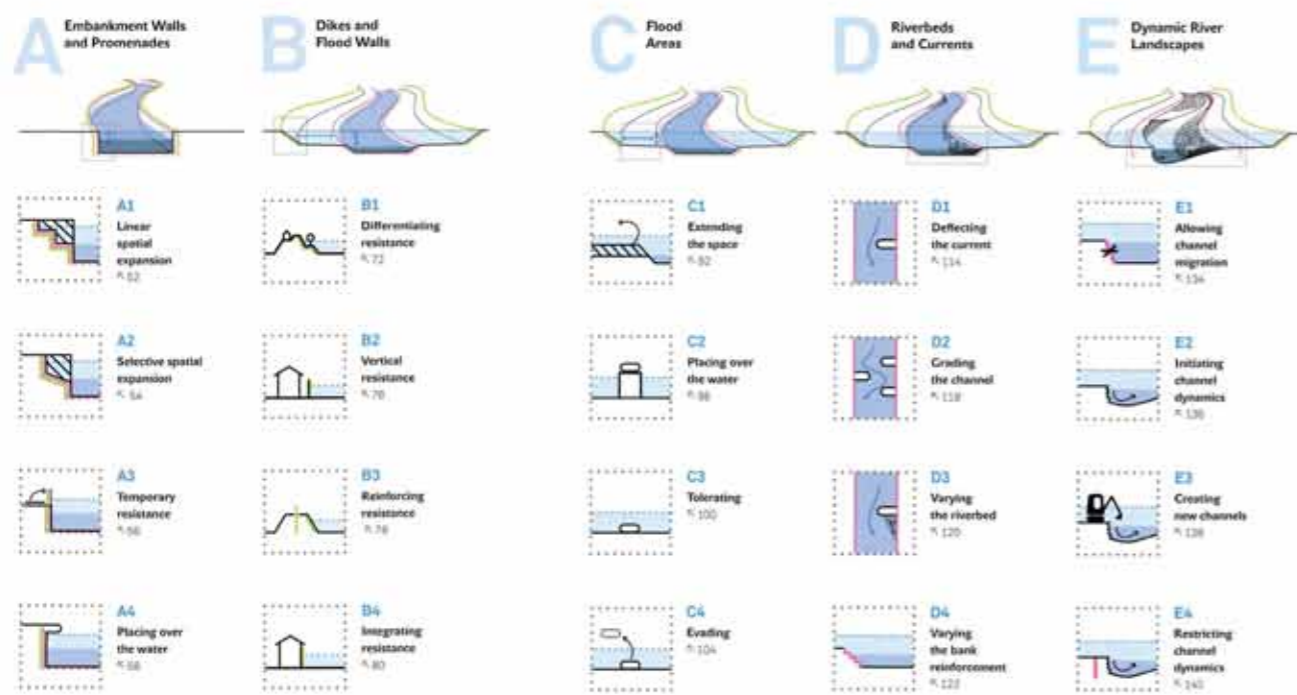


Scoping 300 risk locations



## The cost of flooding

The financial impact of flood damage by storms such as Storm Desmond in 2015-2016, has not yet been calculated for Ireland. The effect of similar storm patterns on our neighbours in the UK, although not directly comparable, gives an indication of the economic scale of the problem.



Categorisation of design flood measures. Source: River Space Design.

Storm damage in the UK in 2015 has been estimated at over £6bn (0.3% of UK GDP), after swathes of Britain were swamped in the wake of Storm Desmond and Storm Eva. Accountants at KPMG based the estimate on the immediate hit to households, firms and insurers, as well as longer term costs. Justin Balcombe, Head of General Insurance Management Consulting at KPMG, said: "The scale of the flooding over the last few weeks has seen communities across large sections of Northern England, Wales, Scotland and Ireland severely impacted. In 2007 when a similar pattern of flooding hit, total insured claims were £3.2bn. However, we consider

that the actual financial impact far exceeded this. We are assessing this month's events through a number of economic lenses, resulting in an initial total cost estimate of £5-£5.8bn." (Sky news, 2015)

## Flood Protection As A National Investment Opportunity

Flood protection is first and foremost an urgent issue to reduce the risk of flooding and catastrophic loss of life. Secondly, it represents a huge injection of capital

into towns, cities and rural areas. It offers a unique opportunity to deliver capital projects with societal benefits. If implemented well, flood protection can add to the quality of life in our environment for generations. If implemented poorly, it can represent a destruction of capital and a missed opportunity. Ireland has earmarked €430m of investment for flood protection over the period 2016-2021. However, is the current approach to flood protection delivering the potential multiple benefits it aspires to? If not, how can it be improved?

## Comparing The Irish And Dutch Approaches To Flood Protection

Traditionally, flood protection in Ireland can be described as having a predominantly engineering-led approach. This approach was based on a technocratic strategy that prioritises the technical aspects of water engineering as the main objective of the project. In contrast, the Dutch have transitioned from a similar approach to a revised approach with multiple perspectives. For the purposes of this report, we will call the revised Dutch approach a 'design-led' approach. The design-led approach, although based on sound engineering principles, has been extended to integrate a wider spectrum of needs such as biodiversity, urban planning, agricultural development, public realm, and so on, into a single unified vision. The 'Dutch method' has led to new and innovative approaches to water management and flood protection.

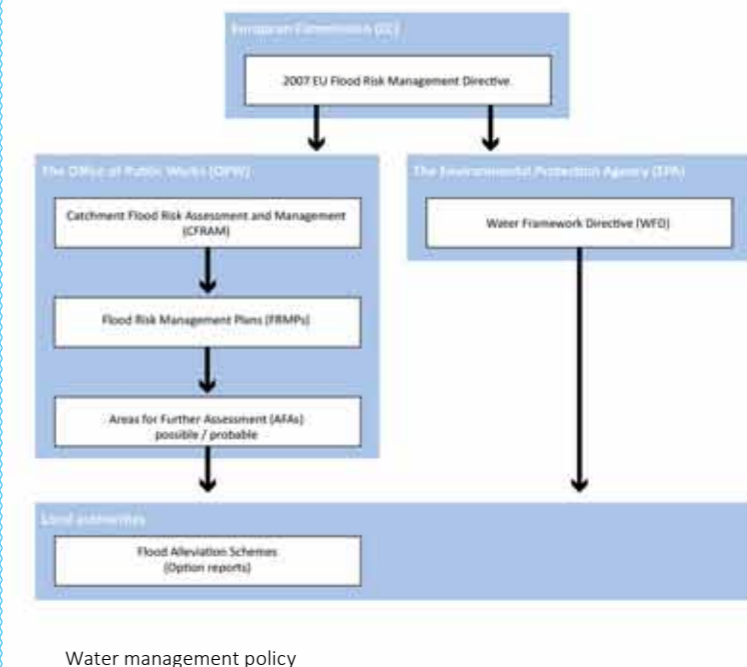
In the Netherlands, massive interventionist engineering projects such as the delta works (1950s) have been critically assessed in recent years to achieve a new dialogue between flood protection and nature, with the issue of cost effectiveness being a significant factor in the discussion. This assessment led to a revised approach. More recently, 'Room for the Rivers' (2000), a major water management project for the Lower Rhine has typified this form of rethinking. This project, which was applied to the regional context of the Lower Rhine, led to wholesale changes at a regional level, leading to new forms of flood protection measures for water management in this part of the Netherlands. Although an important project, it is one of many similar projects at local and regional levels that have offered alternative solutions and new forms of thinking. Key to this change is the wider realisation that the effectiveness of engineering-only approaches has its limits. For example, the dikes can be built higher and higher, polders can be pumped harder and harder to keep them dry, but if the cost of raising dikes becomes too much and ground levels continue to sink, then other options need to be explored. The slow realisation that nature does not always need to be overcome to achieve water security

led to new explorations in reassessing the balance between nature and engineering. A more holistic approach was adopted, in which working with natural dynamics could yield multiple benefits while continuing to retain water security.

## Anticipating Changing European Policy

In Ireland, the complex issue of designing the next generation of flood defences is set to become even more challenging as the second strand of national water management, water quality, is to be fully implemented in line with EU regulations. The Environmental Protection Agency (EPA) is the Irish government agency that has been charged with implementing elements of the Water Framework Directive. Changes in environmental law prescribe new requirements to improve water quality, adding an incentive to water management agencies to integrate their thinking to deliver smart systems for water management. The program of implementation is underway. Despite flood protection and water quality belonging to separate governmental departments; the Office of Public Works (OPW) and the Department of the Environment (DOE) respectively, both strands may well become increasingly coordinated in time, in line with the intentions of EU water policy, to form a

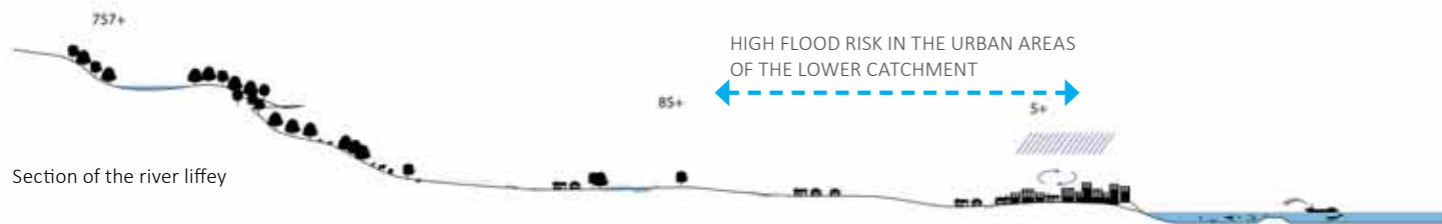
more unified water management policy to share and coordinate investments. With this long-term perspective and holistic approach to water management in mind, the design-led approach offers new opportunities for integrated solutions.



# 3.0 HOW THE PROJECT WORKED

## The living Lab Project Flumina Hiberniae 2040

Flumina Hiberniae 2040 is a wide-ranging, participatory and inclusive project between creative Dutch experts and several levels of Irish government representatives, for the management of Irish rivers. The project is titled 2040 and directed at the consideration of a long-term vision and also the development of a long-term international collaboration between the two countries, with the aim of fostering a future relationship of exchange.



Natural:  
Origin as a bog stream in the Wicklow Mountains.



Rural:  
River Liffey from Ballyward Bridge, near Kilbride, Co. Wicklow



Sub-urban:  
Near Heuston station



Urban:  
River Liffey with The Millennium Bridge and Ha Penny Bridge with River Liffey

The living lab project, Flumina Hiberniae 2040, has been set up to investigate a design-led approach to flood protection in Ireland. The project has been commissioned by the OPW, Dublin City Council, Fingal County Council and Cork City Council with co-funding from the Creative Industry Fund in the Netherlands. The Dutch offices involved also contributed pro bono work. It applies the Dutch design experience to the Irish situation using working examples in which flood protection, amenity enhancement and water quality management are combined. This 'Dutch method' uses a highly-integrated design approach and seeks to promote sustainable values and long-term aims for flood protection.

### Site Visits, Workshops, Breakout Sessions And Presentations

The project spans several levels of collaboration. Firstly, REDscape organised

a multidisciplinary team of several Dutch design offices representing landscape architecture, urban design and architecture, and civil and hydraulic engineering to reflect the wide-ranging scale and contextual nature of the study, from urban to rural and regional locations. The Dutch team collaborated in a series of workshops in the Netherlands and site visits to Ireland to focus on their own experience, to analyse and develop perspectives and to share those findings with each other. The design offices then divided themselves into the study of two regions; Cork and Dublin. Based on an outline approach, the two groups studied the regions in more detail and presented analyses of the case study areas, selected by the participating city and county councils.

Secondly, a series of interactive collaborative workshops was organised between the Irish and Dutch experts. The workshops were carried out in Ireland and formed the platform for interaction and response, feedback and amendments, as

well as wider discussions to determine the final form of the research. The Dutch design offices presented their initial ideas and findings at the first workshop in the form of sketches, analyses and images. Feedback and breakout sessions were then held, where feedback by the OPW and partner organisation was drawn onto large maps in the form of sketches and discussion. The design offices used this input to develop their designs in the second phase. After several weeks, a final workshop was held to present the resulting design for the future of water management in the regions. Each design office made a separate presentation that examined their designated region, as well as a detailed case study outlining the key problems, options, solutions and chosen options which were then visualized. These presentations were also communicated in the form of posters. The presentations were then followed by a wider discussion and the most important conclusions were discussed. All of the different regions and case study areas were also visited by the Dutch and Irish teams.



Images of workshops at Dublin Castle and the Netherlands.



# 4.0 THE CURRENT FLOOD PROTECTION APPROACH

## The Current Process for selecting and delivering flood protection

Based on the EU Flood Directive of 2007, the Irish Government implemented the National Catchment Flood Risk Assessment and Management (CFRAM) Programme for the reduction and management of flood risk in Ireland.

This process was designed to develop flood hazard and risk maps and develop Flood Risk Management Plans (FRMPs), setting out a prioritised set of measures for the long-term sustainable management of flood risk around Ireland. This process makes use of spatial planning policy and has prioritised a total of 300 Areas for Further Assessment (AFAs) for flood protection measures. The process has involved three steps:

- Screening: All methods for managing or reducing flood risk in the maps are assessed to determine which methods might be applicable for the given area.
- Option Development: From the list of all potential methods developed in 'screening', the options to reduce flood risk are identified.
- Option Appraisal: The options identified in step 2 are subject to a Multi Criteria Analysis (MCA), an economic Cost Benefit Analysis (CBA), environmental assessments and extensive public consultation to assess the relative effectiveness and economic viability of the different options.

The MCA compares the relative merits of the different options against a range of objectives. The objectives define what is intended to be achieved in terms of flood risk reduction and related benefits. The objectives focus on reducing the detrimental effects of flooding on human safety, the environment, cultural heritage and economic activity, and where possible to contribute towards the achievement of objectives in other sectors. Under the MCA, each option is scored based on how it performs against each objective. These scores are then multiplied by the Global and Local Weightings to deliver the overall MCA benefit score. The weightings reflect

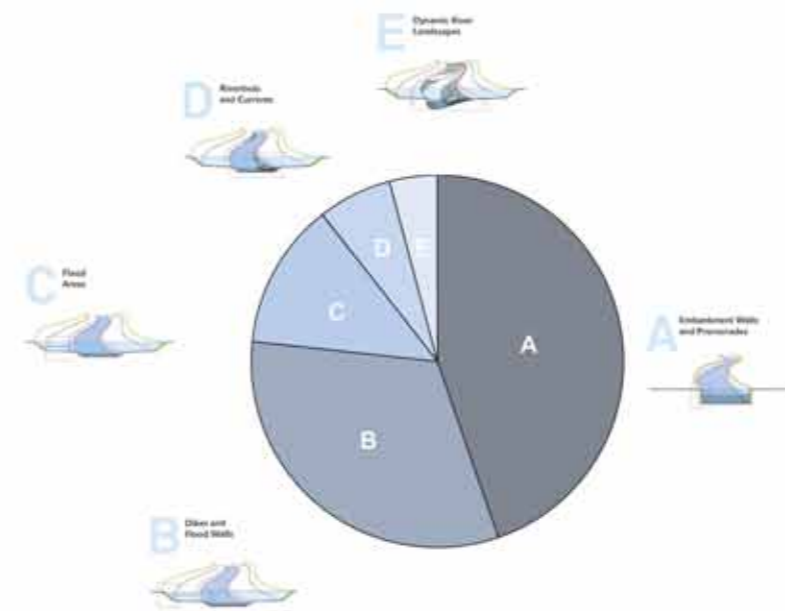
the relative societal value of each objective based on a 1000 person survey. The end score represents the overall benefits and impacts across all objectives. Together with local consultation and professional judgement, the preferred outcomes for flood risk protection are decided. This process is responsible for selecting the preferred spatial solution.

### Evaluation of the Current Process for selecting and delivering Flood Protection

The current management style aims at optimal use and control of resources. Despite supporting an integrated design approach, which should in theory deliver flood protection with multiple benefits, the clear majority of the projects being proposed under the current process comprise structural flood protection solutions. Although a very practical and cost effective solution, structural flood protection can have significant drawbacks in delivering long-term sustainable solutions. Future gaps such as water quality and improved biodiversity cannot be addressed with structural solutions, and other alternatives will need to be developed. As these proposals at the plan level move into detailed, project-level assessments, opportunities to explore the achievement of other benefits can be explored.

It is generally accepted that flood risk cannot be managed only by building bigger and taller hard flood defences, and that the potential for sustainable 'soft engineering' approaches, such as the attenuation of excess water within the catchments, need further consideration as part of the solution. As a long-term solution, the sustainability of structural measures is also at question as are the wider objectives of environmental and societal benefits, which cannot be optimised without specific consideration and integration. To address this problem, it is necessary to propose an alternative approach to designing flood protection.

Outcomes of current MCA methodology based on 43 AFA locations



Division in typology based on 43 assessed AFAs



Assessed AFA locations; green projects were assessed for case study locations.



# 5.0 WHAT IS A DESIGN LED APPROACH?

## Design thinking versus scientific thinking

A design-led approach is a form of design thinking. “Design thinking is a formal method for practical, creative resolution of problems and creation of solutions, with the intent of an improved future result” (Wikipedia, 2016). Design thinking theory suggests it is no longer just about designers, but it is the thinking process used by designers to be applied to all facets of life, including business management and organisations.

Perhaps the most salient and distinctive attribute of a design-led approach is that it is a back to front approach in which an idealized solution is imagined first and then continuously tested to see if it fits a solution. This is a key tenet in the theory of design thinking. Design thinking can be a powerful tool to solve unpredictable, complex or so-called ‘wicked’ problems (Rittel, 1987). Rittel went on to describe design thinking as having a solution-based focus, which begins with the setting of a general goal, typically an idealized or desired situation. This approach can be described as opposite to a scientific or engineering approach, which typically starts with a problem and then works forwards to creating a solution, as in the case of the MCA/CBA process. The MCA process starts with a series of localized (flooding or hydrological) problems, which are tested for financial risk and subsequently coupled with a set of weighted parameters to select an economically viable solution to the problem. These solutions are chosen from a fixed set of predetermined options, such as walls, retention areas, and so on.

Design thinking on the other hand is an iterative and explorative process. The gathering of many ideas has been described as the ‘knowledge funnel’ in which as many useful ideas as possible are gathered to scope outliers, which may have been overlooked yet prove worthy in delivering the desired solution. Testing is repeated, with continuous adjustments being made in search of the most desired situation. The best chance options are then assessed in more detail as to their consequences. User experience and an understanding of user needs, often with conflicting perspectives,

are instrumental in determining the consequences of a solution.

### 5.1 A design led approach to flood defences- the Dutch Method of water management.

The first steps towards integrated water management in the Netherlands occurred in the 1960s with the adoption of the First National Policy Memorandum on Water Management in 1968. During this phase, water engineers were still preoccupied with the fast drainage of redundant water and with the construction of walls and dikes. However, this system soon became unsustainable as the ‘pumping drainage dike raising strategy’ (Rittel, 1987). began to fall short of expectations as calamities occurred. The changing nature and scope of the water problem caused a shift away from just the physical processes of water management to focus on the whole water system as a social, ecological and physical phenomenon. ‘The Dutch approach to water management has undergone a major shift in thinking over the last 30 years, from a technocratic scientific style to an integral participatory style’ (Van der Brugge, R., Rotmans, J. & Loorbach, D. Reg. 2005). This transition has moved from a take-off stage to an acceleration stage. An important component in this change is thought to be due to ‘policy entrepreneurs’, (Brouwer S., Biermann, F. 2011) who are described as risk-taking bureaucrats who want to champion the prominence of ideas. It is an adaptive management style

(Brouwer S., Biermann, F. 2011) which has been adapted to cope with uncertainties and complexities, in contrast to traditional management styles which focus on the controlled use of resources. A major factor in this transition was the emergence of the environmental movement in the 1980s, an aspect which had initially been disregarded in water management. This movement however could no longer be ignored as ecology and legislation forced new approaches to water management and flood protection, such as the removal of agriculture from flood plains and the reintroduction of meandering rivers, as well as the opening of storm surge barriers on the coast, all resulting from new legislation.

# WHAT IS A DESIGN LED APPROACH?



Camac in Kilmainham. River as back end of the city.



River as front of the city. Source: Yonkers, New York State. <http://alfa-img.com/show/city-of-yonkers.html>



## 5.2 Translating the organisational issue in terms of theory

In theoretical terms, water management can be said to be moving from a probabilistic logic, in which outcomes are defined by uncertainty theory, to a design-led approach.

### Probabilistic approach

Probabilistic theory, as evidenced by data such as hydrometric probability flows, forms a key role in the processes of water management and flood protection. Flooding maps based on floods of annual, 10 and 100 year probable floods events are a key tool in the prescription and design of flood defences and water management. Based on this information, the current approach is to deliver highly-engineered or technocratic solutions in a command and control approach, where certainty and security rather than spatial quality and integration have main priority (Wolsink, M. 2005). Although participation is included, solutions are largely approached as engineering risk reduction with a short-term perspective.

### Design-led approach

A design-led approach is complimentary to the probabilistic approach. Flood maps are still used as the basis for defining where flood protection is needed. The difference emerges later in the process where an integration of water management needs with spatial planning occurs. The design-led methodology is used to allow this discussion to happen on a shared basis within a team. This shift has taken hold in government organisations in the Netherlands with reasonable speed. The

'transition' (Van der Brugge et al., 2005) from a technocratic response to a more sustainable approach in which natural water systems and biodiversity are given equal priority to water defences, has led to the assumption that water management and other requirements can in fact be integrated without threatening the objective of water security. This win-win situation has developed further from environmental planning into other aspects of spatial planning to include integration with residential areas, amenities and other functions.

## 5.3 Why it is worth investigating?

Changing European Policy will require new approaches.

The complex issue of designing the country's next generation of flood defences is set to become even more challenging as the second strand of national water management - water quality - is to be fully implemented in line with EU regulations. Changes in environmental law prescribe new requirements to improve water quality, adding an incentive to water management agencies to integrate their thinking to deliver smart systems for water management.

The programme of implementation is under way. Despite flood protection and water quality belonging to separate governmental departments; the Office of Public Works (OPW) and the Department of the Environment (DOE) respectively, both strands may well become increasingly coordinated in time. With this long-term perspective and holistic approach to water management in mind, the design-led

approach offers new opportunities for integrated solutions.

### Contributing to the quality of the Irish landscape

As already discussed in relation to the Dutch water management approach, it has undergone a transition and is moving from the initial phase to the acceleration phase to become a mature management strategy. Could Ireland be starting on a similar trajectory, with a similar field of forces, policy and funding?

There is an emerging view that an integrated design-led approach is worth pursuing, based on bottom-up activities and focused on multiple benefits including nature conservation, enhanced biodiversity, improved water quality and ecological status and where possible, benefits to reducing flood risk.

Recent changes in European policy for river management, have led to a sense of urgency in government circles to achieve targets in flood protection and water quality. Government bodies may wish to explore new opportunities and to offer more space for design-led approaches. To be truly effective and convincing, these opportunities need to be capitalized on and translated into clear working principles and examples to demonstrate coherent benefits. This is the aim of this design research, Flumina Hiberniae 2040.

The required flood risk management data to carry out the study became available for the first time in 2015-16 through the National CFRAM Programme. This data ensures that there is a wide base of information for all 300 potential study locations. The data for water quality was also to become available



The Delta Works, Netherlands



# WHAT IS A DESIGN LED APPROACH?

in the latter half of 2016.

There is a wide array of other possibilities resulting from this approach which offer long term benefits, cost savings and potentially contribute to the overall quality of the Irish landscape.

The tradition of a design-led approach is now being explored in Ireland. The aim is to showcase these findings to policy makers, local authorities and other professionals as a basis for promoting best practice and a new way of designing for the future of rivers.

The no nonsense Dutch expression, making 'work with work' is often used to underline the multiple benefits of this type of approach with cost saving consequences. Although water management issues such as water quality and flood alleviation remain major protagonists for change, the integrated design approach can be applied to a broader spectrum of issues in the landscape to include benefits to water quality, ecology, recreation, infrastructure, agriculture and the public realm. An integrated design approach to flood protection can be a means to advance other benefits and can become an important tool in realising enhanced value in the landscape.

## New forms of Innovation in river management

As well as the Dutch method, the application of new concepts and ideas for river management are to be explored. As well as technological developments, schools of thought for river design are to be investigated. These include Soft Engineering, Integrated River Basin Management, Ecological Flooding, River Restoration, 'Natural flood risk management' or 'Working with nature'. The last approach has been applied in several countries for various projects including the Netherland's 'Room for the Rivers' ('Ruimte voor de rivier') project.

"Working with natural processes means taking action to manage the risk of flooding and coastal erosion by protecting, restoring and emulating the natural regulating function of catchments, rivers, floodplains and coasts" (Environment Agency, 2013). The guiding principles of these approaches have been assessed and compared in the project.

## 5.4 Benefits to the water management organisations

Several benefits can be achieved using the design-led approach.

### Lessening public opposition

Many water management projects are dealing with fierce public opposition and have been highly publicised in the national media. Several important projects have also been stalled due to appeals within the planning process. Visual representation and graphic communication skills could work much better than reports, lessening public opposition and helping the organisation to get more projects realised in a shorter time.

### Creating higher levels of collaboration with external stakeholders and other governmental bodies

The need for a multidisciplinary approach that embraces new alliances and collaborations with external stakeholders is essential to allow projects to happen for a design-led approach. The shared approach promoted by design thinking allows a greater level of participation. The OPW can play a key role in increasing levels of collaboration with external stakeholders and other governmental bodies.

### Achieving higher quality spatial solutions

The holistic approach can deliver higher quality solutions, which can contribute enormously to the quality of our surroundings and the towns and villages through which rivers flow. The integrated design of flood defences for public rivers can potentially transform dirty backwaters of urban areas into healthy green areas and desirable places to live. The organisations can improve the quality of the surroundings and generate acknowledgement for their contributions.

# WHAT IS A DESIGN LED APPROACH?

### Creating societal benefits

The application of design thinking has the potential to create huge societal benefits above and beyond flood protection. The organisation can coordinate and encourage the development of multiple benefits, including the development of amenity networks, recreational spaces, new nature areas, and green amenity spaces.

### Developing environmentally-sustainable solutions and improved water quality

The delivery of sustainable principles and the integration of biodiversity measures are features of integrated design that are not fully represented in the organisation's current approach. There is potential to deliver all these extra measures as part of a new approach.

### Delivering cost benefits

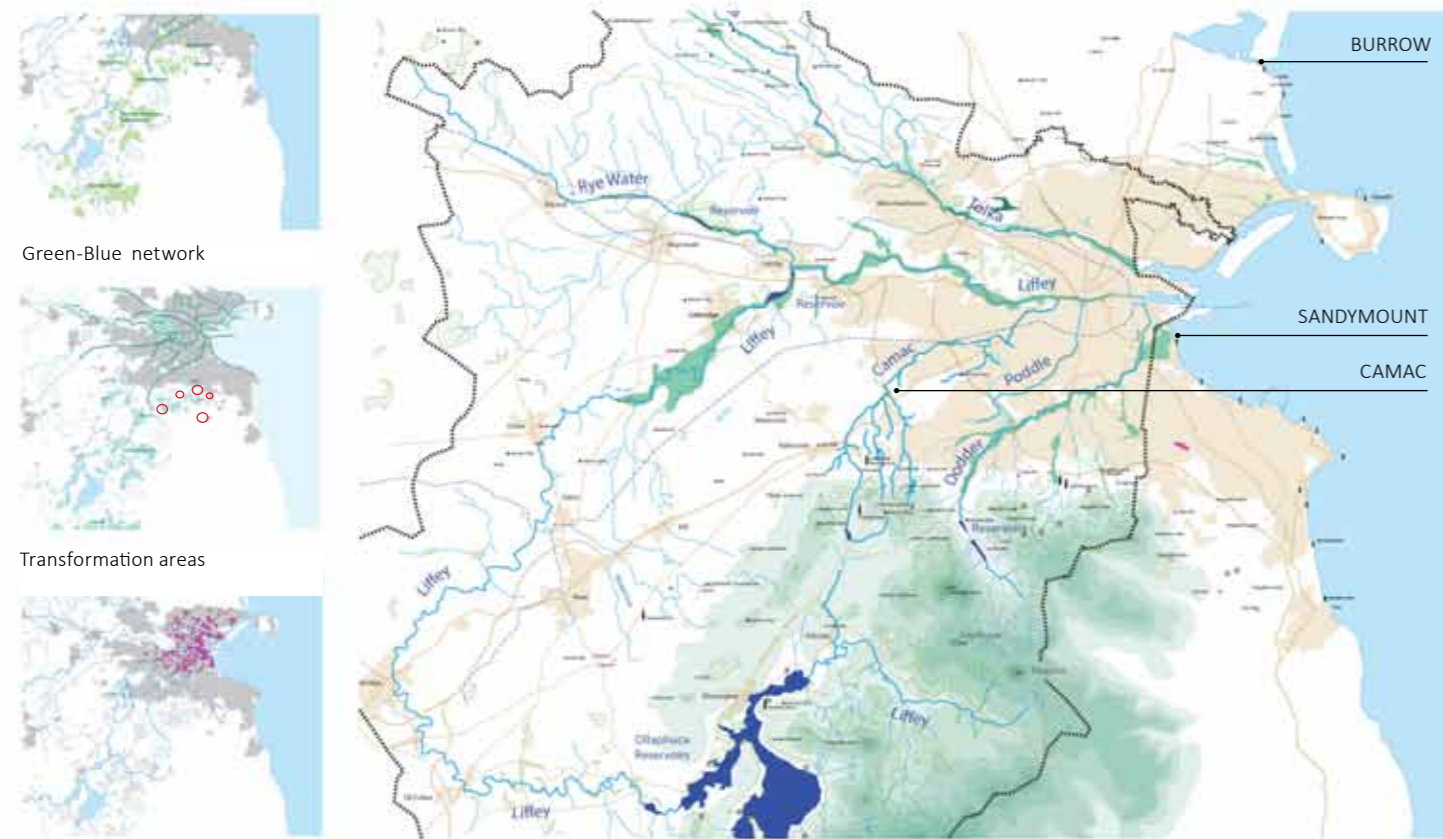
The integration of sustainable solutions for flood protection, the development of long-term alternative solutions, as well as the benefits of integrated users, are all reasons why the application of design thinking can lead to significant saving for the organisation, or across the range of organisations involved, over the long term.



Working with nature: The Sand Motor in the Hague (2016)

## Cork and Dublin regions- developing a toolbox of options

Based on the quick scan of 45 of the 300 AFA locations it was decided by the Dutch design team to focus on two regions; Cork and Dublin, which exemplified many examples of the challenges facing the design of flood defences. The Dublin and Cork regions, based on the Liffey and Lee river systems respectively, were analysed more closely at a regional level to clearly understand the overarching issues before focussing on a flood area.



The Dublin region: designing the whole river system.

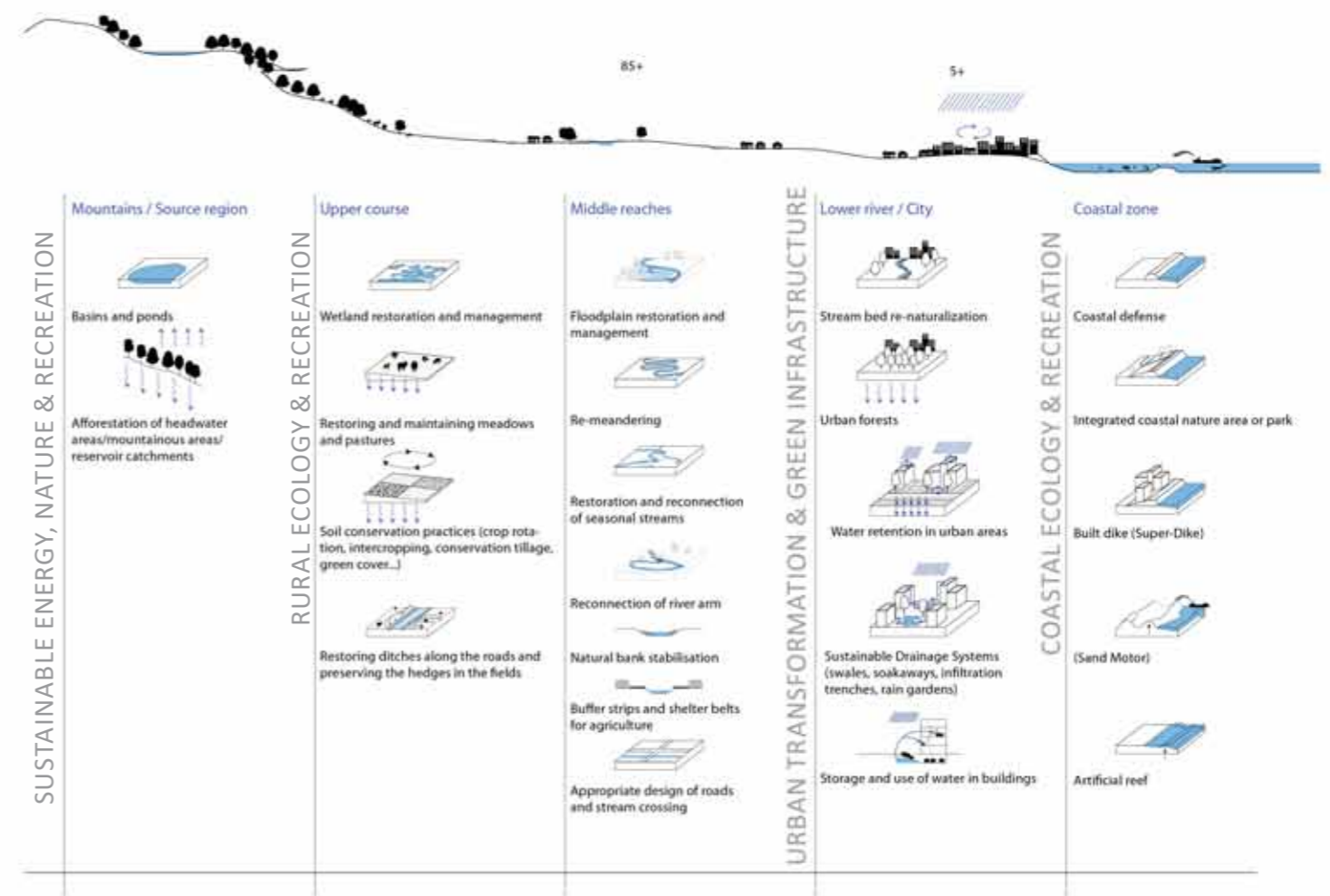
A toolbox was developed for this regional analysis which formed a framework for identifying and combining potential solutions. This approach delivered alternative solutions and reframed the questions in new ways. An example of this was given during Workshop 1 when a discussion started on the benefits of reduced run off given by tree planting. The concept of a forest strategy for upstream areas was put forward and believed to have enough

evidence to offer reductions for run off. It was also pointed out that the investments in upstream areas would likely be less expensive than engineered investments in urban areas where land costs are at a premium. This discussion was one example of how alternative approaches could potentially lead to long-term strategies being formed, which could ultimately cost the tax payer less money and develop interesting new resources in the form of forestry and

amenities. The toolbox offered a framework of spatial design strategies that map the potential approaches to flooding issues.

### Overview of Case studies

A total of five case studies were developed for the two regions Cork and Dublin, to demonstrate the benefits of a design-led approach. Each case study has its own design report however, only a summary is given here.



The toolbox for regional analysis.

Two case studies were focused on the Cork region. The first case study was developed by Dingeman Deijs Architects, and looks at the flooding issues in Cork's inner city and the design of a flood protection strategy for the quay walls that enhances the experience of the River Lee. The second case study, developed by Palmbout Urban Landscapes, looks at developing a new flood protection strategy for the Docklands development, which allows many of the existing industrial buildings to co-exist with a new layer of buildings for the city centre. It also releases the area from years of uncertainty and allows for a phased approach to the development of the area.

The Dublin region was the focus of three case studies. The first case study, developed

by REDscape Landscape & Urbanism, looks at the revitalisation of the River Camac in a suburban and urban setting. It shows how the river can become the catalyst for regenerating disused areas and creating a major new impetus for investing into green infrastructure in the form of parks and green areas, to largely solve the issue of flooding protection. The second case study, developed by Van Paridon De Groot Landscape Architects, examines the issue of coastal protection in Burrow, in Fingal County Council. They propose several strategies, including 'working with nature' and with residents to empower the process of sustainable flood protection to protect homes from being washed away. The final case study, developed by REDscape Landscape & Urbanism looked at another

coastal defence area at Sandymount in South Dublin. In this case, a highly integrated and technical approach shows how several functions can be potentially combined to create long-term protection and a new amenity in the form of a local park.

*It should be noted that the case studies were developed only for the purposes of demonstrating a design-led approach. The case studies have not been costed or fully appraised and do not form proposals for implementation.*

This report only contains a summary of each case study. A full report for each case study is available as a separate report.



# CASE STUDY 1 DEFENDING THE COAST AT BURROW

By Van Paridon de Groot Landscape Architects

Defending the coast at Burrow in Fingal County Council is one of five case studies for the design-led approach to flood defences for the project Flumina Hiberniae 2040. It is a sustainable development for a coastal zone at Burrow.

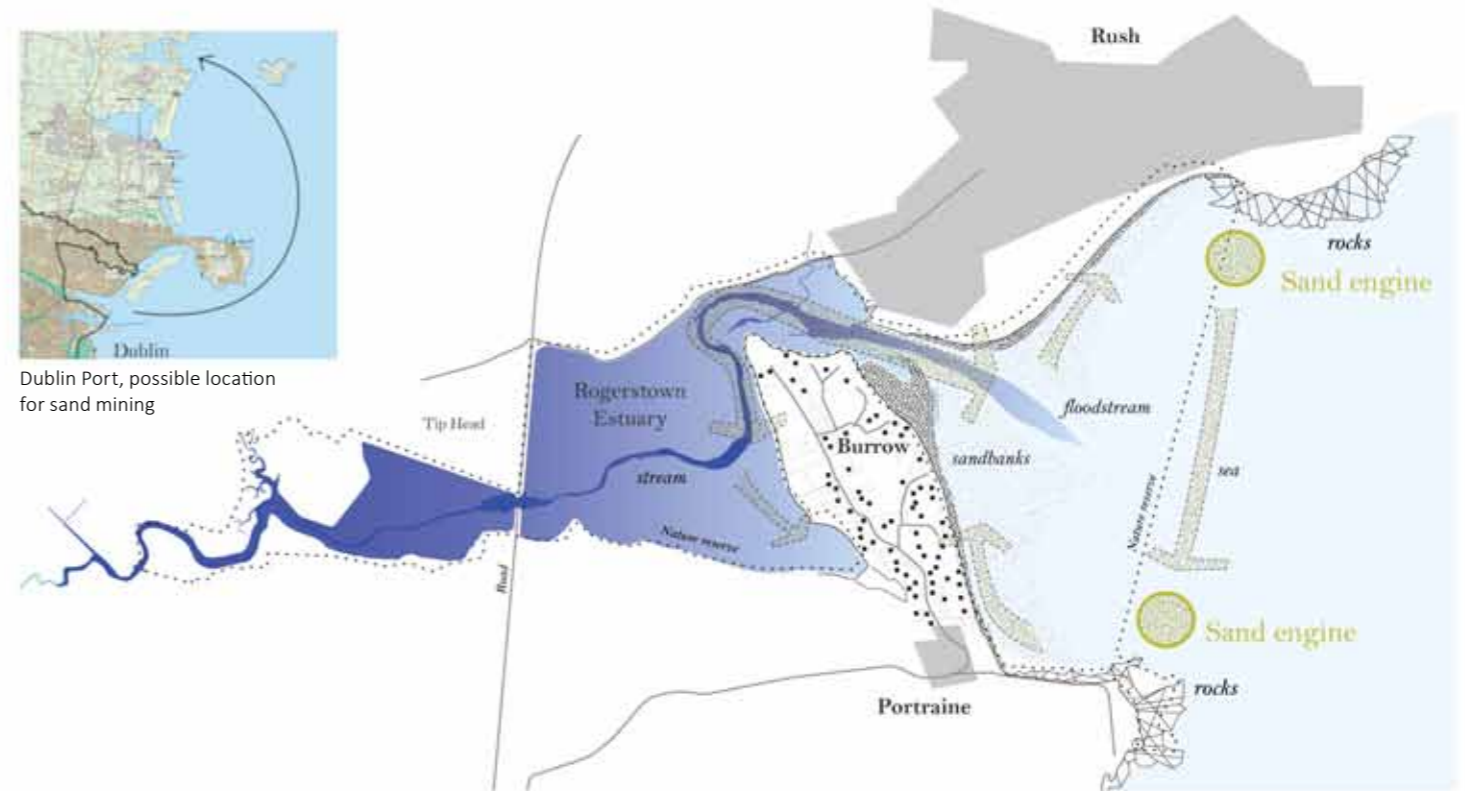
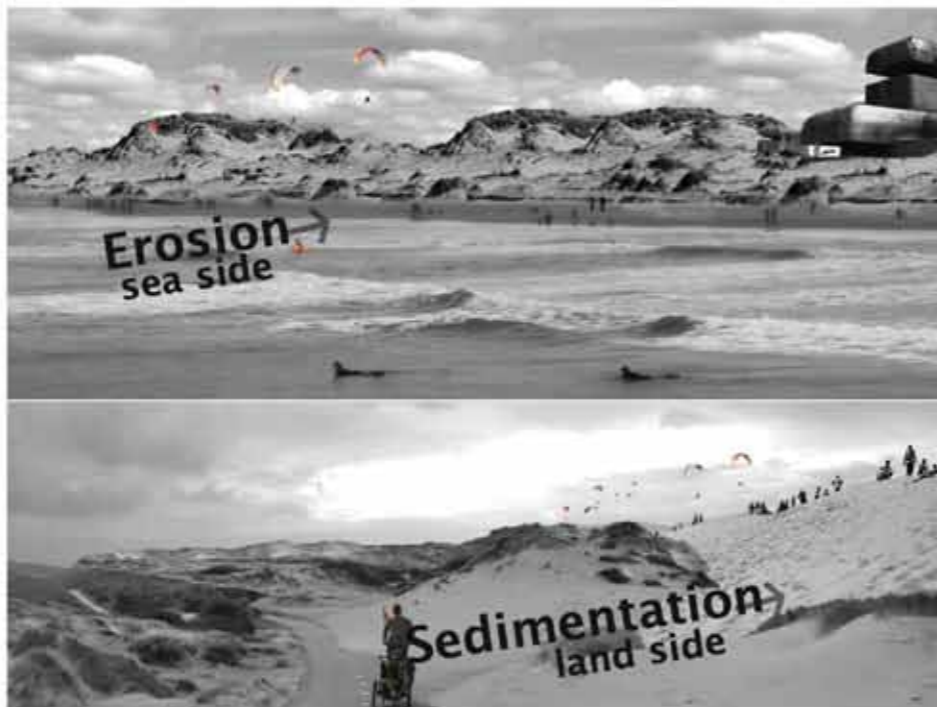
### Current situation

Burrow is on a peninsula, with the east coast of Ireland on one side and the Rogerstown Estuary on the other. Due to the dynamics and shelter of the area, it is rich in nature, with many birds living in the estuary. At the moment Burrow is threatened by erosion and flooding from both sides; from the sea and from the estuary. There are various vulnerable sections where houses and recreational areas are threatened. Climate change leads to rising sea levels and a higher risk of flooding and erosion.

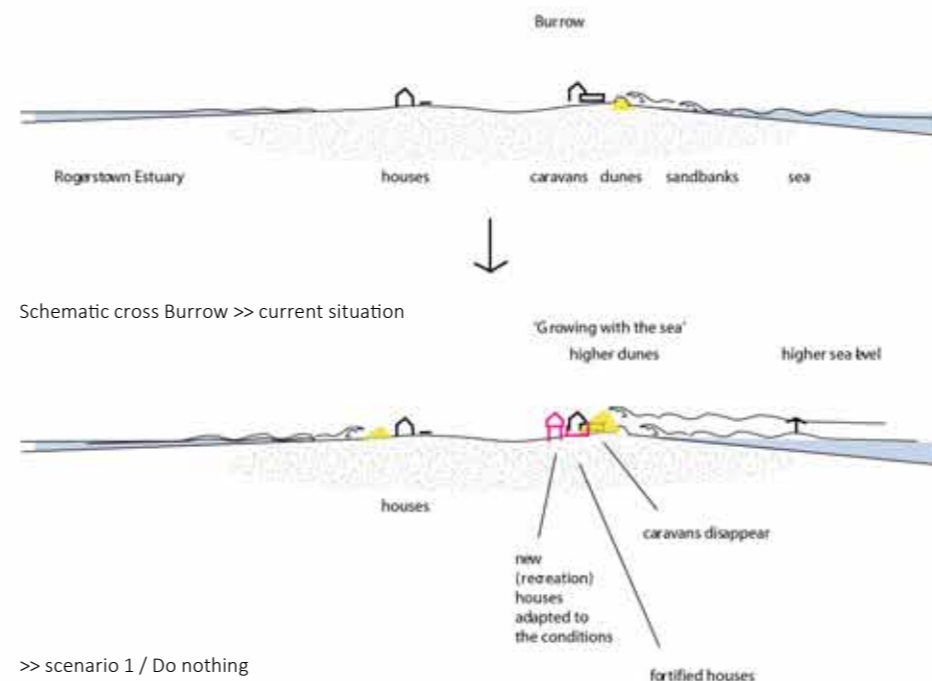
The ambition of the Irish Design Committee is to prevent damage to public and private property, while also strengthening the natural dune character of Burrow. In line with the ambitions of the committee and local residents, the Dutch team launched different scenarios to deal with the problems, in connection with the reinforcement of the qualities of Burrow.



Current situation: sea threatens the land



Two possible locations for the sand engine. The flow of the sea takes the sand to the shore and estuary



>> scenario 1 / Do nothing

### Scenario 1 / Do nothing

The first scenario is based on the question of what happens when you do nothing. Parts of the island will erode, but possibly or probably the eroded sand will end up in other places again. Design research into the development of the Dutch coast (2100) showed that in the Dutch situation the 'erosion coast' naturally narrows but also increases; the dunes grow naturally along with the rise of the sea. Possibly this is a principle that will also work in Burrow. Some vulnerable campsites or houses may disappear in time. These places offer opportunities for new nature. Redevelopment (recreation, holiday houses and cultural development) creates opportunities for new buildings that are better suited to the unique, natural, dynamic area in relation to the sea.



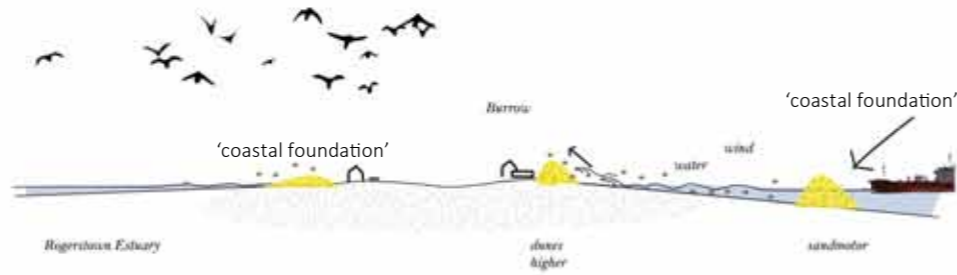
# CASE STUDY 1 DEFENDING THE COAST AT BURROW

# A DESIGN LED APPROACH

By Van Paridon de Groot Landscape Architects

## Scenario 2 / Grow with the sea

The dune area to protect Burrow is rather low. To get good protection around the peninsula, which can address a sea level rise of 1 meter, lots of sand replenishment is needed. At this time, the dunes are sometimes reinforced with sand that is obtained close to the coast. This is very labour intensive, and also not effective. With a storm, the sand washes back into the holes dug earlier in the 'coastal foundation'. To make the dunes substantially higher, new sand is required to increase the entire 'coastal foundation'. In the Netherlands, they have experimented with 'Sand Engines', which involves directionally placing large quantities of sand into shallow coastal parts. The natural processes (water, wind) distribute the sand along the coast. In this way the dunes (and the whole coastal system) get higher in a natural way by the wind and the flow of the water. In this area, it is possible to transport sand from elsewhere, such as Dublin harbour, to the coast foundation of Burrow. If the sand engines are positioned well, the sand may well spread to the coast and estuary.



>> scenario 2 / Growing with the sea



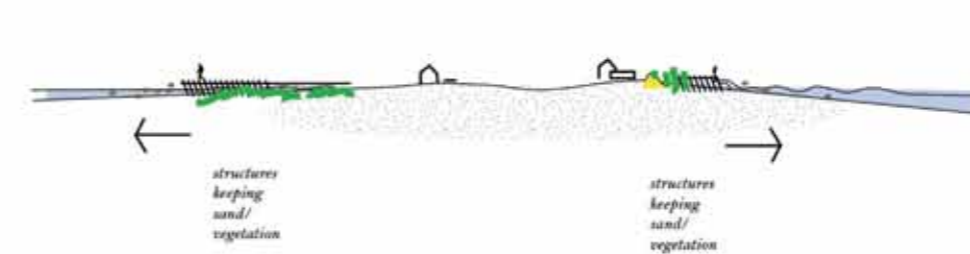
Process: Sand is sprayed in a strategic spot in the sea to a mountain / The sea moved the sand to where it is needed



Opportunities for recreation



Opportunities for nature



>> scenario 3 / New contact with the sea



The structures offers new opportunities for experiences the sea, natural processes and the nature in the estuary (SLEM/Bruno Doedens)



## Scenario 3 / Build with Nature

The third scenario shows a combination of the power of nature and culture. Inspired by the land reclamation projects in North Netherlands, it is proposed to explore new structures that can hold floating loose sand and silt as a protection against the sea. Such structures provide opportunities to develop new physical relationships between the peninsula, residents, recreationists and the sea. Opportunities arise for new ways



to experience the sea and the nature in the estuary. Research into the coastal system should show whether there is enough sediment to 'grow with the sea' in such a way, or whether a combination with scenario 2 is required to add some extra sand to the system.

## Community project

The community of Burrow is very involved in coastal management. They follow the development of the coast and contribute to the strengthening of the dunes. There is an opportunity to approach the coastal defence both top-down and bottom-up, in close cooperation with the community.



It's possible to make the structures with the community (SLEM/Bruno Doedens)



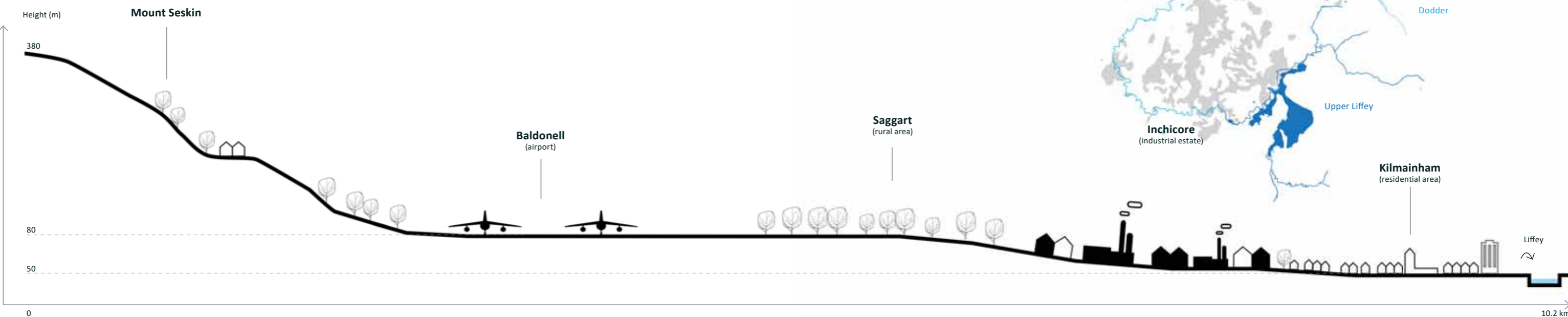
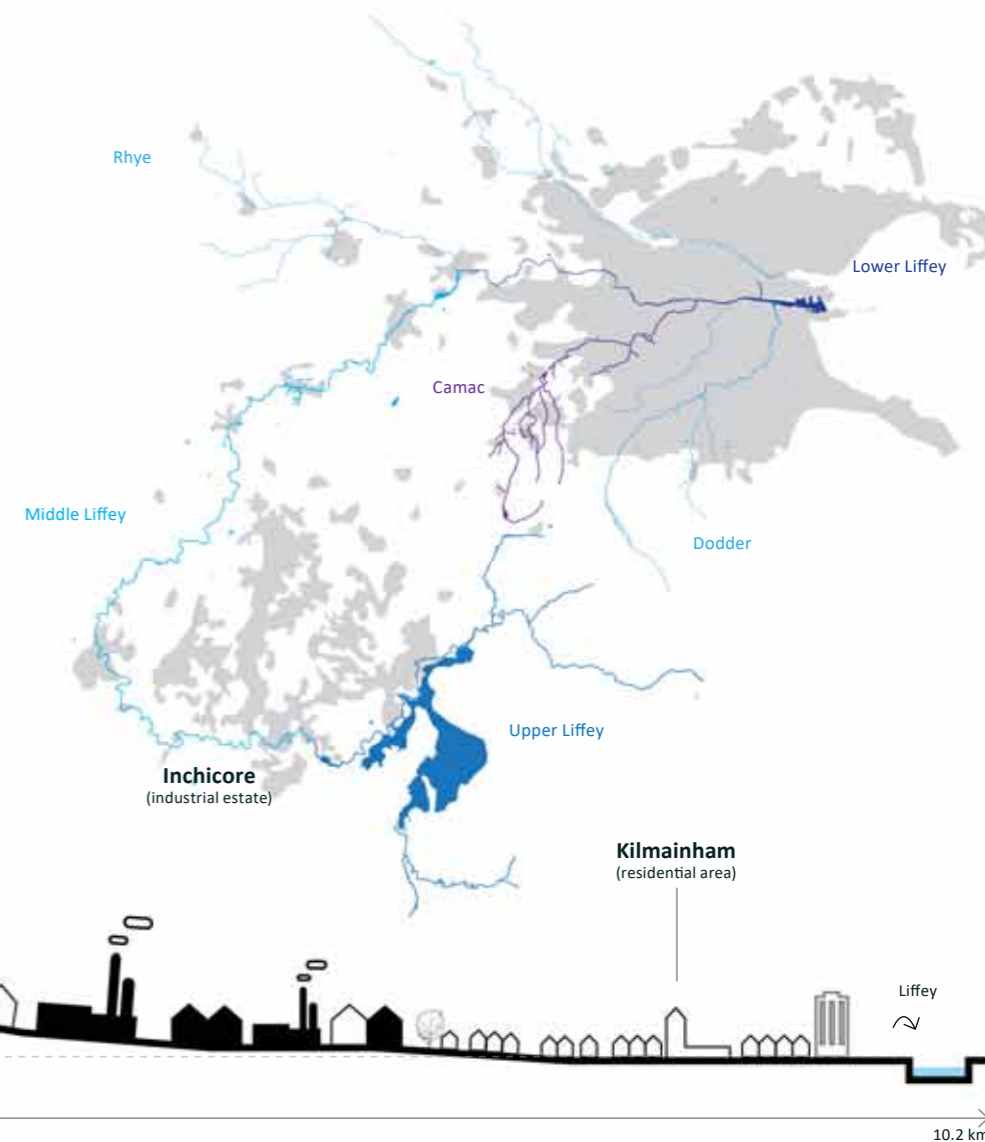


# CASE STUDY 2 REVITALISING THE CAMAC

## A DESIGN LED APPROACH

by REDscape Landscape & Urbanism

Revitalising the River Camac is one of five case studies for the design-led approach to flood defences for the project Flumina Hiberniae 2040. The location was selected by the design team, as it represents many similar situations throughout the country. It is a classic example of how a river which has become highly disrupted within the suburban and urban context of a city can be transformed.



Section of the Camac from source to sea

This study focusses on the River Camac from Dublin West to Inchicore. The river in this part of the city is fragmented, disconnected from its surroundings and polluted, with little potential for further development. The chances are that without intervention, it may degrade even further in time. This study aims to demonstrate an approach which can reverse this decline and start to transform the river and the city around it into a valuable green resource for the future.

The study is broken into two parts. The first part deals with understanding the problem and the issues involved. It explores the history of the River Camac; how it has changed over time and the factors involved in shaping it. It looks at the current experience of the river and examines the correlation between flooding and factors such as floodplain deprivation

and tunnelling of the river. Finally, it looks at the proposed solutions for the flooding problem and suggests why alternatives may be preferable in the long term. The second part of the study develops a new vision for the river which entails transforming the Camac into a valuable green resource for the city. The key to unlocking this potential is based on developing technical principles for flood protection. A revised technical principle for water management, which makes use of current hydrometric data, explores the physical and technical feasibility of alternative approaches. The vision proposes the future of the Camac as an attractive river landscape flowing through the city's districts as an integrated green amenity and recreational landscape. A wide variety of existing and future amenity activities from sport to cultural and recreational possibilities can be found there. The Camac river landscape is to become the back bone of a new green

infrastructure to facilitate pedestrians and cyclists and form a continuous physical route from the Liffey to Mount Seskin. We envisage an amenity area connecting the heart of the city with the Dublin/Wicklow Mountains from Kilmainham to Clondalkin and City West.

Rather than investing in walls, the vision proposes that investments be diverted into the redevelopment of parks and green areas which can function as storage areas for flood defence. The river is to become a catalyst for new urban transformations and the masterplan will deliver a blueprint, (supervised by local government), for landowners to transform and restructure lands while contributing to the revitalisation of the river.

It is a long-term strategy that can only be achieved with a multidisciplinary, integrated design approach, in collaboration with

government agencies and stakeholders, such as landowners and residents. The vision is a preamble to developing a real masterplan outlining a flexible framework with clear spatial objectives, which acts as a practical and clear guide to achieving the aims of the river park. To demonstrate its practical application, three locations have been selected to show the potential transformations and how these can feed into revitalising the River Camac. The basis of the revised technical design is examined and the water management strategies outlined.

### Vision Statement

A vision statement was prepared which raised a number of questions as follows:

- Can we make the River Camac a visible asset?
- Can we combine water storage with

- green infrastructure?
- Can we combine the River Camac with recreation?
- Can we connect the river with surrounding water infrastructure?
- Can we de-urbanise the flood zones in the city?



Transformation strategy : floodplain restoration  
Model 1, transformed the green area (nature, park, sports field) into a water park by excavating land and expanding the riverbank planted with reed systems.



Mourne Road



Kilmainham



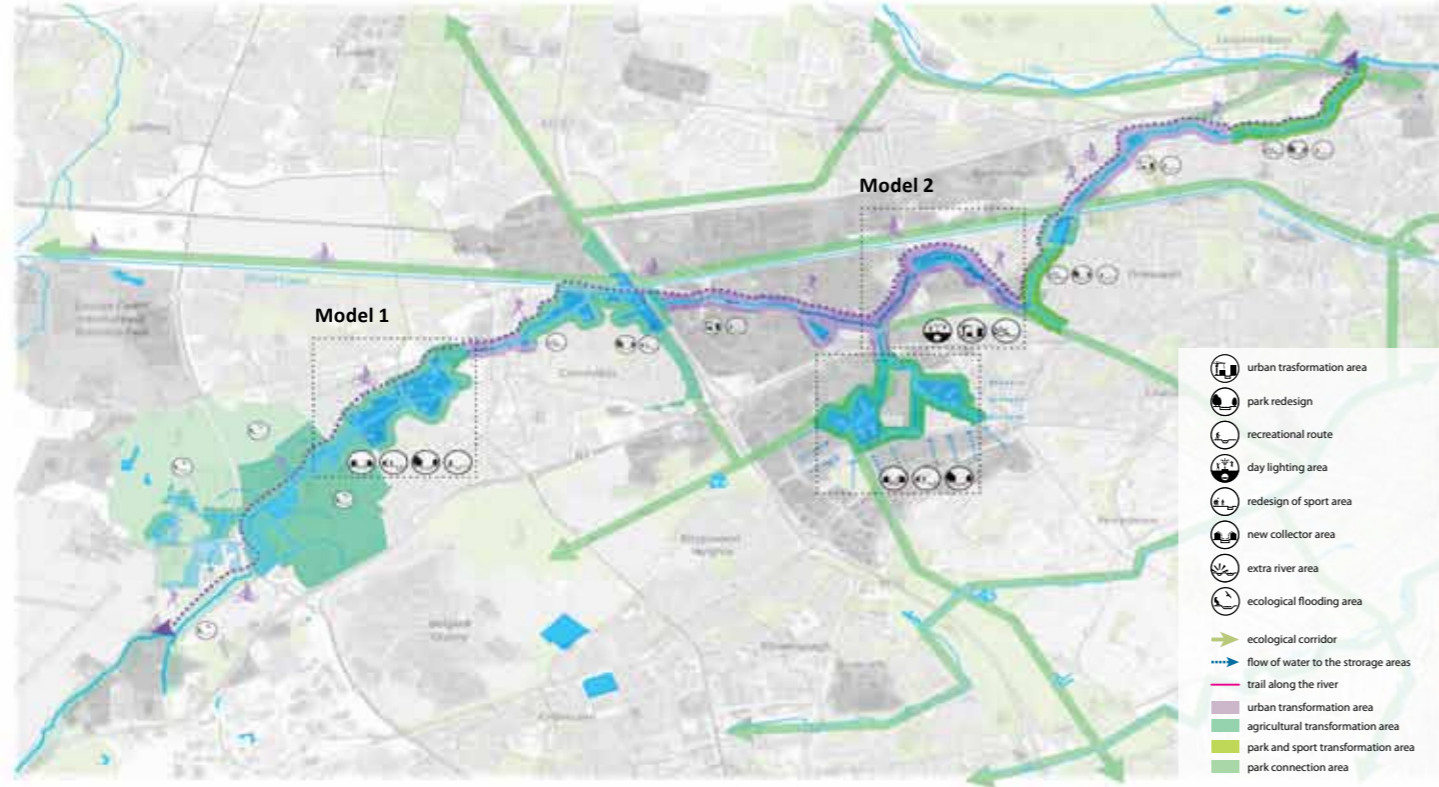
Camac Road



# CASE STUDY 2 REVITALISING THE CAMAC

by REDscape Landscape & Urbanism

# A DESIGN LED APPROACH



Masterplan: a continuous amenity network of routes and green spaces for the Camac.



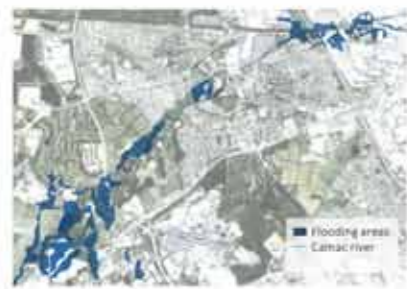
Model 1 New situation with transformation (flooding)



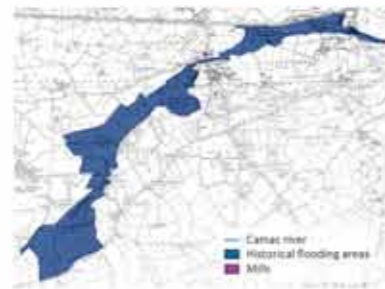
Model 1 Existing situation (Clondalkin)



Model 1 New situation with transformed green areas for water retention

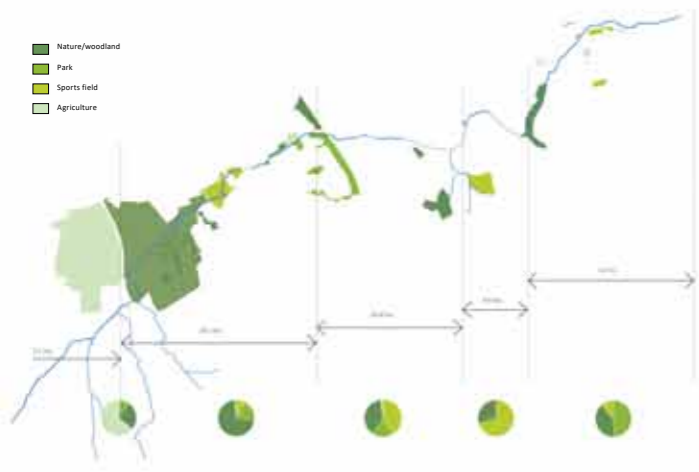


Existing flooding area

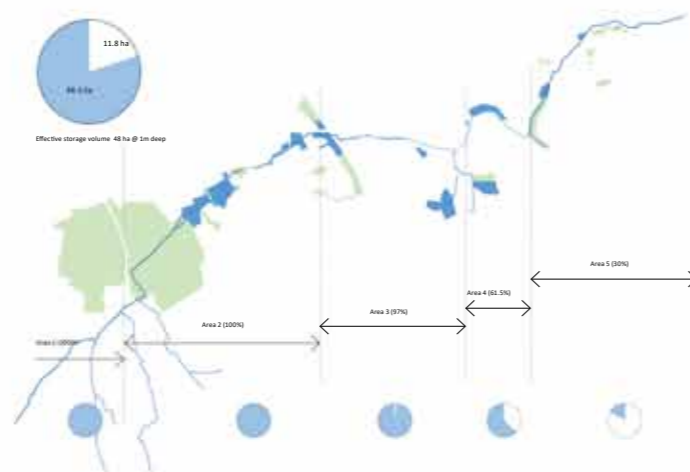


Historical map

Potential green space for water retention ( 125 ha)



Potential effective storage space for water retention with excavated sites (482 000 m3) or 48 ha x 1m



Model 2 - Flood situation ( 3-5ha of storage)



Model 2 - Urban transformation, reconnecting the Camac



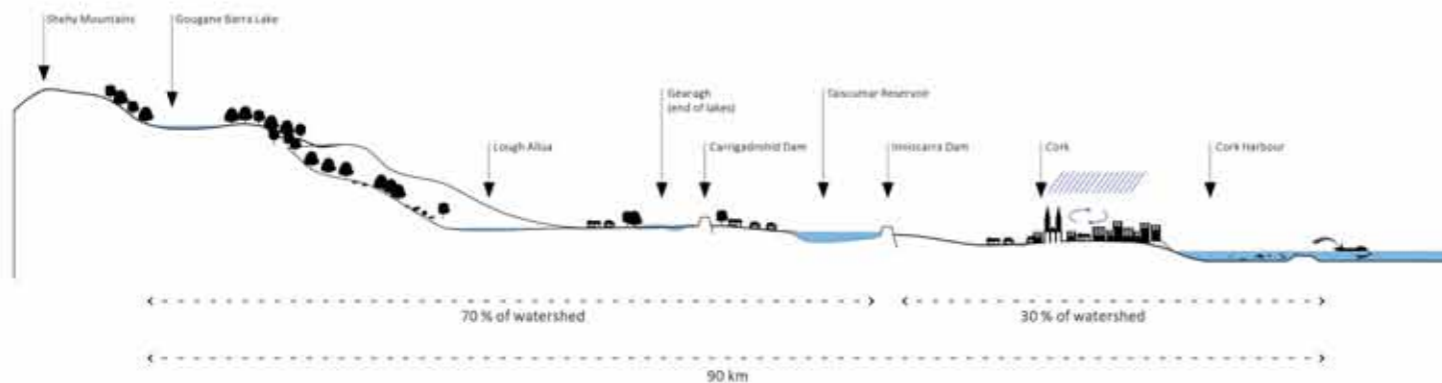
Model 2 - Existing situation



# CASE STUDY 3 FLOOD PROTECTION CORK CITY

by Dingeman Deijs Architects

Flood Protection Cork City is one of five case studies for the design-led approach to flood defences for the project Flumina Hiberniae 2040. Cork is the second largest city of Ireland and is situated in the south of the country. The River Lee flows through Cork and most the city is situated on an island in the estuary of the river, before the river flows into Lough Mahon and on into Cork harbour. Cork harbour is one of the largest natural harbours in the world.



Section

Due to climate changes, an increase in extreme rainfall (fluvial) and the rising of sea levels (tidal), the water pressure on the inner city of Cork is extremely high. Therefore, in recent years the city had to deal with numerous floods. In 2009 and 2014, significant areas of the city centre were flooded by water. To address these events, the OPW proposes to build walls and embankments to protect Cork City against such floods.

By researching this water issue on different scales, long-term and short-term strategies are explored as concepts (but without costing or technical analysis) to protect Cork and its surroundings against the floods. Using this design-led approach, alternative approaches have been considered for "Flood Protection Cork City".

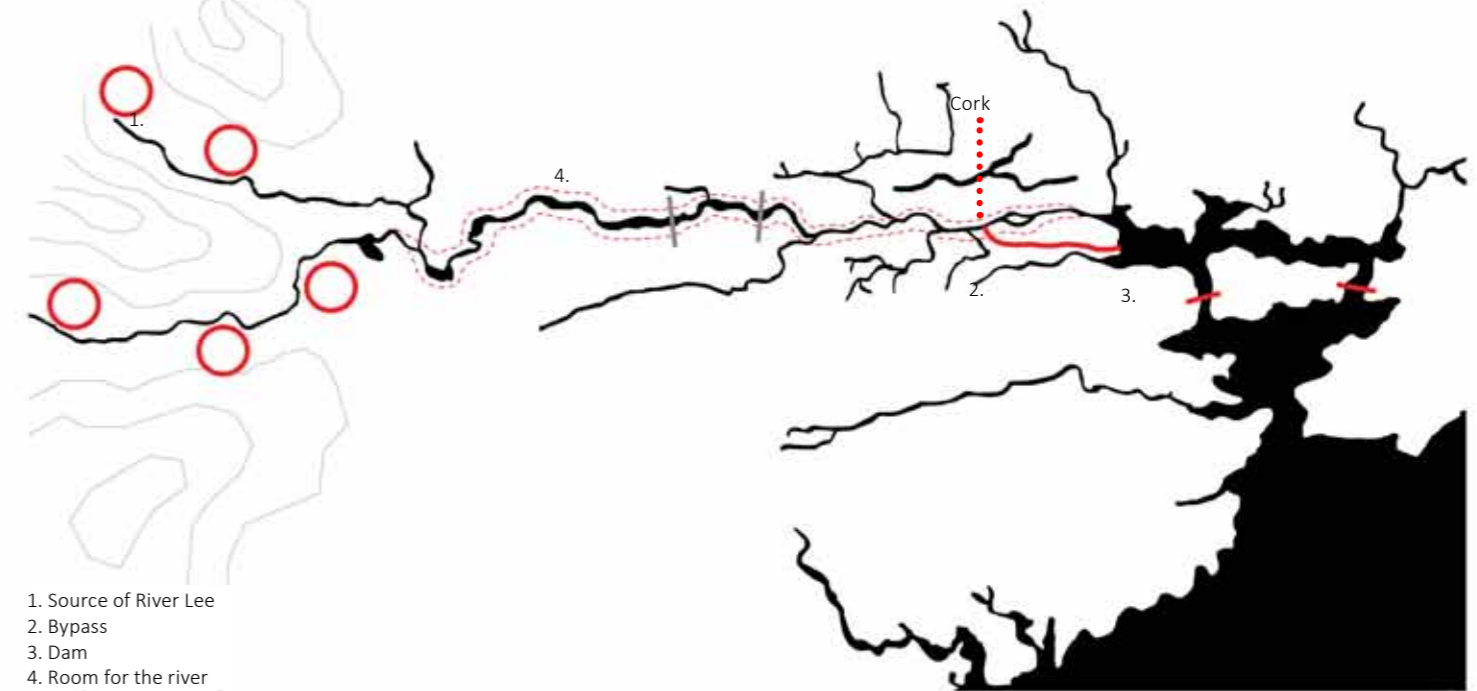
At the source of the River Lee (Shehy Mountains), water storage facilities can be added to the surroundings to collect water in times of extreme rainfall, which might reduce flood levels in the city. At the other end, two dams can be placed at the estuary of the river as a long-term intervention. In times of spring-tide, combined with storm surge, the system can be closed to protect Cork against the floods and make it a safe place to stay. These options (that have not been costed as part of this demonstration study) are illustrated later.

In Cork inner city, short-term interventions can be made to create more safety. Using natural transitions such as stairs and rolling/increased surface levels, new smooth transitions between the dock and river will arise. This approach will capitalise on the spatial and scenic qualities of the riverbanks. This presents an opportunity to experience the river in a totally new way,

where we don't fight the water, but we live with the water.

Through five typologies; a self-moving wall, water stairs, a (green) room for the river, water storage in parking garages and water storage in sports centres, innovative water solutions were considered as concepts for the river. On the south side of Cork City, an opportunity could arise to transform the quay into a car-free zone, to create a new public space (a boulevard) for the city. A church can once again show its impressive front by adding stairs towards the river. In this new public space, one can experience the dynamics of the river and create more space for the river. All of these water storage solutions could promote a sustainable future for Cork city and will give opportunities for an ecological and sustainable city, which can utilise its surroundings to enhance tourism, recreation and economic opportunities.

Proposals for the lee



- 1. Source of River Lee
- 2. Bypass
- 3. Dam
- 4. Room for the river



1. Source of River Lee



3. Dam



Reference: Maeslantkering Rotterdam

A history of flooding



1853 1953 1963 2004 2009 2014



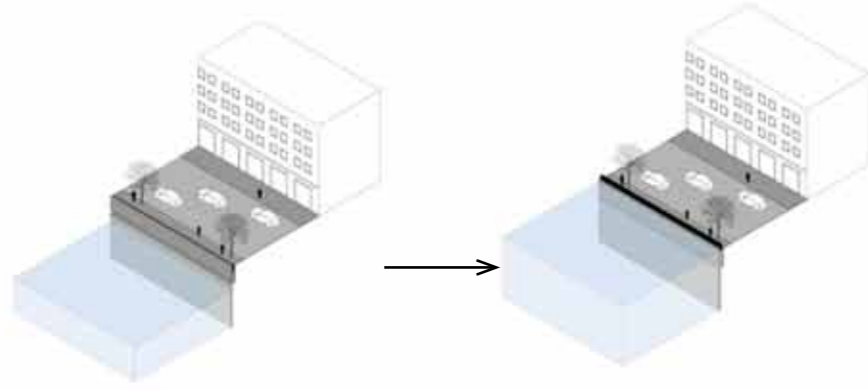
# CASE STUDY 3 FLOOD PROTECTION CORK CITY

by dingeman deijs architects

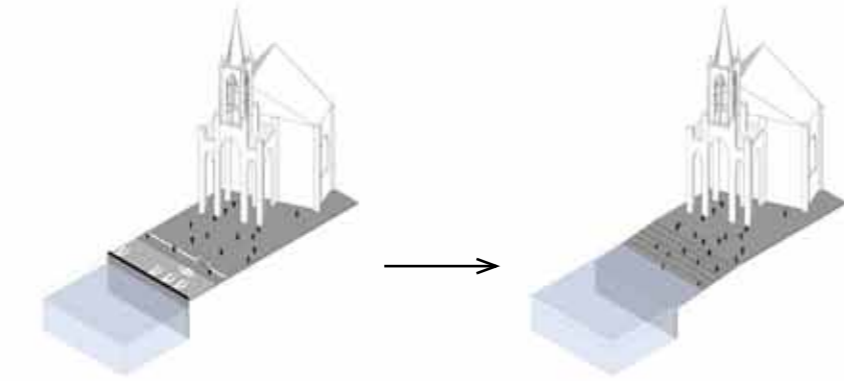
Flumina Hiberniae 2040

Irish Rivers 2040

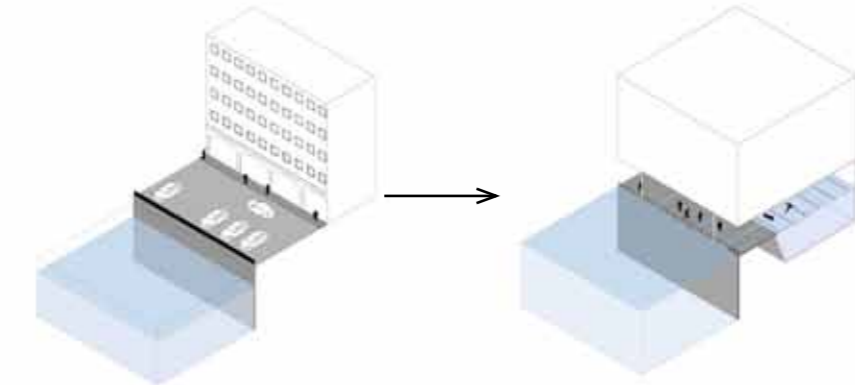
## A DESIGN LED APPROACH



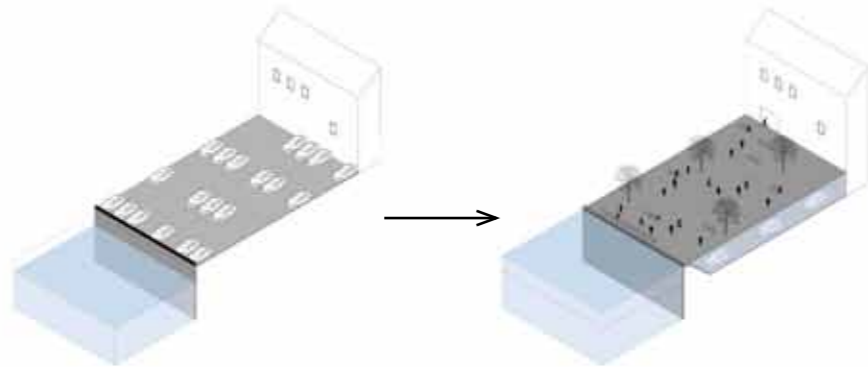
Self moving wall - Invisible wall which blocks the water during flooding



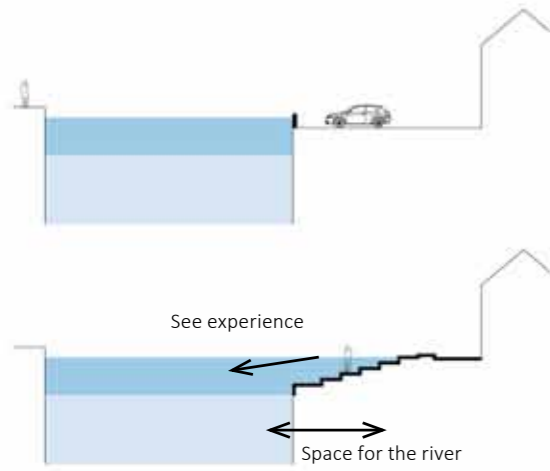
Waterstairs, a new public space to stay along the river



Water storage sportcomplex - Urban transformation in the form of a new urban water storage program



Multifunctional water storage parking garage.



Concept

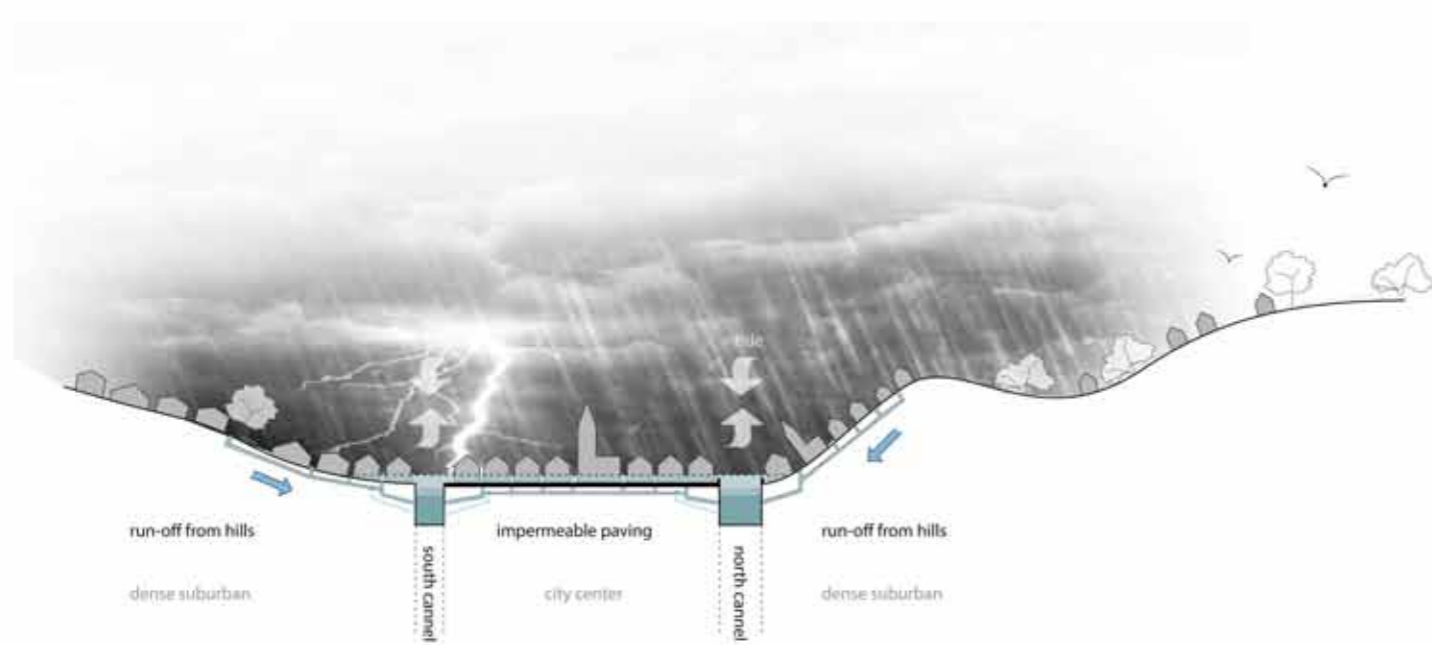




# CASE STUDY 4 TRANSFORMATION OF CORK DOCKLANDS

### by palmabout urban landscapes

Transformation of Cork Docklands is one of five case studies for the design-led approach to flood defences for the project Flumina Hiberniae 2040. South Docklands is located in an ideal spot next to the city centre with access to water. To make this an asset, a framework or strategic plan must be devised that is both flexible and provides a clear vision on future transformation.

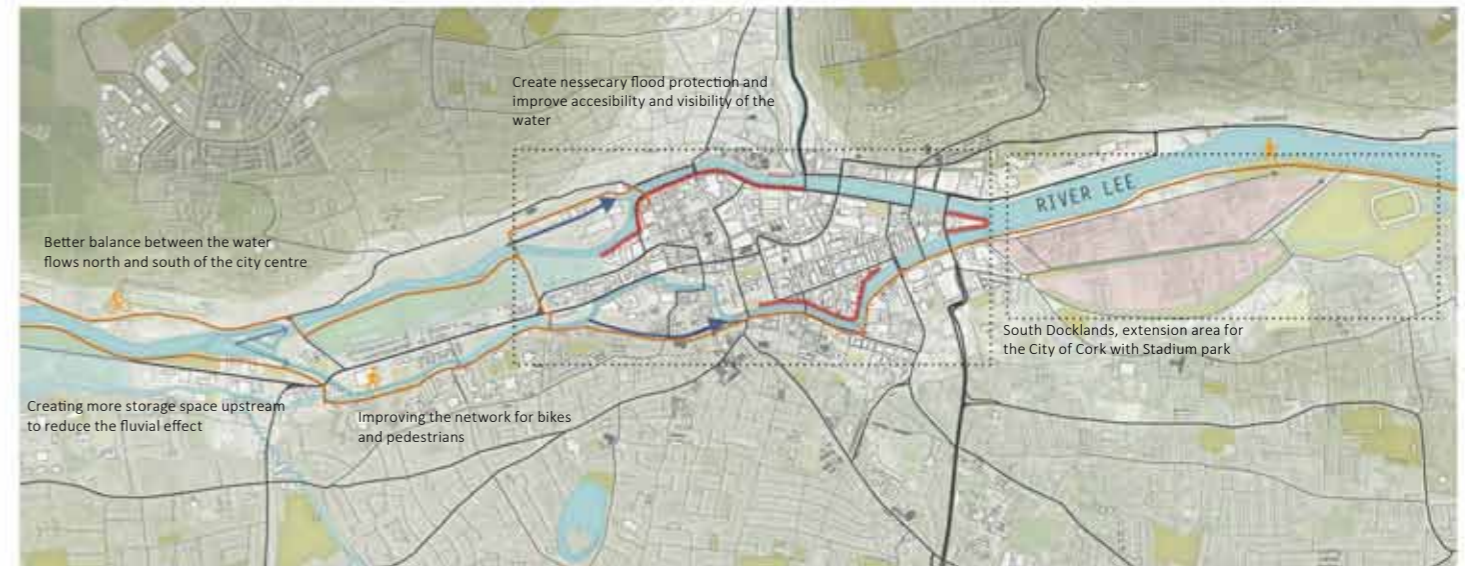


The South Docklands will become a highly-urbanized quarter providing space for people who want to live close to Cork inner city with all its amenities, and close to the landscape of the River Lee. The city centre of Cork is densely built. Little space is left for retaining water. It is a sealed city. The South Docklands can become an area that deals with water in a different, more sustainable way.

Transforming the South Docklands from an industrial area into a new neighbourhood must deal, in a sustainable way, with the problems around water and water safety, and still give possibilities for the long-term development of this attractive riverside location. Crucial to the long-term development is the position of the main flood defence for the area. This study sees two possibilities; Centre Park Road and Kennedy Quay, as two structural lines parallel to the River Lee. The process of

transformation is a process of planning that must be done in a strong combination with existing economic activities, existing real estate, possible contamination and the combination of new housing with existing industrial activities. A well-planned framework must form the basis of this transformation. On one hand, the framework deals with the essence of this future residential area such as long-term flood defence, main infrastructure, main public spaces, phasing and identity. On the other hand, the framework is a plan that leaves a high level of flexibility for future demands for development.

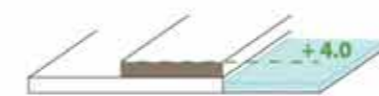
On the masterplan map, all interventions in the greater Cork area are combined. This provides an overview of all integrated measures. This is work in progress and should be worked on in relation to present developments in Cork in order to make an imaginary map that addresses projects in water management, urban development, ecological development, infrastructure, public transport and so on. This is an overview for a sustainable ambitious development of Cork.



#### Analysis - conclusions



1. heights Cork Docklands



2. Safe height  
A flood protection of 4 meters is safe



3. Bothar Victoria marks both the problem as well as the opportunity to start the development. An opportunity to create a building that is a safety measure and attracts the first group of people to move into the area. Development of this strategic place next to the city centre has to combine flood protection for the building with flood protection for a bigger area and attach to the city centre; an integrated commission.

After this first development at Bothar Victoria the area can be transformed step by step providing on the long run safety with a gradually rising sea water level.



4. New scheme based on the existing structure of the area



5. two design strategies making flood protection on two locations parallel to the Lee River



# CASE STUDY 4 TRANSFORMATION OF CORK DOCKLANDS

Flumina Hiberniae 2040

Irish Rivers 2040

## A DESIGN LED APPROACH

by palmabout urban landscapes

Design strategy - Phasing 1



1. Starting at Bothar Victoria. First urgency



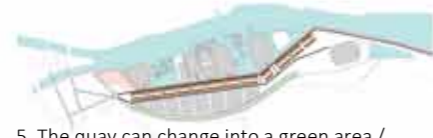
2. First development, the dike with integrated building blocks as a flood defense



3. The south area of Centre park Road is suitable for a gradual transformation into a neighbourhood with a strong water structure.



4. On the north side of Centre park rd new development can be made



5. The quay can change into a green area / water park adjacent to Corks city centre and can occasionally flood

Design strategy - Phasing 2



1. Starting at Bothar Victoria. First urgency



2. First development, the quay as a public space Developing buildings alongside the quay with a plinth of approximately 1 meters; flood safe



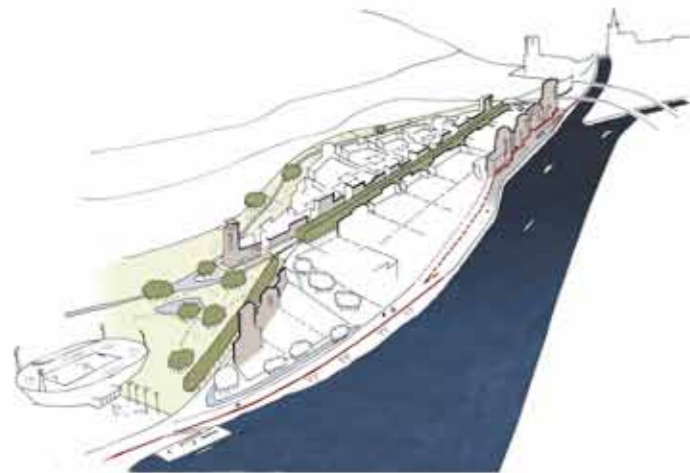
4. Transformation of the whole area



3. Gradually transform the quay, when necessary incorporating existing industrial activities, water related activities or buildings



5. Flooding of the quay and the water park



design strategy 1



design strategy 2

Design strategy - housing



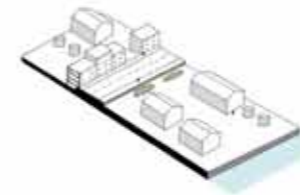
1. Building block alongside Kennedy Quay incorporating flood protection (+4M)



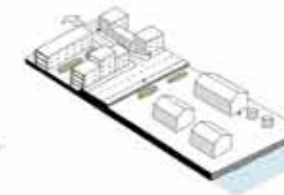
2. Solving height difference within the first building block.



3. Multiple conditions for housing plots, housing connected to the dike



1. Development of flood defense in combination with housing



2. Height difference between Centre



3. Multiple conditions for housing plots, housing connected to the dike



The Quay (new Bothar Victoria)



Centre Park Road



# CASE STUDY 5 MULTIFUNCTIONAL DIKE AT SANDYMOUNT

by REDscape landscape & urbanism

The rising sea levels in Dublin Bay are endangering the security of residential areas from Sandymount to Booterstown and beyond. Sandymount's coast is one of the five case studies for the design-led approach to flood defences for the project Flumina Hiberniae 2040.



Proposed route, variation source: NRA feasibility eastern by pass feasibility study (2007)



new proposed route, REDscape 2016.

Projections suggest that sea level changes could reach as much as 7mm per annum, indicating a rise in the levels of Dublin Bay by 0.56m or more by 2100. The location was selected by the design team, as it represents many similar situations throughout the country. The approach developed is a multifunctional, technical approach which markedly contrasts with the "working with nature" approach applied to the coastal case study at Burrow. It is recommended that the other options used in Burrow and found in the toolbox should be also applied. Therefore, several measures are to be used in combination, to mitigate the effects of potential flooding. These other possibilities were not further researched as many (such as offshore reefs) were referred to in the Burrow study.

This study is broken into two parts. The first deals with the examination of the current proposal. This proposal is sufficient for the coming years but with rising sea levels will not be adequate in the long term. The study recommends developing a structural solution that can deliver spatial and other qualities both now, and in the future. It then examines the strategy toolbox and focuses on the multifunctional dike as a possible option.

In the second part of the study, several scenarios are sketched for the multifunctional dike. These options look at integrating benefits from a changing urban dynamic with the idea of a long-term sustainable approach. A new coastline is proposed. Scenarios range from a linear coastal park to a more extensive parkway with diverted traffic systems. Even a tunnelled eastern bypass can be combined. To demonstrate these strategies, case studies of before and after situations are worked out to demonstrate the potential of the approach. These should not be considered as final designs but as general ideas to be further explored in more detail



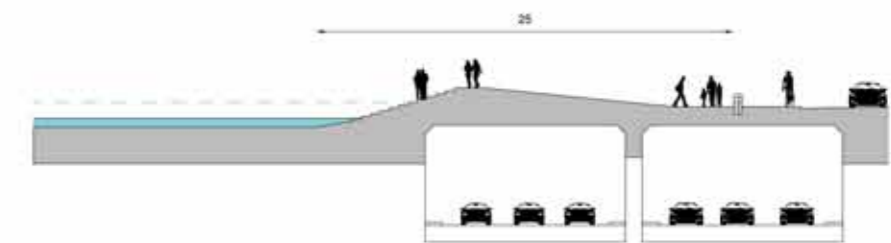
Existing situation at Sandymount



0. existing situation



1. new park and coastal protection (50 years)



2. new extensive park, reduced local traffic, full coastal protection for 100 years. Eastern by pass integrated.



# CASE STUDY 5 MULTIFUNCTIONAL DIKE AT SANDYMOUNT

Flumina Hiberniae 2040

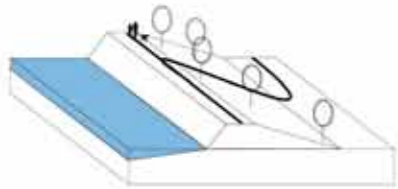
Irish Rivers 2040

## A DESIGN LED APPROACH

by REDscape landscape & urbanism



Multifunctional dike with possible extended coastline (25m)



Multifunctional dike as strategy. See toolbox.



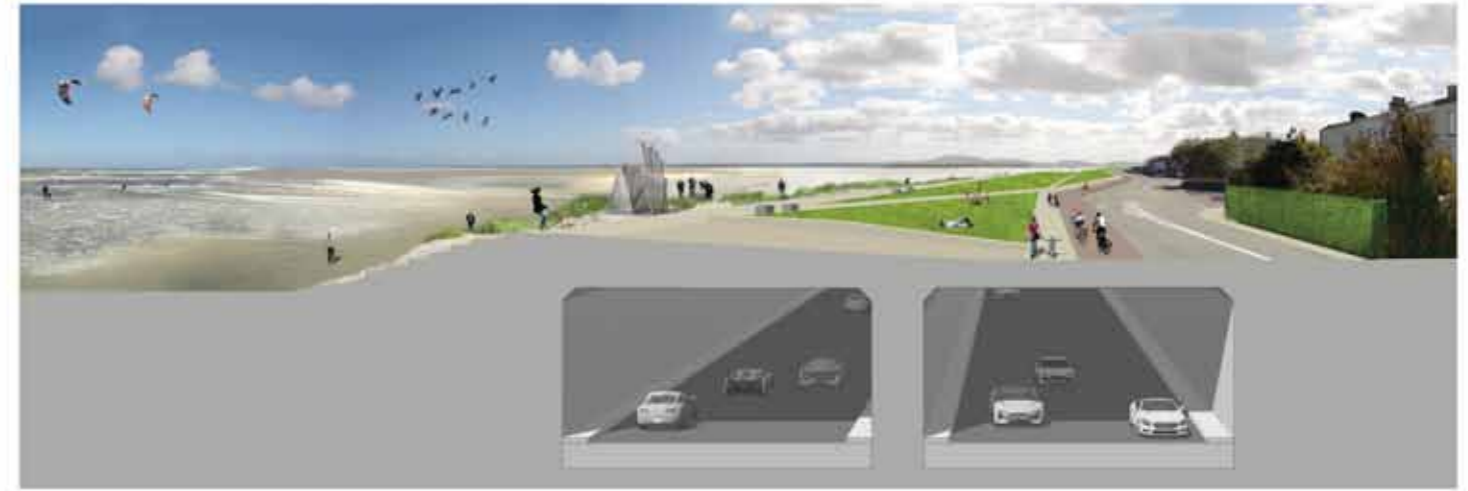
Reference: Kelly on beach



Reference: Dollymount beach



Reference: Public Bathroom, HHD\_FUN Architects



2. showing possible combination with a new eastern by pass (extended coastline 25m)



Scenario 1. new park and coastal protection



## 1. Develop a long term sustainable vision for flood protection and water management for Irish rivers

*“We haven’t been tasked to solve the problem now, or to solve the current difficulties, but to look at the scope until 2040. That’s the important difference. Where do you want to be in 2040? That’s an essential difference in scope and how the problem can be approached. The best strategy I believe is that you do both; long term and short term. What are the future scenarios in terms of climate, what are the long-term solutions, what can you do today and tomorrow?”*

*- Patrick Mc Cabe*



It is recommended that to sustainably manage flood risk and optimise the outcomes and benefits, a long-term strategy must be developed in parallel with a short-term strategy. The need for this approach is highlighted by the need to provide a more comprehensive response to emerging EU policy requirements for improved water quality. Although reducing flood risk is necessary, it could be argued that this approach is symptom driven, i.e. the risk of floods, which are essentially leaks in the system, are being dealt with on a project-by-project basis. Reframing the context of flood protection in the long-term will lead to different insights and proposals for flood protection.

An alternative approach could be used to design the river on a system-based approach, and determine how the causes (rather than the symptoms) in the system could be effectively dealt with. This would

likely lead to quite different proposals for the river systems that would likely need to address larger areas and regions. This overview of the river as an entire spatial as well as technical water system should be embedded in the approach. The potential benefits to developing a long-term approach were indicated by the design offices; one office cited the potential to direct investments into alternative up stream (rural) forestry strategies to attenuate flood risk, which could offer alternative financial returns on investments relative to (urban) engineering solutions. This was one of many possible strategies mentioned in the case studies, which merit further research as part of a long-term strategy.

The question of sustainable solutions for river water management should play a role in the current process of flood protection. The implication of a sustainable approach has become very evident in other countries such as the Netherlands, where they have come to realise that some conventional solutions can cost more money in the long term and are no longer feasible. A good example in the Netherlands is the lowering of water levels in peat districts for agricultural purposes. This has led to oxidation of peat and the gradual sinking of ground levels, which has in turn led to the increased need for pumping, which in turn has led to an increased rate of lowering, thus becoming a vicious circle. The non-sustainability of this approach has been rolled back by ceasing the pumping of these areas and ultimately changing the

use to more extensive forms of agriculture. This is one example of several water management policies over the last 20 years to be reviewed to achieve a more sustainable river management system.

The issue of sustainability and conflict with short-term solutions was also raised. Are short-term technical solutions possibly hampering long-term sustainable objectives? The problems surrounding the Burrow location, where homes were potentially to be washed away by the encroaching coast, was a good example of how a sustainable coastal protection system was needed to develop a long-term stable vision for the area.

The advantage of developing a long-term sustainable approach would be to avoid the pitfalls of poorly directed short-term investments, and to assist in clarifying investments which serve long-term as well as short-term benefits. This potential improvement in investments is unclear, but only a minor improvement could lead to significant savings in the capital investment budgets of about €0.5bn over the next 4-5 years.



The Dutch team leaders:(from left) Dingeman Deijs, Marcel van der Meijs, Ruut Van Paridon, Patrick Mc Cabe.



*“I have the feeling that if we got one task from the politicians that should be ecologically sound, it would be to come up with a sustainable flood defence.”*  
*- Marcel van der Meijs*

## 2. Develop approaches based on investments in green infrastructure and ecological needs with a regional perspective.

The design-led methodology provided several alternative approaches, demonstrating how investments could be shifted away from structural solutions (such as walls) into the redesign of softer solutions, such as parks and open spaces. These approaches potentially offer flood defences with multiple benefits.

In the Camac River case study, the design research showed that sufficient land was available along most of the river to deliver increased levels of water retention for peak flows to offer required levels of flood protection. This alternative strategy demonstrated how investments in green areas, such as the redesign of parks and amenity areas to retain water, could feasibly deliver 80% of the requirements for flood protection. This would dramatically reduce the need for walls and lead to multiple benefits such as improvements in recreational areas, residential living areas, networks, water quality, biodiversity and so on.

The recommendation is to develop alternative approaches based on investments in green infrastructure and

ecological needs as they deliver multiple benefits and offer more sustainable solutions. It was also clear from the research that there were obstacles to investments in some aspects of green infrastructure, including land ownership and legal issues. It is also recommended that these issues be investigated more thoroughly and be addressed with innovative thinkers and experts from those areas to develop solutions. Changes in planning and other forms of law should not be ruled out for new water management policies and might form an integral part of the process for the long-term strategy for water management in the organisation.



## 3 - Develop a vision for integrated solutions to deliver multiple benefits for flood protection

*“Yes widening the scope of flood protection is essential because then for Ireland you can search for the best solutions. Costs and benefits can be weighed and then I mean very wide costs and benefits. Costs that may initially be more expensive than conventional water defences, but the benefits that could be delivered could be much wider, such as living quality, for the number of houses or the residential quality. A higher ambition level. The integrated overarching approach is what everybody is looking for.”*

- Dingeman Deijns



also applied to technical solutions. The Lee water defences in Cork city (case study 4) showed several integrated solutions. The existing approach recommended a wall which blocked physical access and lessened visibility to the water. The alternative concept delivered the benefits of a walled protection, while at the same time delivering access to the water and creating a public podium on the waterfront. The Sandymount Coastal Park (case study 5) demonstrated an integrated park and highway solution for 3km of coastal protection and the delivery of the eastern bypass in Dublin. Integrated solutions can achieve extra spatial quality and multiple benefits.

The recommendation is to develop a vision for integrated solutions for flood protection to deliver multiple benefits, crossing different disciplines.

The design-led methodology showed that the integration of functions could deliver multiple benefits. The basic ideas are that one plus one equals three. In other words, sectoral thinking delivers sectoral solutions, but multi-sectoral thinking develops integrated solutions with added benefits. Bringing functions together to develop synergies is the key to integrated solutions. This can happen in any number of ways and at several scale levels.

Existing foreign examples such as ‘space for the rivers’ in the Netherlands has shown that integrated approaches (ecology and water management at a regional scale) have been highly beneficial. The River Camac (case study 2), showed how redevelopment of industrial areas to residential areas could potentially develop a revenue stream to create new space for the rivers as well as developing more attractive residential living and nature areas and an enhanced amenity network. The integrated approach was

## 4 - Develop a multidisciplinary approach

*“We look at the whole range of solutions, because it is a complex adaptive system. You certainly can’t solve this using one method only. It is so complex that you need to develop a set of measures in the search to make it realisable. Which measure at what time? Can you use the best measure? Land, gardens and houses are disappearing into the sea. We need to develop a strategy for how an island can develop defences sustainably. What is the order of priorities; urgent, acute, sustainable? You don’t need an approach, where you ought to or can solve everything yourself (as an organisation) but if you know how to create a process, a situation where not just one party must come with solutions. You need technicians, you need good engineers, you need ecologists, coast morphologists, residents, ambitious parties, ambassadors. You need these constellations to achieve good plans. It is important that a vision is hanging over this, a constellation. It’s not something that you as an organisation can do on your own.”*

- Ruut van Paridon



Although the OPW has been tasked with the responsibility of flood protection for Irish rivers, the societal importance of Irish rivers extends beyond the delivery of technically robust flood protection. The design of Irish rivers is much broader than just an engineering task; it is also an ecological, cultural, recreational, planning, public realm assignment with social, economic, spatial and cultural implications. The diversity of the assignment needs to be reflected in a more inclusive approach, to reflect a

multidisciplinary team. The inclusion of designers, ecologists and other disciplines from the offset in the development of new plans is recommended. Dominance by a single discipline ought to be avoided, while recognising that safety remains the primary focus and objective. A multidisciplinary approach is not only advisable; it has become a necessity. The design-led approach indicated that alternative solutions are only achievable through collaboration with external parties. Contributing to water management should be in their best interest as well. Increased interaction with external organisations and parties such as farmers, planners, developers and other parties to achieve long-term aims are likely to become the norm. The research showed that the format of workshops and breakout sessions between the OPW and partner organisations was well received and supported.

It is recommended that a multidisciplinary approach be applied at three basic levels as follows:

- The creation of multidisciplinary project teams (engineers, landscape architects, ecologists, cultural historians etc) to develop and design projects.
- The development of collaboration between the relevant government organisations.
- The collaboration of the OPW and government bodies with private external parties (landowners) to align aims and achieve the long-term objectives for Irish rivers.



## 5. Develop a design led culture within the organisation

*“Anne Bogan (Cork City Council) said very clearly during the first workshop, “I want a city where I can live, where people will want to live, where people can live sustainably.... that you are working on a city, where you are working on shaping the character, the residential quality.” And I think you need to keep describing the ambition, describing and drawing the ambition. That’s why I made the masterplan map..... And I think drawing is crucial. There have already been lots of written reports made, but not enough drawings and plans explaining a clear vision. And this needs to be made clear to the politicians.”*  
**Marcel van der Meijs.**



and interactions during this project, it is recommended to develop a design thinking culture within the OPW and partner organisations.

## 6. Develop a statement of ambition for the future of Irish rivers.

An all-encompassing nationwide vision for the future of Irish rivers needs to be developed and supported politically. The ambition needs to signal a future objective to which the relevant organisations can work towards as a long-term objective. The ambition statement for Irish rivers needs to be inclusive, underlining its amenity, ecological, cultural and touristic benefits, as well as its vital role at the heart of Ireland’s cities, towns and villages. Rivers need to be central, publicly-orientated spaces, accessible both physically and visually and integrated as the frameworks for blue / green amenity and ecological infrastructure in the country. Rivers need to be branded with a green image that supports the image of Ireland as a tourist destination.

The project showed that there was support for the design-led approach and that it had demonstrated possible benefits and delivered new perspectives for flood protection. Most experts agreed that it had potential to be applied in the future to other projects. The method of working and the visualisation of future solutions were also thought to be beneficial. The workshop format was also seen to be beneficial. There was also support to explore the summary findings of certain projects in more detail. This response supported the argument that design thinking could offer more value to flood protection. We concluded that the OPW and its partners would benefit from the application of design thinking and that there was potential to apply it in a more structured way. One approach for application could be to develop a design thinking culture. Firstly, a multidisciplinary team could be established in developing important new projects to be realised, including long-term strategic projects. Based on the work undertaken

## References

### Introduction

- European Environment Agency. 2011. Disasters in Europe: more frequent and causing more damage.

### Chapter 2

- Sky News, 2015. <http://news.sky.com/story/1613230/flood-impact-could-be-nearly-6bn-report>. Monday 28 December.

### Chapter 5

- Brouwer S., Biermann, F. 2011. 1. Entrepreneurs in Dutch Water Management Towards Adaptive Management: Examining the Strategies of Policy. *Ecology and Society* 16(4): 5.
- Rittel, H. 1987. The reasoning of designers. University of California. pp6.
- Van der Brugge, R., Rotmans, J. & Loorbach, D. Reg. 2005. The transition in Dutch water management. Springer Verlag 2005. <http://link.springer.com/article/10.1007/s10113-004-0086-7>
- Wolsink, M. 2005. River basin approach and integrated water management: Governance pitfalls for the Dutch Space Water Adjustment Principle. University of Amsterdam.
- Restore Project. 2013. Rivers by Design. Rethinking development and river restoration. Environment Agency.

### Chapter 6

- Wikipedia: [https://en.wikipedia.org/wiki/Design\\_thinking](https://en.wikipedia.org/wiki/Design_thinking)

## Image credits

Page	Image	Source/ designer
Cover image.	Visuals of case study for Camac river	REDscape
4-5	Photo, participants workshop 1, Dublin castle	REDscape
6-7	Photo, historical flooding in Cork city	Old Photos Of Cork, <a href="https://oldphotosofcork.wordpress.com/">https://oldphotosofcork.wordpress.com/</a>
8	Photo, flooding in Shannon basin	Irish Times, <a href="http://www.irishtimes.com/news/environment/floods">http://www.irishtimes.com/news/environment/floods</a>
9	Soil maps, River maps, Scoping locations	REDscape OPW
10	Categorization of flood measures	Book: River space design
11	Schematic, water management policy	REDscape
12	Schematic, river Liffey	Van paridon de groot
13	Photo, participants workshop 1, Dublin castle. Workshops in the Netherlands	REDscape
15	Schematic pie chart and AFA locations.	REDscape
17	Photo of Kilmainham Photo of Yonkers.	Source: Google Maps Source: Yonkers, New York State. <a href="http://alfa-img.com/show/city-of-yonkers.html">http://alfa-img.com/show/city-of-yonkers.html</a>
19	Delta works, Netherlands	Neeltje Jans Deltawerken, <a href="http://www.neeltjejans.nl/deltawerken/">http://www.neeltjejans.nl/deltawerken/</a>
21	Working with nature, the sand motor the Hague	Joop van Houdt, Rijkswaterstaat <a href="https://beeldbank.rws.nl/RuimtevoordeRivier/Search">https://beeldbank.rws.nl/RuimtevoordeRivier/Search</a>
22	Regional map schematics	Van paridon de groot REDscape
23	Toolbox	Van paridon de groot
24	Photos, burrow	Van paridon de groot
25	Maps and schemes	Van Paridon de groot
27	Maps and schemes Photos	Van Paridon de groot internet
27	Photos	Bruno Doedens
28-31	Schematics, maps, photos and images	REDscape
33	Schematic	Dingeman Deijs
34	Schematic	Dingeman Deijs
33	River Lee Dam	Google Maps Dingeman Deijs
33	Reference Maeslandkering	Rijkswaterstaat, <a href="https://beeldbank.rws.nl/Photos/2918/437783.jpg">https://beeldbank.rws.nl/Photos/2918/437783.jpg</a>
33	Historical pictures	Pinterest.com
34	Schematics and visuals	Dingeman Deijs
35	Birdview	Google Maps
36-39	Schematics, maps, photos and images	Palmabout urban landscapes
40-43	Schematics, maps, photos and images	REDscape
43	Visuals of case study for Camac river	REDscape





Irish team representatives discuss options at the workshop in Dublin Castle.





