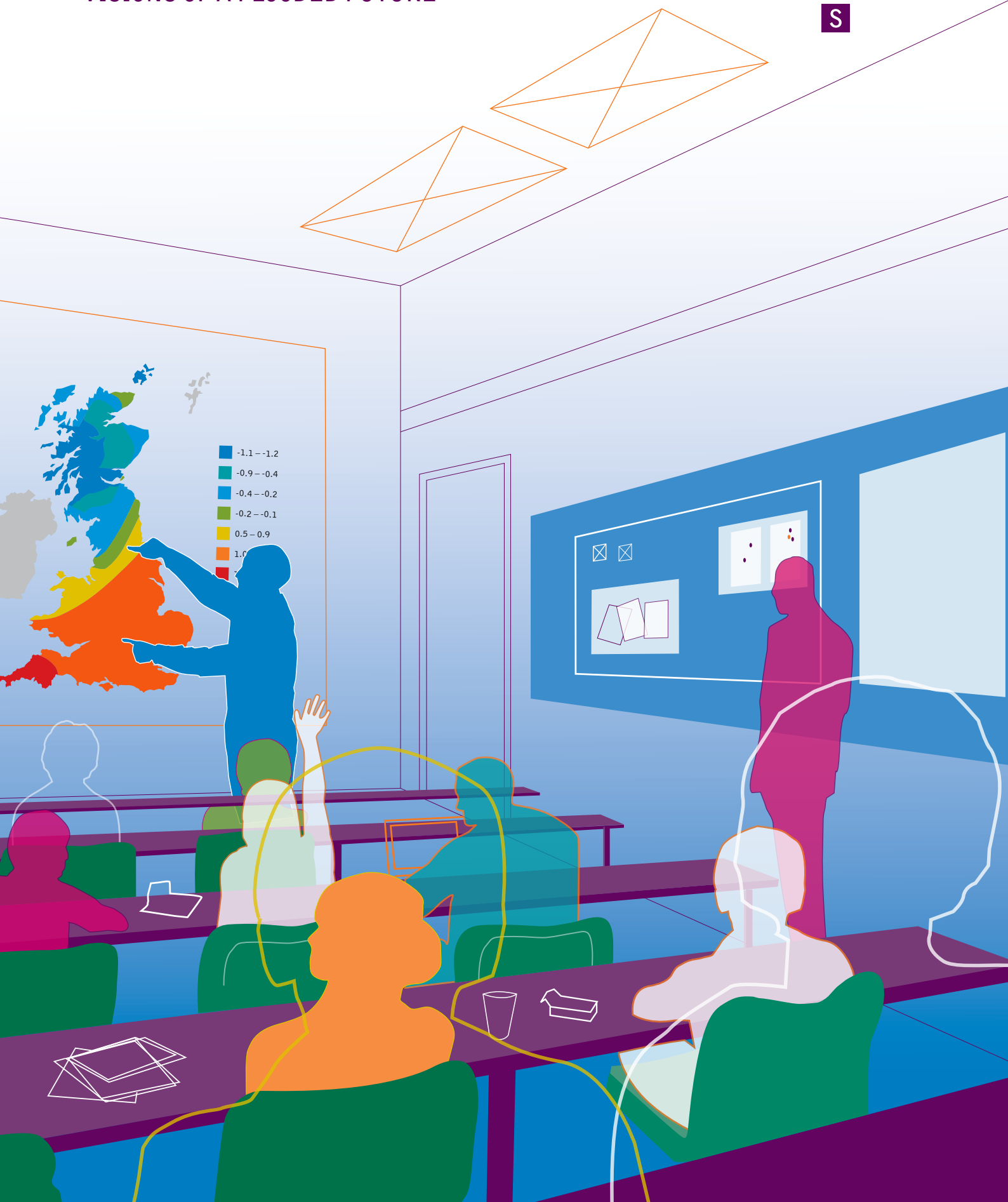


# LIVING WITH WATER

VISIONS OF A FLOODED FUTURE

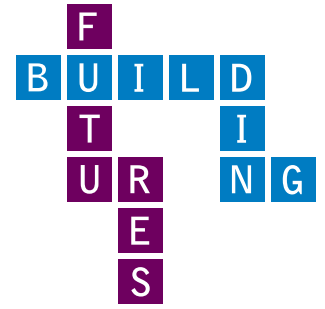
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# LIVING WITH WATER

VISIONS OF A FLOODED FUTURE



## FOREWORD

Building Futures has been in existence since 2000. It is the RIBA's think tank, charged with looking forward 15 to 20 years to prepare the profession and those we work with for the opportunities ahead and the challenges that we will all face.

We work closely with other agencies, particularly CABE, and have jointly published studies on the future of the professions, housing, schools and libraries. We are currently engaged in a programme which includes exploring happiness and well-being in future built environments, universities and university cities, urban futures and the pressure of population growth and migration, and flooding. This publication brings together a cross section of ideas about the increasing number and severity of floods we will face in the UK, and particularly the Thames Gateway, and how we might respond.

In the course of our work we have become only too aware of the vast scale of futures thinking and research going on elsewhere – in academia, the independent, private and public sectors. This is especially true of climate change and flooding. Our role is to look at their work from the perspective of those who will be taking hard decisions about the buildings and landscapes we will be creating over the next couple of decades; and to reflect on how they might ameliorate flood risks or add to them if we make the wrong choices. Rarely can the architectural profession and their colleagues in allied professions and property have faced such a thought provoking dilemma.

This publication is a contribution to Building Futures' continuing work programme on flooding, and is intended to stimulate debate and discussion in as wide an arena as possible. I hope you will enjoy reading it and will find it useful in your work.

**Dickon Robinson**  
Chair of Building Futures  
June 2007

# INTRODUCTION

'Around 5 million people, in 2 million properties, live in flood risk areas in England and Wales.'

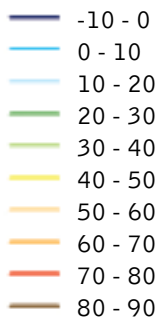
Environment Agency

A growing number of buildings of all types are threatened by flooding, and if trends continue as predicted, the risk to property and livelihoods will only increase.

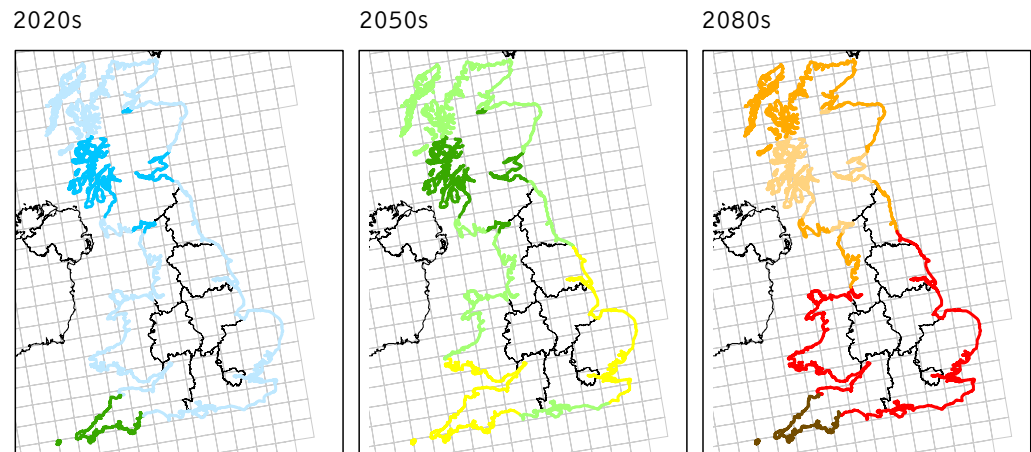
We rely on heavy engineering, tidal barriers and riverside and coastal defences to protect our built environment from flooding. The desire to live adjacent to water reflects our cultural heritage and historic settlement patterns, and we continue to build on flood plains and other flooding-prone areas. We value a close relationship to water – witness the thriving areas of regeneration with water at their heart in Newcastle, London Docklands, Nottingham, Cardiff and Bristol. We live with the risk of flooding at the very centres of our towns and cities.

Nowhere is this situation and the pressures therein more obvious than in the areas surrounding London, and particularly the Thames Gateway and the rest of the Thames estuary, the focus of the focus of this project but with clear implications for areas across the length and breadth of the UK.

Net sea-level change relative to 1961-1990(cm)



Net sea level change for Great Britain under the UKCIP02 high emissions scenario



Source: UKCIP02 Climate Change Scenarios (funded by DEFRA, produced by Tyndall and Hadley Centres for the UK Climate Impacts Programme). For more information on these maps and how they were produced, go to: [http://www.ukcip.org.uk/scenarios/ukcip02\\_extras/](http://www.ukcip.org.uk/scenarios/ukcip02_extras/)

## SCENARIO: A FLOODED FUTURE

### NEW CHALLENGES, FRESH OPPORTUNITIES

Climate change will increase our exposure to urban flooding. Adapting to and mitigating against both the causes and effects of climate change are enormous challenges for the way we design, plan, build and manage our built environment. Do we protect or relinquish our current coastline and what of our coastal settlements? Defending our communities against rising sea levels and urban flooding from rivers and run-off will require fresh thinking, and new approaches to engineering, architecture, planning, and funding for flood defences.

The long-term nature of climate change itself and the inevitably long-term approach necessary to adapt to climate change may provide new opportunities. Challenges drive innovation. The design challenges presented by flooding are already resulting in emerging best practice in design and development, use of new materials, and a better understanding of the relationship between urban topology, development choices and flood risk.

This will have implications for spatial and infrastructure planning, the slow but relentless drive towards improving the efficiency of our buildings, and for design and the use of materials. Such challenges and choices will be the principal drivers for change. In tackling the challenges, if we can harness the cross-professional nature of the response, and take inspiration from the long-term visions that are emerging, new possibilities emerge, and a chance to reassess the very essence of our relationship with water.

### FLOODING IN THE UK

Flood risk is a significant and growing problem for the UK. There are two primary causes for an expected increase in exposure to flood risk in the future. These are climate change, which will result in an increase in both the severity and intensity of rainfall, and new developments planned on existing floodplains, which are both at risk of flooding themselves, and which exacerbate the risk of flooding downstream.

Flooding, and managing it, cost the UK around £2.2 billion each year. We currently spend around £800 million per annum on flood and coastal defences; and, even with the present flood defences, we experience an average of £1,400 million of damage. While the level of spending is consistent, damage due to flooding is intermittent and can be enormous when a major flood occurs.

### CLIMATE CHANGE AND FLOOD RISK

We are more aware than ever of the changing nature of our environment and the pressures that this is increasingly putting on the way that we live our lives, the decisions we take as individuals and society, and our very perception of the risks of climate change is changing.

There is becoming little doubt that change is coming, and already the evidence is being gathered, and projections becoming more sophisticated. Sea levels are rising – only slowly at the moment, but most projections have the rate increasing, and continuing in the long term. The patterns of rainfall are also changing. Summers are already becoming hotter and drier, and winters milder and wetter. Storms are becoming more frequent and more powerful.

**'Climate change is the most severe problem that we are facing today, more serious even than the threat of terrorism.'**

David King, UK government chief scientific adviser

### CLIMATE CHANGE AND FUTURE FLOODING

The Government's own Foresight project produced a challenging future vision for the future of flood and coastal defence in the whole of the UK. The report held two key messages. Firstly, that if we continue with existing policies, in virtually every scenario considered, the risks grow very substantially. Secondly, the risks need to be tackled across a broad front.

We must either invest more in sustainable approaches to flood and coastal management or learn to live with increased flooding.

Key findings included:

- Climate change is an important factor in increasing flood risk, particularly through the impacts of rising sea levels and more stormy weather.
- Other important factors include the way we use land, increased urban development and the effects of increased wealth and higher standards of living.
- Figures for annual damage from flooding could rise from the present level of £1 billion to about £25 billion in the worst case scenario.
- The number of people at a high risk from flooding could rise from 1.5 million to 3.5 million.
- More effective land management will help reduce the risks in most scenarios. However, in the worst case scenario these are of little benefit and greater use of flood defences and coastal re-alignment will be required.

[www.foresight.gov.uk](http://www.foresight.gov.uk)

'A possible effect of the ongoing change in the climate system would be the disintegration of the West-Atlantic Ice Sheet. Such event would lead to a 5m to 6m sea level rise.'

Institute for Environmental Studies, Amsterdam

### DESIGN AND FLOOD RISK

The Environment Agency is leading a project to examine the future of the Thames Barrier and what will follow when it reaches the end of its expected operational lifetime in 2030. However, fresh engineering projects of this kind are only part of the solution. While appropriate planning control of new developments and physical flood defences (whether to keep out water or channel it into areas away from homes and businesses) are likely to be the most important factors to reduce flooding risk. However there are many other ways of reducing the impact of flooding.

Planning Policy Statement 25, recently reviewed by the Department of Communities and Local Government, begins to address the need for better assessment of development in flood risk areas. PPS 25 requires Councils to identify flood risk areas more precisely and specify what can be built on such land. They are also required to protect land needed to drain water from flood risk areas. Councils are required to consult the Environment Agency on significant planning applications in areas under flood risk.

Many groups are continuing to research flood resilience measures for homes to identify their cost implications and their role in reducing flood risk and recovering faster after flooding takes place. Measures include: defences to homes and businesses themselves, raising the height of electrics and other vulnerable services on the ground floor, designing the ground floor for less vulnerable uses (including for car parking), and water resilient flooring and fittings. Making the ground floor more resilient with concrete floors, waterproof plaster, and electrics above the typical flood level are examples of possible measures, or even adding an extra storey to properties or flats. With appropriate designs, uses and materials the effects of a flood can be greatly reduced.

## LIVING WITH WATER

Historically, our settlements followed the coast and rivers, relying on proximity to water for food, irrigation, transport and leisure. Building design and day-to-day life reflected this close relationship. Our settlement and structures accommodated water, were resistant to flooding and, where necessary, were often temporary in nature to allow seasonal occupation.

Only recently in human history have we sought to find solutions that permanently protect land on a large scale through fluvial engineering, claimed salt marshes and wetlands that provided softer natural barriers, and relied on concrete to 'eliminate' flood risk. We rely on our flood defences to protect not only people and private properties, but also vital amenities and public assets, including hospitals, the emergency services, schools, municipal buildings and the transport infrastructure. Disruption of these by flooding inevitably has major knock-on effects for business and society.

Perhaps we need to do more to curb our compulsive, single-minded efforts to control water through elaborate structural interventions, move away from bricks and mortar-based solutions. The challenges we face now and in the coming years may drive us back towards embracing the previously dynamic relation between land, water and communities.

New challenges drive innovation in design and building construction. A more concerted approach that harnesses the drive and ambition of the private and public sector will be necessary to meet the climate change challenge, and that in itself is a potent mix. Longer-term vision begins to present new possibilities: the funding of infrastructure, delivering a consistent, long-term strategic vision, community planning and creation, coastal and fluvial engineering and possibly coastal retreat, design solutions, planning and development opportunities, and dealing with outdated perceptions of flood risk and water adjacency.

## VISIONS OF A FLOODED FUTURE

Each paper is intended to provide a perspective on the emerging themes and questions:

- What changes are needed to current design, planning and development practices that will deliver the future of the Thames Gateway?
- Who can provide a long-term vision that can maximise opportunities as well as respond to threats?
- What are the implications and possibilities inherent in the long-term nature of the response to climate change – to 2050 and beyond?
- What is preventing long-term planning now?
- What spatial planning opportunities can be identified alongside the threats and dangers that are already being explored?
- How far can architectural or design-lead solutions mitigate against flooding at a local level and help to provide future occupants with a more viable property and way of life in a world of increased flood risk?
- What is necessary from landscape management, both at a micro and macro level, to minimize flood disruption, embrace future water adjacency and safeguard livelihoods and development value?
- What is the Thames Gateway area likely to look like in 2050 and beyond?
- What new tools, practices, approaches and research is required to continue to develop and expand in the future?
- What are the implications of continuing our current relationship with water?

The contributors are from a variety of backgrounds and professions, each drawing upon their imagination, experience and both established and emerging thinking.

'Our climate is changing and we need to use predicted weather data, rather than past records, to design buildings. The good news is that vernacular architecture somewhere in the world is probably already designed to cope with the extremes of climate we will face – whether flooding, drought or high winds. We can learn from these precedents.'

Bill Gething



The Thames Estuary is a vast stretch of land, strongly characterised by the river, yet fragmentary in its development. Plans to increase development along the Estuary corridor and throughout the Thames Gateway offer a unique opportunity for us to redefine our relationship with water and the surrounding landscape.

## LOCATIONS

- 1 Royal Docks
- 2 Gateway Bridge
- 3 Rainham Marshes
- 4 Dartford Marshes
- 5 QEII Bridge
- 6 Tilbury Docks
- 7 Gravesend
- 8 Stanford-le-Hope
- 9 Basildon
- 10 River Medway
- 11 Rochester, Chatham & Gillingham
- 12 Isle of Grain
- 13 Southend
- 14 Shoeburyness
- 15 Isle of Sheppey



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## LET IT RAIN, LET IT RAIN

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## MIST TO MAGIC

THE RIVER THAMES FROM TOWER  
BRIDGE TO THE NORTH SEA

3

## FREEDOM FROM THE CITY

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## OBSERVATIONS

ON FUTURE DEVELOPMENT AND FLOOD RISK

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## SUMMARY

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**KIM WILKIE (WILKIE ASSOCIATES)**

Kim is a landscape architect whose designs are inspired by both memory and imagination. Kim continues to teach sporadically at Berkeley, writes optimistically about land and place, and meddles in various national committees on landscape and environmental policy in the UK. Kim's vision explores our attitude to water, its management, and the slowly emerging need to change our treatment of water from sky to sea.

**P.10****DAVID PRICE (DAVID PRICE URBAN DESIGN)**

David Price is an architect and urban designer, and has developed integrated and forward-looking designs centred on the Thames waterfront, developing opportunities to design with water in mind. His interest was developed through his close association with the late Gordon Cullen, and their work together helped to develop the concept of Townscapes in relation to the Thames Estuary. David's recent published work has included an examination of the potential for developing water cities in the Thames Gateway. This is further explored in David's narrative, drawing inspiration from the region's history to discover new trajectories for the future of the Thames waterfront settlements.

**P.12****PAUL RUFF & GLEN MOORLEY  
(WESTMINSTER UNIVERSITY)**

Paul and Glen are final year students at Westminster University School of Architecture. They originally developed their ideas on designing for flood risk as part of the 2006 Building Futures Exhibition, Visualisations of a 21st Century City, asking what our cities will look like in the future, and how will London deal with flooding? This essay develops their ideas further, using two distinct future scenarios, investigating the dialogue between the existing buildings and infrastructure and emerging pressures of climate change.

**P.17****KIRAN CURTIS & KEES VAN DER SANDE (KCA ARCHITECTS)**

Kiran Curtis Associates, established in 1997, are an award winning practice of architects and urban designers, and have gained a very wide range experience designing commercial, mixed use schemes, private and affordable housing, estate regeneration, and master planning. KCA were appointed by the Environment Agency in 2006 to develop a new design guide 'Building a Better Environment: a guide for developers'. In their essay, Kiran Curtis and Kees van der Sande examine the questions we must ask to find solutions to the effects of climate change in the short, medium and long term.

**P.22****ALAN CHERRY  
(COUNTRYSIDE PROPERTIES)**

Founding Director of Countryside Properties, Alan Cherry is a member of the Government's Urban Task Force and Chairman of the Sustainable Development Round Table affiliated to the Government Office for the East of England. He is also a member of the Thames Gateway Kent Partnership and the Kent Thameside Delivery Board. This essay explores the pressures flood risk is already bringing to bear on development in the region and identifies emerging new approaches to flood risk through the eye of the developer.

**P.27**

## 1

## LET IT RAIN, LET IT RAIN

KIM WILKIE

Perhaps we start at the wrong point with flooding, treating the water as a dangerous hazard to be blocked out or speeded through, rather than as a precious resource to be harvested.

Drought and flood are part of the same cycle – a destabilized one. Freshwater falls as rain or snow, is absorbed into the ground and flows down through rivers to the sea to evaporate and return again as rain. It irrigates our lives on its way. Just 1% of the Earth's water is usable for drinking and it steadily recycles at its own rate. As we accelerate that rate, water has less chance to sink into the ground; rushes over the land taking soil, nitrates and pollutants with it; floods into riverside towns; overflows sewers; and then is sped out to sea, leaving contamination, destruction and... no water.

Why is the freshwater cycle becoming increasingly rushed and unstable? Climate change is one reason. Weather patterns are turning more volatile, dumping large amounts of rain in short sharp bursts between long, hot periods of drought and evaporation. As ice caps melt and warmer oceans expand, sea levels and tidal surges are rising.

Burgeoning domestic demand is another. More single households, power showers and greener lawns put a strain on rivers and aquifers. Higher car ownership and parking pressures have encouraged us to pave over substantial areas of our towns and suburbs. Rain that used to sink into front gardens and playing fields now bounces off impermeable surfaces to swell the deluge in storm drains. Combined sewers that cannot cope with the sudden downpours then overflow into rivers.

While out in the countryside, decades of subsidized land drainage and deep ploughing shed polluted water and topsoil off farmland into faster straightened rivers and past banded flood plains to bottle-necks in low-lying built

'DOWN HERE IN THE SOUTH EAST WE SPEND SIX MONTHS OF THE YEAR TALKING ABOUT BUILDING THE RIVER BANKS UP AND DREDGING THE RIVERS TO GET THE WATER AWAY QUICKER TO STOP THE FLOODING, AND THE OTHER SIX MONTHS WONDERING WHERE ALL THE WATER HAS GONE'. (KENT FARMER)

developments. On a global and national scale, damage from flooding is greater than from any other natural disaster. Around 1.8 million households, 140,000 commercial properties and 1.4 million hectares of agricultural land in England are at risk.

But it is not all doom and gloom. There are ways of regaining balance, using water carefully and slowing down its journey from the sky to the sea. The Environment Agency's Floodplan (Making Space for Water) and river restoration initiatives are pioneering work on flood management rather than flood prevention. The natural environment relies on the steady flow of water through, rivers, lakes, marshes and aquifers. Wildlife, plants and even the micro-organisms in the soil are dependent on the water cycle that the extremes of drought and flood can destroy. The health of the countryside and much of our enjoyment and recreation are based on a balanced water regime. There is great scope to restore river corridors and floodplains, capture flood peaks in traditional flood meadows and store water in farm ponds, marshes and wetlands. If we manage to connect issues across government, there is a rare new opportunity to take full advantage of the Water Framework Directive and reforms to the Common Agricultural Policy to tackle land management, water flows and diffuse pollution.

Possible new initiatives in the built environment could make a similar impact. The UK is about to embark on a major programme of new house building. Considerations of water shortage and flooding need to be critical factors in decisions about where and how the housing is built. Houses could be clustered around productive open space creating new opportunities for water management and recycling and leading the way for retrofitting older parts of our cities. Water efficient design, such as dual flush lavatories and low flow taps and showerheads, can reduce household water use by up to 25%. German households use a third less water than we consume in the UK. Changing building standards and



With emphasis on sustainability and sensitivity new communities could be organic by nature but grown around principles which will deny sprawl, minimise the need for huge demand on existing infrastructure by planning social requirements and facilities alongside transport networks to provide access, connectivity and convenience to residents and businesses alike.



Garden barges floating at Shad Thames blur the boundary between river and bank and demonstrate just how adaptive it is possible to be. Image by KCA Architects

layouts could make a dramatic difference to the way that water is used and recycled. There are connections to be made between harvesting water, managing waste, growing food and generating energy on a small local scale.

So where does the Thames Gateway fit in all this? The first question should probably be why there? Why build 160,000 new houses in the flood mouth of one of the most flood vulnerable capitals in the world? A capital that is, ironically, also situated in the most drought-stricken corner of the country and chronically short of drinking water. The Association of British Insurers and Terry Farrell have been two of the few voices challenging the sanity of the idea. Terry argues that houses for London key workers should be built within the capital's current envelope, accessible through the existing transport network. There is little sense in creating a remote slum of affordable houses in a place where no one would choose to live.

The estuary should be understood as landscape in its own right: a place for water, wildlife, farming and recreation. It is a huge area, covering three counties and many different landscape types. The estuary itself has a vast, windswept, horizontal scale that dwarfs buildings and people. The Medway towns can continue to develop as separate communities, but the land itself needs to be respected for its own crucial contribution to the capital's safety and sanity. It is not a vacant lot waiting for development.

Can houses and flooding coexist? Ideally not; the flood plains should be left open to absorb the increasing number of violent downpours and tidal surges. But there could be a landscape of houses and roads on stilts; salt marshes full of birds; flood meadows grazed by cattle; and riverside arable farmland that floods in winter. There could be a waterland where the elemental landscape sets the priorities and inspires fresh architecture. New building forms could evolve that tolerate and even welcome water.

There are exciting possibilities for tapping the thermal qualities of water for heat pumps; for using water for transport; for capturing rain on a community scale; and for creating beautiful new buildings on water. The possibilities rely on careful and thoughtful design that starts with the environmental context, rather than a rushed economic and political desperation to find cheap new housing.

Worldwide, water shortage and flooding are in the vanguard of climate change. Our urban and rural lives have been too careless of the resource, relying on easy water from ancient aquifers – stored under the ground over thousands of years - rather than renewable water from the freshwater cycle. In the United Kingdom of all places, it must be possible to find a sensible way of managing water. Rather than alternating between drought and flood, we need to press for political courage to regain balance, using water carefully and slowing down its journey from sky to sea.

## 2

**MIST TO MAGIC****DAVID PRICE****THE RIVER THAMES  
FROM TOWER  
BRIDGE TO THE  
NORTH SEA**

How can one change a pervasive historic perception that the Thames Estuary is an area of myth, mystery and fear into a rich and diverse system of both practical and scenic opportunity? The solution surely lies in the genius of the waterscape itself and the formation of a vision that reflects the many evolving characters that surround it, effectively reshaping its future. Essential to the cohesion of such a vision, the subtle and structural techniques of 'Land Art' will be our guiding principle as we begin our journey downstream.

For if one reads the newspapers or attends to broadcast media it often seems that the words 'flooding' and 'catastrophe' are synonymous. It is the tragedies that occur worldwide and their reporting that have caused this semantic confusion, but it is often forgotten that natural disasters have been a feature in history so long as they can be traced or have been recorded. In contrast flooding as part of the natural cycle of events and the seasons is welcomed by the biosphere for the advantages it brings to huge numbers of species inhabiting both coastal and riparian environments.

The reality that the inevitable changes in the global climate will occur, whatever or whoever are the cause, are largely cast in a negative or disinterested light so far as the ultimate consequences are concerned, and just when it is optimism that is required. Despite the huge amount of publicity the subject is now attracting politics, parochialism and protocols make it still a curiously uncertain, 'misty' subject. However design, and an advanced concept of future planning, can undoubtedly play a very significant part in finding a solution in both the short and long-term. From a UK perspective, the Thames and the Estuary into which it leads is currently the most lively and potentially most magical expression of our gradually evolving relationship between land and water.

**SCENARIO**

Setting the scene for new development horizons requires the imagination and vision not only of the designers but also the strength of the leadership that will be needed to carry out the best ideas in the long term.

We should be able to agree that it is the creation of places and spaces which will accommodate the expansion of the water and live alongside the increased possibility of flooding along the river and around the estuary. It is here that Land Art, creating new and progressive spaces, landscapes and townscapes should come into its own.

**A QUESTION OF SCALE**

Examination of any regular map of the country makes the Thames Estuary look remarkably small in comparison to other features to be found along the coastline. However, distance is a matter of personal interpretation depending on three basic functions - origin and destination - time and method of travel - and thirdly the landscapes and topography between places. For example, it is about 40 miles from Glasgow to Edinburgh, much the same between Chepstow and Gloucester and also from Reading to Tower Bridge and Tower Bridge to Shoeburyness or the eastern point of the Isle of Sheppey where the Estuary effectively becomes the North Sea.

These physical dimensions imply that approximately 100 miles of shorelines along the banks of the Thames, south Essex and north Kent coasts and the Medway Delta will have to adjust as surge tides and sea levels rise. The other scale, of course, is time. Prediction is an indiscreet and possibly arcane art but some assumptions are necessary. There are commentators who only suggest doom and gloom but this is disagreeable to anyone who actually is thinking forward, be it 20 or 200 years ahead.



Our General Arrangement for the Greenwich Peninsula competition in 1988 was based on a largely water-recyclable canalised planning structure.  
©Price and Cullen Architects



The Royal Docks. The perimeter of Inner London lies at the far end where the "Gateway Bridge" will cross the river.  
©Thames Gateway, Communities & Local Government

London, like so many other cities across the world, would never have been created without a river as their artery. They can be your kindest friend or ultimately your greatest enemy if not treated with care. It is now high time and tide to look downstream, and for the future of the Thames and its Estuary to be re-examined, re-explored, enjoyed and reinvigorated.

There are three essential components to the river which will be clarified as the water levels rise. In due course it is possible that the existing barrage at Woolwich may have to be raised permanently as the inner defence for Metropolitan London, depending on the new protections to be decided upon further downstream. This will give hydrologists something of a challenge. This comment does not underestimate the environmental and ecological changes that would then occur, nor to the very nature of the river and its operational functions. However, on the positive side such a choice would stabilise the waters of Central London and open up various intriguing possibilities. In terms of the setting of the embankments, the viability of both river transport and the web of cross-river connections so desperately needed to engage the evolving business and residential districts of Southwark, Tower Hamlets and Newham, it is vital we at least raise the possibility.

Specifically, the location includes the Isle of Dogs, the Greenwich Peninsula and the Royal Docks - the original "Water City" which was suggested in 1981 by Reg Ward and his colleagues - and code-named "Eastminster". Although still incomplete, it is at serious risk unless some definitive precautions are made downstream, and these must be commissioned very soon.

This also applies to the two next most important projects on the north bank, the Lower Lea Valley where the 2012 Olympic Games are to be centred with all of its future legacy, and the Royal Docks where, despite their enormous dimensions, development is at present best described

as fragmentary. They are bisected geographically by the Woolwich barrage which, so far, provides protection.

The north shore is almost implacably flat topographically, whereas in contrast, towards Woolwich the higher ground first noticed at Greenwich climbs to Blackheath and beyond, commanded historically by the Roman Road of Watling Street on the crest of the hills as we move closer to the river's southern border. This certainly influenced the decision to place the existing barrage between Silvertown and South Woolwich.

Development of the riverside was virtually guaranteed by this construction and it is easily seen that it is now crowded with building in favour of public amenity. However, these are compromised by the huge and mostly ugly concrete flood defences that were required to be built, denying the great artery from general view.

An outer defence position can be envisaged to control the tidal sector downstream from Woolwich, but conceived in an entirely different fashion as we will show later. Certain events are outside of our control, but we can design and plan our habitations for the future if we have the will and confidence. We have the talent and science to do this. This applies not just to the Thames but virtually all estuaries and by inference, many coastal locations. Where land is considered to be existing flood plain, in low-lying regions or more marginal situations, development proposals must be rigorously considered. However this is not simply the preserve of the planning system. Good design is not just about sound construction and fine aesthetics but also the quality of advice architects and urban designers should be able to give to potential clients regarding the overall suitability of any project with regard to location, fitness for purpose and environmental consequence.



From Woolwich looking West we see the inner marker beyond which river defences may not be compromised.  
©Thames Gateway, Communities & Local Government



The seed for the second 'Water City', or the 'Gateway City' as it will be known, is already sown at Tilbury with Gravesend on the opposite bank. With a new barrage located immediately to the East a physical as well as virtual linkage could be created between the Kent and Essex shores.  
©Thames Gateway, Communities & Local Government

### THE ROUTE TO PROGRESS

Myth and mystery have been close associates in the history of the Thames. It would be foolish for us to ignore this and reveal all of its secrets in one great masterplan. The genius of this great artery is in its diversity and how it leads to the secretion of places, in origin both old and new. However there are some fundamental issues which must be addressed regarding containment, protection and expansion of the water regime if we are to preserve its fascination.

A new point of control will be required to afford the protection metropolitan London will need from large-scale flooding and I believe this is best served by the construction of a new and innovative barrage between Gravesend and Tilbury. Here the opportunity exists to create a second 'Water City', not as a competitor to "Eastminster", but in order to stimulate the emergence of a fabulous focal point engaging both Thurrock and north Kent. In itself an architectural, engineering, land art and urban design challenge, this potential new barrage has a further purpose, as it is at the location where the Thames converts from River to Estuary.

### FURTHER WATER CITIES, LAND ART AND TRANSFORMATIONS

The first point to be clarified is that, implicit in the sequence of Water Cities, they are of different characters and respond to local conditions, context and needs. They give form, structure, community and visual energy to the proposals.

We have already noted that "Eastminster", the first in our sequence of Water Cities culminating at the Olympic project, will have to rely on the Woolwich barrage and existing river walls for protection in the short term. Proposals for the area have been made at many scales and densities over the last few years, at most encompassing many hundred thousand new dwellings and associated developments. This is the equivalent population of three London Boroughs added

to the original regeneration of London Docklands. This is feasible so long as the infrastructure of inner London and this Eastern outreach can take the strain, and its extent limited to the proposed Gateway Bridge just east of the Albert Dock Basin. This where the real transformation of the Thames and its new influence should begin.

The first element to consider is the controlled sector of the Thames between the Gateway Bridge and the Dartford Crossing, the Queen Elizabeth II Bridge, where the banks are in a poor environmental state. Cluttered by both industrial and residential piecemeal development which penetrates far inland, the river exhibits an air of abandonment. A strong concept of the landscape which both connects and defines places as we travel downstream is required, what we might call the 'Thames Pleasance'. This could accommodate and integrate new development as old buildings and uses are gradually replaced as they become redundant. One can imagine the combination of a progressive landscape and a new culture of robust architecture and positive planning, conscious of the implications that flooding may have, which should over time create an entirely new perception of the river and its subtle influences. The riverbanks must not be overcrowded by buildings simply greedy for a view from mere inches away, but rather set back allowing the Pleasance to be created and given the opportunity to mature.

There is something else of subtle but significant consequence to consider. The Thames is not just a great artery but also a division between communities and Counties from north to south and this becomes no more apparent than at the Dartford Crossings where we will soon arrive. "Connectivity" is another of those ill-defined expressions to which we are now accustomed, but which still holds a great variety of meaning. Even if the traffic is congested, the journey south across the bridge affords a prospect of Kent and the Downs in the distance, whereas the northbound route through the tunnel emerges in placelessness.



Rochester, Chatham and Gillingham are all in need of reorganisation, modification and development to varying degrees of magnitude. At the apex of the Medway Delta their combined waterfronts could command a Medway Lagoon which would also utilise certain parts of the shorelines of the Isles of Grain and Sheppey.  
©Thames Gateway, Communities & Local Government



As time passes and the water gradually rises South Essex may gain another Water-City courtesy of the River Roach. Its hidden presence will be exchanged for a new role as it polarises Southend, resulting in the demand for a new waterfront on the North side. Considering that its neighbour Basildon will be in a similar situation but from the South it may not be inconceivable that they should be regarded as a unit.  
©Thames Gateway, Communities & Local Government

Consequently, when we consider the locations and methods of cross-river transit, they should be conceived so that neither side feels visually and socially disadvantaged. The Thames is a two-way street and so should be its landside connections, which in the upper reaches could include inhabited or occupied bridges.

The portal to the bridge and the climax of this part of the visionary concept lies at Rainham and Aveley Marshes to the north and Dartford Marshes to the south. The new high-speed railway line from the continent emerges in Rainham Marshes but need not blight them in the negative manner that some famous examples from history have ably demonstrated. It is here that the skills of the Land Artist will come to the forefront in the immediate future. Considered together their area is roughly equivalent to the scale of Richmond Park and Hampton Court Gardens, both of which address the subject of water in different but illuminating ways.

As a potential park of two parts it is capable of generating national and international status, formalised by the railway in the northern sector and the relative freedom of the southern wetland at Dartford. They are an irresistible combination in themselves and provide an enormous opportunity for Land Art and Architecture to engage together in harmony.

The landscape from Purfleet, and then east of the QE2's visible span on the north shore to Grays, deserves far better in terms of its relationship with the river that it presently 'enjoys'. Hiding behind the seemingly formidable sheet-piled river walls the conurbation extends as far as Tilbury Docks, the focal point of the second Water City, echoed on the south side from Dartford to Gravesend, except for the geographical relief of the Swanscombe Peninsula which is already proposed to be developed. The level of the river walls was set long before the expected rise of water levels was anticipated. This is why a new controlling barrage is necessary and its sensible location is at the relatively narrow point across the

Thames just east of Tilbury and Gravesend. The topography is suitable, the rising ground of Kent and the not too distant ridge joining Grays and Chadwell St Mary would allow Land Art to complete the defence in an elegant and practical manner.

Beyond the barrage the river is released into its next incarnation where the possibilities for the future become more complex, organic and in many senses unpredictable, including the concept of two further Water Cities.

### THE MAGIC OF THE ESTUARY

Having left the relative security of the upper reaches of the Thames we now enter a world of uncertainty, where threat will be converted into opportunity as we make room for the water. The mists of the Dickensian images we know from Great Expectations will be conjured into an entirely new and holistic attitude to the environment.

A new dimension of far-future thinking is required practically, economically and visually. Ahead lie the major islands of Canvey, Grain and Sheppey, and the Medway Delta where a major decisions are needed. Some of these islands will inevitably be eroded or overtaken by the rise of sea level. It is therefore here that the discussion becomes most engaging. Design in the expectation of flooding rather than trying to ignore its possibility or probability is crucial. There is simply no other long term option. To attempt to defend the coastline with more and yet more concrete and protect the low-lying land and settlements, however historic in value, would only require a single failure to make the whole exercise entirely worthless. In comparison, why not admit the water and create new places organically just as they were thought of and developed in the first instance?

For example, the huge defences at Canvey Island were eventually built in response to the floods of 1953. Unfortunately no lessons were learned in terms of building



Taken together Rainham and Dartford Marshes have the scale, location and strength to provide an unrivalled opportunity for Land Artists to develop and demonstrate their skills and imagination.

©Thames Gateway, Communities & Local Government



Living with water has immense possibilities where the land has been marginalised through contamination and neglect. Downstream of the Gateway Bridge the banks should no longer be crowded by buildings both anxious and greedy for a room with a view. Nothing could be more disastrous as an outcome as watching the magic and genius vanish overnight under the cover of sprawl and insensitivity. Gordon Cullen's drawing demonstrates that our love of the River, great architecture and the endurance of nature are all that are needed to drive the mists away. ©Price and Cullen Architects

design and town planning as redevelopment proceeded to primarily fulfill housing need, especially in flood plains. Although this is now a matter of history there is a sudden realisation that topography could, and perhaps should, dictate the pattern of development around the Thames Estuary.

As certain places are absorbed by the evolving waterscape new islands may be formed as the inlets and tributaries overflow beyond their seemingly benign boundaries. We have taken the view that the 10 metre contour should be examined with great care as it is the probable safety line for the next 200 years. This does not mean that the sirens will wail overnight but rather by way of caution. The inevitable question is where protection becomes the advocate or the adversary, and there is no better example than at the Medway Delta, potentially the location of the third of the Water Cities.

Chatham sits at the centre of this complex, and although redolent with the spirit of the Royal Navy the Dockyards have been virtually deserted for many years. Rochester commands the high ground and Gillingham the majority of the population. Over time Chatham will be inundated unless control measures are taken to actively prevent it. The formation of a stable Medway Lagoon, which would require the construction of two new barrages and the necessary ancillary works, would make the most of the parallel scenic and development potentials, enough surely to make such an investment worthwhile. Indeed if they could be joined together in a new and innovative way the combination could become a new focal point of Kent, and one of the most spectacular additions to the Estuary and its belongings.

Even to a casual observer it must be clear that the Estuary between Shoeburyness and Sheppey makes them invisible from one to the other as the distance is about seven miles. We are on the seaside, no longer the riverside. But Southend, just to the west of Shoeburyness, and despite its

considerable elevation above present sea level on its south side, should be watchful. The River Roach and its impact as its scale increases on the north side of the town cannot be ignored. Taken together with the various creeks to the west, the possibility of our fourth Water City may be germinated - the forge of a connection to Basildon, to which the waters of the Estuary will eventually reach. At first glance Southend and Basildon would appear to make an unlikely marriage but in the longer term not to be dismissed.

In this way the changing nature of the Thames and its Estuary can provide both inspiration and opportunity, and we must rediscover how to design with its great power in mind. We can turn mist into magic, and all it requires is sublime imagination.

## 3

## FREEDOM FROM THE CITY

PAUL RUFF AND GLEN MOORLEY

London, as well as other major coastal cities around the globe, will be dramatically affected by a significant sea level rise predicted as a result of a global temperature increase and melting ice caps. Already changes in weather patterns and water levels see the current Thames Barrier closed more than 15 times each year, in order to prevent flooding by high spring tides and regular storm surges. This raises a number of possible options for London and the Thames Estuary, examined here through the development of two parallel scenarios: firstly, the creation of a new 10 mile barrier at the mouth of the river, and secondly, the possibility of controlled flooding and the increased use of soft and environmental defences.

### SETTING THE SCENE

It is 2008, and a severe breach of the Thames Barrage is followed by repeated tidal flooding. The sheer scale of the disaster immediately calls into question the government's plans for new house building within the Estuary.

Major towns became key target areas for housing development in the Thames Estuary in the pre-flood development plan. Many of the new houses are proposed for current flood plain zones, where there is already a threat to existing settlements and developed areas.

A set of predefined criteria, including an eventual 10m sea level rise, frequent and severe flash floods and storm surges, with their effects becoming steadily more apparent from 2008, have been used to instigate this study and examination of the subsequent proposals. However, this reflects an ever-increasing and very real need for an official strategic plan, addressing rising water levels and future London growth.

## THE CULTIVATION OF INDEPENDENT COMMUNITIES IN THE THAMES ESTUARY

### SCENARIO A: A BIGGER BETTER BARRIER

As part of this scenario new barrier is built at the mouth of the Thames Estuary, protecting the city of London and the surrounding Estuary area.

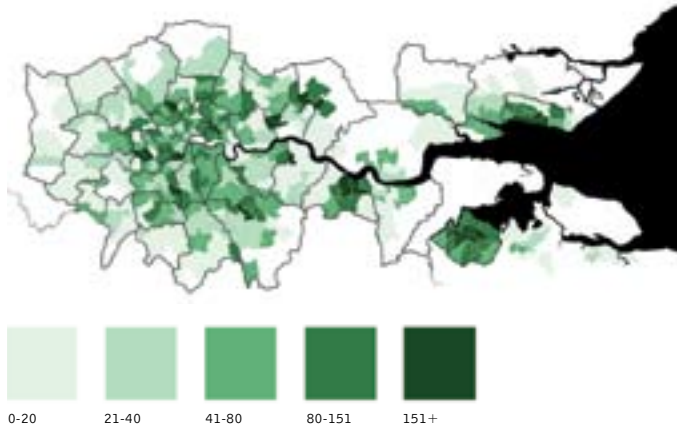
In the development of this scenario, major new transport infrastructure needs to be created. As with many new mass developments, such as in such cases as Brazilia and vast areas of the rapidly developing American desert, the significant transport infrastructure that is needed to serve the eventual settlement is constructed long before the implementation of the rest of the development as a whole, providing opportunities to integrate transport and development needs, serving the community and providing confidence for potential developers.

The initial major infrastructure element that would be required in order for Scenario A to be effective would be the upgrading of flood defences. This would take the form of a vast 10 mile barrier stretching from Sheerness, on the southern tip of the Estuary mouth, up to Shoeburyness, just east of Southend. This barrier would then be supported by a series of embankments along low-lying coastal areas near the Estuary.

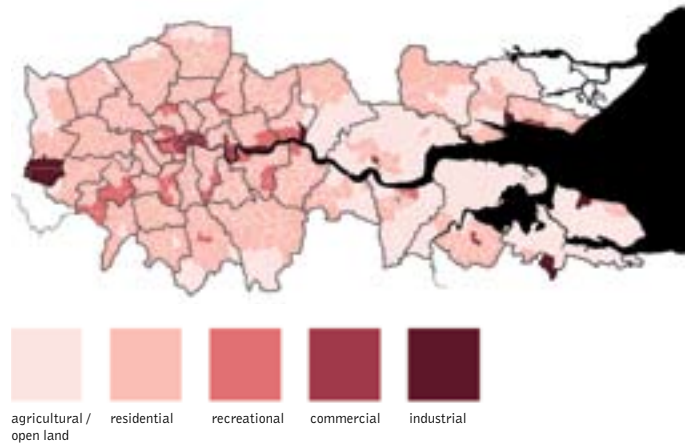
There are two main funding strategies possible for the new Thames Estuary barrier: one is funding directly through the public purse, and is the alternative through the opportunity to market the scheme to a private or series of private investors. Both strategies would significantly benefit from the barrier being used as a new transport artery, linking the north and south sides of the Estuary. The new link would offer the immense transport infrastructure needed to connect the Thames Estuary area to the rest of London.

Scenario A's strengths lie in its two main concepts: the supplying of a secure sea defence system for London today and in the future, and the creation of vast new

Population density  
(per person per hectre)



Land usage  
(dominant percentage)



Analysis of Thames Estuary development and its effects through population density and land use.  
©Paul Ruff and Glen Moorley

development opportunities in both the commercial and residential sector. These additional possibilities to unlock latent value, enhance development profits and provide opportunities for investors will help advance this key strategy for providing the investment needed to provide London's flood defences in the long term.

With the initial transport infrastructure, including a road/rail system integrated into the barrier, and the creation of a orbital transport route (perhaps forming a figure of '8' system linking at Dartford) is possible. This would then allow quick and easy travel from and around the new development area.

But, even under such a scenario, why would people choose to move to the Thames Estuary? This is a question that will actually help us predict the type of development that might occur throughout the Estuary. As soon as the barrier is built and the Thames Estuary is secure, commuters will increasingly move further away from London in search of a higher quality of life. The majority of these commuters will have valuable jobs in London, and the financial resources to move away from present suburbs or inner city areas. This will however increase the demand for rapid rail or road links into Central London, with both Stratford International and Liverpool Street becoming key East London stations.

Initially, there will be two major types of development driven by this scenario, nodal growth around key rail/road routes and links into London, and the increase of riverside properties. Such riverside and transport hub developments will initiate the 'infill' process of the remaining Thames Estuary. With the threat of flooding and rising water levels subsiding, developers will quickly supply Londoners with new and attractive opportunities to live on the banks of the River Thames. One possible result is that this will create mile upon mile of new estate housing. The volume house builders' dream! A sea of uniform suburbia will spread across the

Thames Estuary, with quantity of development given precedent over quality.

This scenario could be envisaged as hugely prosperous for the area. With this newly protected land, it would be possible to create a multi-nodal London following the 'Randstadt' Model (the Dutch Ring City - comprising of Amsterdam, the Hague, Utrecht and Rotterdam), to develop new major commercial, industrial or technological centers and to form new world markets, internet cities and global HQ's, thus bringing new wealth and prosperity to the area. Due to the large influx of jobs and residents, leisure and social demands will increase the area's versatility and recreational opportunities. This will help London to expand to a point where it is two thirds larger than its present size by the turn of the 21st Century.

A human development on this scale will always claim its victims, and in the case of this scenario, it will be the Estuary itself. With the removal of flooding will come the end of silt and sediment deposits and reduced fertility, wildlife and entire ecosystems will be eradicated. Increased new building will turn most of the Estuary into an impenetrable surface and heighten the demand to then rechannel the River Thames in order to deal with the extra water quantities. More importantly, vast areas of natural beauty will be spoiled or destroyed. A tarmaced housing estate utopia could quickly slide towards dystopia, and be far from the best solution for dealing with flooding and the future development of the Thames Estuary.

### SCENARIO B: TO GO WITH THE FLOW

The development of the second scenario for the Thames Estuary, without the option of large-scale sea defences, attempts to look at things on a much smaller and more human scale, where flood defence isn't treated with a broad brush technique.



Basildon prospers from new coastal tourism  
©Paul Ruff

In this scenario, the absence of the proposed barrier between Sheerness and Shoeburyness and upgraded London-wide flood defences would mean that large areas of land within the Thames Estuary were at risk of regular flooding from tidal surges. This flood risk would increase as the predicted change in sea levels, due to global climate change, began to take effect. Because of this, large-scale development in the area would not be a viable solution. Different areas would be affected according to their topography and environmental context. Under present evidence it is doubtful that mass developers would be able to produce the tailored solutions that would be needed for such divergent situations and challenges in each area.

It is this lack of scope for mass housing which would make this alternative scenario a far more interesting and exciting situation when envisioning the way that urban design choices could meet the challenges posed by climate change and increased flood risk. Due to the lack of a barrier, it would be impossible to turn the area into a dormitory for London and this would encourage us to look at ways of developing the Estuary that had far more relevance to the area, its environment, character and inhabitants.

By looking at London, the city that facilitated the need for development within the Thames Estuary, we tried to understand what makes it such an interesting and exciting place. One of the reasons is that it has a very granular nature; it has not been designed as part of a grand plan, but is a conglomeration of all the small towns and villages that have merged into one another over time. It is this great level of variety that is one of the reasons London is so appealing as a place.

With this idea in mind the existing towns and villages within the Estuary area become the focus for development, as opposed to the spaces between them. By understanding the character of each of the many conurbations within the Thames Estuary, we are able to enhance and exploit each of their

individual styles and advantages, in order to benefit the area as a whole.

Rather than working on the scenario from an overall perspective, by starting on a micro scale, it is possible to create a far more interesting picture for the entire area. This approach would make sure that each town added something different and unique to the entire landscape, and in doing so, these places would enhance, and in some cases create, their own new identities, giving more compelling reasons for people to visit or live there. An example of this approach sees Rochester develop further as a beautiful historic tourist destination with a new university campus, much like Cambridge or Oxford, whilst Medway Marshes becomes the first national park to serve the people of London. The area already has more biodiversity per square metre than any other place in the country so has the ability to become a successful nature reserve, attracting huge numbers of visitors from the capital and beyond.

Another approach is to try and focus on the benefits that flooding the area could have. One can approach the possibility of Basildon becoming a beach destination due to its new found proximity to the shoreline. This would give the town a brand new dimension and induce a whole new kind of development within Basildon. The new waterfront would suddenly become a focal point for cultural projects and leisure developments, enhancing the diversity of the town, in terms of both recreation, employment and architecture.

Other developments would see a new architectural style emerging. Improved technology would allow houses to be built that could rise upwards as flood levels rose, such as is beginning to be developed in the Netherlands, whilst being anchored to their bases by telescopic legs. Houses raised up above the ground to prevent the ingress of floodwater could become common sight in the Estuary, alongside these, fully aquatic architecture, grouping together in clusters or acting as a nomadic buildings, roaming as their



**Stanford - Le - Hope**

Stanford-le-Hope adapts to isolation through the development of self sufficient lifestyles  
©Paul Ruff



Architectural decay produces a new vernacular  
©Paul Ruff

owners see fit. All these options give the area an appealing variety in architectural styles, as well as offering alternative ways of living.

It is also possible to examine ways in which people and communities could adapt to cope with increased flooding without having to leave their homes. School boats would be a feature of areas where flooding was a regular occurrence, so that the children of each town would not have their education effected by any prolonged periods of flooding. Other ideas perhaps see companies exploiting the commercial opportunities that would be offered by an area's change of circumstances. Courier companies would set up water borne services where goods and groceries that could not be accessed in times of flood could be delivered to people's houses. As well as having an International Airport housing main distribution centres, Southend might exploit the flood waters by creating vast flood retention lakes, encouraging windsurfing and other water-sports.

The sudden change in circumstances would lead to many people being unable to sell their homes due to negative equity and difficulties finding adequate insurance. Due to their house's increased risk of flooding, homes could rapidly become worth less than their purchase price. Therefore it becomes necessary to look at options that would allow people to live with occasional flooding by adapting their homes. One of these options was the idea of prefabricated 'bolt-on' architecture. As a consequence of regular flooding, ground floor rooms and spaces would become mainly untenable or seasonal rooms. This would result in a need to increase space within houses above ground level.

However, as design and build in its traditional form would be beyond the means of many of the area's residents, the idea could develop for architecture to be seen as a product rather than a service. Prefabricated units would be marketed by companies with a history in mass produced building elements, and would offer a range of solutions for increasing

above ground living space, enabling families to continue to live in houses where flooding had dramatically changed the way they used their space. These pre-planning approved, architect-designed attachments would come in a variety of forms, ranging between bolt-on bay windows, plug-in balconies and instant attic conversions.

Although some of the people who live in the Thames Estuary will be able to adapt the way they live to allow for occasional flooding, some areas will be so badly affected by increased flooding that their original inhabitants would desert them. After the original residents have moved out, these zones and their abandoned buildings would be deemed by the council as too difficult to police from a planning perspective, and could become deregulated zones. One case study we examined would see this scenario occurring in the Estuary town of Stanford-le-Hope. Here, squatters and people who wanted to live outside of the regulated system quickly took up deserted buildings. This saw the area develop a style of subsistence living, where people would rely upon one another for their food, clothing and other needs, rather than acquiring them all from the outside world. These small self-sufficient communities would have the ability to change their surroundings in any way they saw fit due to the area's deregulated nature.

The scenario also drives the ways in which other aspects of the area would develop, including the estuary's industry and transport infrastructure. Developments in transport could see roads and other transport links concerned with networking each of the areas within the Estuary, rather than just linearly linking each individual element with Central London. This would help to create a multi-centred area where each place had character and importance, rather than just a situation where the entire Thames Estuary acted as a subservient settlement to London.

The adaptation of the area's main industries so that they can cope with the estuary's increased flood risk would



©Thames Gateway, Communities & Local Government

THERE IS AN EVER-INCREASING AND VERY REAL NEED FOR AN OFFICIAL STRATEGIC PLAN, ADDRESSING RISING WATER LEVELS AND FUTURE LONDON GROWTH.

provide a further challenge. Here, the main industrial areas at risk are oil refineries and power stations, with both being principally located close to the existing shoreline. Using surplus and obsolete equipment from the North Sea oil industry, large floating industrial units could be set up. This would enable these industries to stay located on the shoreline, where they could be easily supplied, whilst also being resistant to any flooding that should occur and the ecological aftermath that would normally be associated with industrial fuels and materials coming into contact with flood water.

This vision of the future begins to focus on enhancing and adapting what already exists within the Thames Estuary. By engaging with the area and its existing population in a way that attempts to understand its history and context, this scenario creates a more agreeable solution to Thames Estuary development than simply superimposing a developer-devised culture, whereby standardised houses are served within newly created clone towns. By establishing the area as a series of entities, rather than simply another satellite of London, it will create places where people actually want to live, rather than somewhere necessity takes them. Places that will embrace the changing nature of the foreshore.

### SUMMARY

Although there are definite question marks over the true necessity and the physical practicality of London expanding eastwards down the River Thames and out along its Estuary, current government thinking shows that it is highly likely. Even though this would see tens of thousands of new homes being built in an area of Britain that will be amongst one of the most badly affected by the problems of rising sea level. However, it is sometimes by solving some of the most difficult problems that the most innovative and beautiful solutions are created.

Though we tried to give equal weight to each of the two scenarios we have explored, the more they evolved, the more seductive we found the holistic and soft approach of

scenario B. Whilst the creation of a giant barrier in scenario A would help to completely solve, at least temporarily, the problem of flooding in London and the Estuary, it also seems to introduce many more problems within the area it would be designed to protect. There would also be repercussions further down the coast associated with the use of hard flood defences. It shows how a sweeping response to a problem gives very little allowance for variations and often does not consider the multitude of repercussions that it will cause.

Scenario B gives the opportunity for each of the areas' problems to be addressed individually through tailored solutions, giving people and settlements their own identity through design and lifestyle. As each area overcomes its own specific problems an identity is created for the whole region, not through an iconic statement, but through the repetition of unique and creative ways of tackling similar, but not identical problems.

The Thames Estuary represents a great opportunity for architectural design, largely due to the pending problems the Estuary faces. By responding progressively to these challenges and understanding that conventional buildings and their design could play only a limited role in the area's future, design solutions can explore new inhabitation possibilities and alternative architectural styles that can only aid the current and future development of the Estuary.

Neither scenario can conclusively solve the problem of future flooding development. Nevertheless, in their own way they each show plausible methods and approaches that need to be considered before we embark on the future development within the Thames Estuary.

## 4

## LIVING WITH WATER

KIRAN CURTIS AND KEES VAN DER SANDE  
KCA ARCHITECTS

### SETTING THE SCENE

Flooding is not a new issue, mankind has always lived with the threat and many design responses and strategies to flood risk, whether tidal, fluvial or from urban run-off, exist. Examples can be found in places such as Holland, Tokyo and Phoenix of highly developed flood defence systems.

However as society enters the new territory of climate change we face greater levels of exposure and uncertainty, and this throws into question the appropriateness of the current responses available to us.

Adapting successfully to face the effects of climate change in the short, medium and long-term is the new challenge we face. And to arrive at the right solutions to the challenge we must first make sure that we're asking the right questions. As a way of exploring what these might be, this piece will pose, in no particular order, some of the questions that deserve to be asked.

### WHY DEVELOP NEW PROPERTY WITHIN THE FLOOD PLAIN AT ALL?

On the face of it proposing new or replacement development of homes and commerce in areas known to be at risk of flooding seems irresponsible. But in practice current economic and social benefits have always been balanced against potential future risk.

Within London and the Thames Gateway the drive to find new land for housing development and economic expansion is strong. Current proposals to regenerate areas within the Thames Gateway favour large-scale opportunities and 'brown field' sites. The rationale is that in theory it is easier to deliver a smaller number of large scale projects and sites blighted by previous uses will be remediated as part of the process. It ignores the fact that over two thirds of the areas fall within the highest category of flood risk.

## QUESTION TIME?

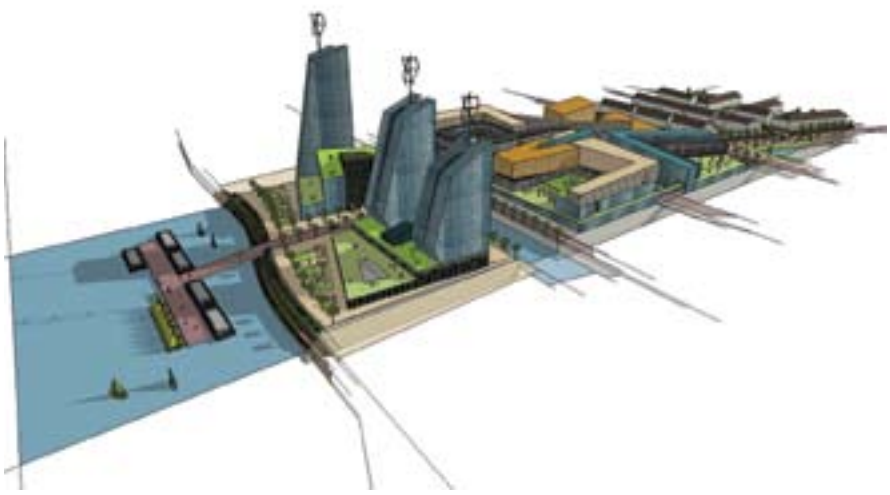
Alternative approaches might look at urban expansion into less valuable areas of the Greenbelt and off-set this by allowing brown field sites to return to the flood plain as open wet land space rich in biodiversity and wildlife. Previous polluters of land could be forced to clean up the worst contamination.

Another approach might be to restrict development within both the flood plain and green belt and to encourage further intensification of current urban and suburban areas via more relaxed planning codes. Or we could find alternative political and social strategies to link the housing shortage and supply of jobs in the south east, with the housing surplus and shortage of jobs in other parts of the country.

### WHEN DEVELOPING WITHIN THE FLOOD PLAIN HOW DO WE IDENTIFY AND QUANTIFY THE RISK THAT SHOULD BE DESIGNED FOR?

Current estimates of flood risk are based upon statistical historical information with a margin of safety added. New guidance is based upon taking a view on predicted climate change scenarios. This approach is based upon the idea that, if the probability of an event is small enough, then we can live with it as long as we have some sort of back up plan. Unfortunately the science behind climate change is very much in its infancy and contains large levels of uncertainty. By its very nature it negates the relevance of empirical historic data. In this case past performance really is not an indicator of future returns!

A different approach would be to consider consequence rather than probability. By designing for probability we leave ourselves open to an event that has a low chance of happening but is catastrophic if it does. Examples of designs that accommodate a high probability of an event happening by minimising the consequences include traditional Japanese architecture and various types of indigenous dwellings on stilts.



A section through the flood plain developed as part of KCA's Living with Water initiative explores a series of land use strategies that go with different levels of risk. ©KCA Architects

As flooding becomes less predictable due to climate change should we change our mind set to 'what if the flood happens tomorrow' and start from the outset to design for the 'worst case' to minimise and manage the impact?

**IN DESIGNING FOR PUBLIC SAFETY AND TO MINIMISE DAMAGE TO PROPERTY AND COMMERCE WHAT LEVEL OF RISK IS ACCEPTABLE?**

Risk is an intrinsic fact of life. One cannot let future events that may or may not happen completely stifle the present. There is however clearly a balance to be struck, whereby we put in place contingency plans for the worst, and temper our actions so as not to recklessly invite disaster.

Flooding even without loss of life tends to result in the displacement of people from their homes for long periods of time and the loss of items of personal value. The emotional impact of flooding on people and the huge effect on their well being must therefore be recognised.

**WHY DON'T PROPERTY AND LAND VALUES REFLECT THE RISK OF FLOODING?**

In deciding on what an acceptable level of risk is one normally weighs the likely benefits against the likely consequences of a course of action. However there currently appears to be no correlation between the risk of flooding and property prices within London and the Thames Gateway. This is perhaps a result of a lack of awareness, a poor appreciation of the reality of the risk and the ultimate feeling that it is someone else's responsibility.

Whilst it would be unacceptable to permit development in the flood plain that did not adequately mitigate against the risk to occupants' life clearly there will always remain a risk to property and peoples' possessions. If property and land prices better reflected the level of flood risk this would allow a degree of individual choice as to the balance between

benefits and consequences. And if price were sensitive to the effectiveness with which flood risk mitigation is integrated into the design of developments, innovation and better quality solutions would be encouraged.

**WHEN DEVELOPING NEAR THE EXISTING FLOOD PLAIN TO WHAT EXTENT SHOULD WE ANTICIPATE THE EFFECTS OF CLIMATE CHANGE ON FLUVIAL FLOOD PROFILES AND SEA LEVELS?**

When does land and property that is not currently at risk of flooding but may soon become so need to be considered?

As the strategic approach shifts from defence towards managed retreat there is an opportunity to define timescales for land use. Thinking in 25 year to 50 year periods architecture and design could respond with developments that serve a current need but sit lightly on the land to make way for the wetlands of the future. This would require appropriate forms of ownership and tenure, shorter leaseholds. Again, property and land value would adapt to reflect the situation.

**OVER WHAT TIMESCALES SHOULD WE ATTEMPT TO FORECAST RISK AND THEREFORE DESIGN FOR?**

Whilst buildings are often designed for 25 to 30 year periods and lending geared to similar periods, leases for domestic properties are structured for periods of 99 or 999 years. Expectations for property as an asset tend to be for longer periods of time than their designed lifetimes, even though such aspirations do not always take into account that the cost of periodic refurbishment can be as much as of new build.

These expectations may no longer be tenable given the extent to which the environment is predicted to alter as a result of climate change. The result may be that land values and the approach to property ownership must be adapted to cater for shorter timescales.



©Thames Gateway, Communities & Local Government



Taking flood risk as a key constraint from the outset KCA has developed proposals for the regeneration of Albion Quayside in Gravesend that integrate the mitigation and management of flood water seamlessly into the urban design. ©KCA Architects

Developments that need to pay back and realise a profit over shorter periods would present an interesting challenge to the design and construction industry. Temporary, portable, recyclable and even disposable (or biodegradable!) architecture could be considered. The logic of standardisation and offsite mass production would be further strengthened.

The challenge would act as a further driver for reducing infrastructure costs through decentralisation and greater self sufficiency in terms of energy and water. Renewable energy plant could be designed to be relocated and reused elsewhere. Off-grid carbon neutral schemes would be encouraged.

With the potential of reduced land values, community or group self build organisations could be encouraged to take on the development and long term stewardship of such sites. Planning policy would need to take a more flexible view of land in this category and its short, medium and long term use, and modify its expectations accordingly.

**WHAT SHOULD WE DO TO DEFEND PEOPLE, EXISTING PROPERTIES AND INFRASTRUCTURE CURRENTLY AT RISK FROM FLOODING? FOR HOW LONG ARE WE PREPARED TO DEFEND THEM AND HOW MUCH ARE WE PREPARED TO INVEST TO DO SO?**

The effect of a major flood upon London as an economic and cultural centre would be significant for both the prosperity and well-being of the country as a whole. Large areas of central London, including Fulham, Battersea and Southwark are currently reliant for protection from flooding on the Thames Barrier. Therefore we need to question what design life the Thames Barrier really does have left and what can be done to upgrade or extend its usefulness.

Over and above the Barrier, we need to ask what should be done to upgrade and future-proof existing infrastructure, property and services against a major event?

Since the construction of the Thames Barrier the city has become complacent about flood risk, indeed in some cases secondary measures have been dismantled, such as flood barriers within the Underground system.

Capital-wide contingency plans and emergency services along with increased public awareness need to be put back in place to ensure safety and the ability to implement a rapid and effective return to normality.

**ONCE THE OBJECTIVES HAVE BEEN SET WHO IS RESPONSIBLE FOR DESIGNING ON A REGIONAL LEVEL AN OVERALL SYSTEM FOR FLOOD DEFENCE, AND DEVELOPING A MANAGEMENT STRATEGY FOR LONDON AND THE THAMES GATEWAY?**

It is not clear who is responsible for large-scale strategic planning for flood risk on the scale of the Thames Gateway to deliver a joined up solution for the greater common good. The Thames and estuary functions as a single entity and therefore flood defences and the long term management of London and the Gateway can only be properly approached on the same scale by looking at the whole.

Currently it appears that the intention is to finance upgrading the primary flood defences via adjacent development. How can this lead to a complete and 'water tight' defence? If it is in the interests of London and the Gateway as a whole to sacrifice certain areas back to the flood plain, a body empowered to make these decisions is urgently needed.

**WHO IS RESPONSIBLE FOR THE FINANCE AND IMPLEMENTATION OF THE PLAN/SYSTEM AND UPDATING IT WITH TIME?**

Again, a body is needed to implement an overall defence and a strategy for flood management, and it must have



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AT ALBION QUAYSIDE A NEW TYPE OF FLOOD DEFENCE AND RIVER SIDE WALKWAY DEVELOPED BY KCA REMOVES BARRIERS BETWEEN THE LAND AND WATER WHILST AT THE SAME TIME INCREASING THE CAPACITY OF THE RIVER. WITHIN THE SCHEME A SERIES OF CONNECTED NEW PUBLIC SPACES MAKE SPACE FOR WATER AND PROVIDE A ROUTE FOR IT TO RETREAT. A MIX OF USES PROVIDES ACTIVE COMMERCIAL FRONTAGES AT STREET LEVEL AND KEEPS HOUSING SAFE AT FIRST FLOOR AND ABOVE.

the finances in place to allow it to do so. This then leads to further questions of how the capital will be raised, who will contribute, and in what proportion?

### **WHAT IS THE BALANCE OF RESPONSIBILITY BETWEEN THE INDIVIDUAL AND THE STATE FOR THEIR OWN SAFETY AND WELLBEING? HOW CAN PUBLIC AWARENESS OF FLOOD RISK BE IMPROVED?**

In London the individual is clearly either unaware of flood risk or feels that it is the authorities' responsibility to keep them safe from it. Yet effective mitigation of flood risk needs to work on a number of different levels from a regional level down to local level and finally down to the level of the individual property.

Again greater public awareness of risks and a sense of personal responsibility would drive improvements in the standard of resilience of property offered within the flood plain.

### **ON AN INDIVIDUAL SITE AND BUILDING LEVEL WHAT CAN URBAN DESIGN, ARCHITECTURE AND LANDSCAPE ARCHITECTURE DO TO MITIGATE AGAINST FLOOD RISK?**

Design can offer a great deal to alleviate the potential effects of flooding and designing for flood risk invites innovation and creative solutions. However, demand needs to justify this. Without public awareness of flood risk, and more discerning and informed buyers, the market will only offer the most basic measures required by regulatory authorities. Minimum standards of mitigation set by regulatory authorities should also be further reviewed and strengthened. Design guidance, the development of best practice and realised exemplar projects are needed to assist design professionals and raise expectations across the board.

### **IF DISASTER STRIKES, LIVES ARE LOST AND PROPERTY DESTROYED, WHO IS LIABLE?**

The insurance industry currently offers cover against damage to property and possessions from flood risk, relating premiums to the likely risk. Again, as the level of risk becomes more difficult to predict, the offer of insurance may become more difficult to make.

The other issue to consider is professional liability and the potential implications of the new Corporate Manslaughter and Homicide Bill 2006.

The successful mitigation of flood risk relies upon a sequence of decisions including:

- whether to locate a specific development use within the flood plain in the first place - a choice usually made by the developer and/or local authority?
- what design measures are employed to tackle both primary and secondary flood risk specified by design consultants?
- how these measures are constructed and implemented on site by the contractors, the maintenance of flood mitigation systems, Sustainable Urban Drainage Systems, demountable systems etc. by occupants and management companies?
- the degree to which early warning systems, closing of flood gates, implementation of escape strategies etc. are relied upon by occupants and management companies?

Given this, the apportioning of responsibility and liability is anything but clear cut.

KCA'S LIVING WITH WATER PROJECT HIGHLIGHTS A STRONG SYNERGY BETWEEN THE SORTS OF MEASURES NEEDED TO MITIGATE AGAINST EXTREME FLOODING EVENTS AND THOSE NEEDED TO DELIVER RESPONSIBLE SUSTAINABLE DEVELOPMENT WITH ZERO OR REDUCED CO2 EMISSIONS.



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### WHAT CAN ARCHITECTURE, URBAN DESIGN AND DEVELOPMENT DO TO HALT OR SLOW THE DEGREE OF CLIMATE CHANGE PREDICTED AND SO ITS EFFECT OF FLOOD RISK?

Unsustainable development, the travel patterns they encourage and existing buildings contribute greatly to CO2 emissions. An opportunity exists for the design and development community to make a real difference through innovation, application of new technologies and the promotion of low carbon regeneration.

#### SUMMARY

There are a number of opportunities that arise from planning for flood risk. By making space for water we create the potential for great new landscapes, open amenity spaces and wildlife habitats. Designing for flood risk also puts into sharp relief the need for more responsible sustainable development, with an explicit and embedded aim of reducing the potential effects of climate change.

The potential effect of flood risk on land value and the notion of shorter timescales with its potential effect on ownership arrangements open up the intriguing possibility of lower cost accommodation.

The necessity of addressing flood risk on a regional scale should further encourage the development of an overall vision for the Thames Gateway. And, in addressing the Thames Gateway as a whole, other issues such as transport, the Terry Farrell proposals for a national park and the generation of renewable energy on larger scales would also benefit.

Self sufficient, sustainable developments designed for a 25 to 50 year life would encourage new and potentially very exciting architectural and urban design responses to emerge.

Perhaps the most significant immediate effect of climate change is the level of uncertainty that we are forced to deal with. If the effectiveness of our historic strategy of simply attempting to subjugate the forces of nature is thrown into doubt can we replace it with an approach that is more adaptive, flexible and sensitive to our changing environment?

# 5

## OBSERVATIONS

**ALAN CHERRY**  
**COUNTRYSIDE PROPERTIES**

### BACKGROUND

The preparation of the RIBA's Building Futures Flooding Project requires a vision to ensure that we react positively to the consequences associated with climate change; rising sea levels and an associated risk of flooding. A long term view is needed to mitigate against the threat of serious flooding, both in coastal areas and in other towns and cities with tidal estuaries.

The key consideration is what changes need to be made to current planning and development practices in the Thames Gateway. Over the next 10 years some 160,000 new homes and around 180,000 new jobs are being planned for the Thames Gateway. This is in addition to the existing 1.25 million people who live and work in the area. Indeed, London is one of the major financial centres of the global economy; therefore it is invaluable to the UK that it is not only protected, but enhanced.

Whilst this area is guarded by London's flood defences, including the Thames and Barking Barriers, it cannot be purely physical measures that protect Londoners. It is imperative that there is cohesion between the various planning policies and other strategies to ultimately provide developers and other professionals involved in the development process with a clear set of guidance.

The Environment Agency is leading a project to prepare a strategy for flood risk management in the Thames Estuary until 2100. We acknowledge and broadly agree with the principles of this work as it sets out a programme of management that supports the development of sustainable communities.

### CLIMATE CHANGE / THREAT OF FLOODING

As we are well aware increasing sea levels will be one of the damaging results of climate change, resulting in both tidal and fluvial flooding.

## ON FUTURE DEVELOPMENT AND FLOOD RISK

The challenge is that of the new development planned for the Thames Gateway 91 per cent of the new homes and 1 million m<sup>2</sup> of commercial space is likely to be located in the floodplain where currently there are around 500,000 properties. The question still remains as to what will be the likely effects of climate change and importantly to what level will sea levels rise and over what period?

Granted, the effects might not be as bad as the most pessimistic view, however we do need a long-term strategy to protect the existing environment, population, economic and social infrastructure, the rich character of open spaces and biodiversity.

### NATURAL DISASTERS

'Flooding' and 'Catastrophe' are synonymous. The effects of Hurricane Katrina on the city of New Orleans was a stark warning of the consequences of climate change and such devastating events are likely to become more frequent throughout the 21st Century.

More locally, the effects of flash flooding in Boscastle, Cornwall two years ago resulted in significant devastation to a once tranquil setting, raising our awareness as to the harsh realities of the changing climate.

The effects, environmentally, economically and socially of such a disaster would be devastating on a national level if it was to occur in a larger conurbation such as London. This is reflected by the fact that some £237 billion of assets, including 10% of the existing housing stock and 5 million inhabitants lie within areas at risk of flooding.

The Association of British Insurers (ABI) has provided guidance to minimise flood risk, to which developers are mindful to follow in order to avoid their developments becoming uninsurable.



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COUNTRYSIDE MARITIME IS LEADING THE WAY IN ECO-FRIENDLY HOUSING WITH AXIS, ITS LATEST DEVELOPMENT ON THE AWARD WINNING ST MARY'S ISLAND, THE FORMER ROYAL NAVAL DOCKYARD IN CHATHAM, KENT. SET WITHIN 20 ACRES OF OPEN SPACE ON ST. MARY'S ISLAND, IT COMBINES ECO-FRIENDLY FEATURES WITH CONTEMPORARY HOUSING DESIGN, AS WELL AS MEETING DEMANDS TO CONSERVE ENERGY AND RESOURCES. SUSTAINABILITY AND THE ENVIRONMENT HAVE BEEN KEY CONSIDERATIONS RIGHT FROM THE BEGINNING STAGES OF THE PROJECT.

The ABI advise that managing the risks of climate change could reduce the potential costs resulting from extreme weather conditions. In the UK, taking account of climate change in flood management policies, including controlling development in floodplains and increasing investment in flood defences, could limit the rising cost of flood damage to a possible four-fold increase (£5.3 billion) rather than 10 – 20 fold by the 2080s.

### DEVELOPMENT IN THE FLOOD PLAIN

There is a significant housing need within the UK and as PPS3 (Housing) suggests, this supply could be met by providing housing developments in suitable locations, namely those that offer a good range of community facilities and with good access to jobs, key services and infrastructure (e.g. Thames Gateway). A flexible approach to the supply of land is required, managed in a way that makes efficient and effective use of land, whilst minimising environmental impact, taking account of climate change and flooding.

### MITIGATING THE EFFECTS OF FLOODING

The development sector's role within the mitigation of climate change, rather than control measures, will be a rather long term process; however factors that immediately contribute to flooding (paved surfaces, increased roads, loss of open space etc) can be reconsidered to negate their impact. There are various measures that need consideration when mitigating against the threat of flooding:

### PHYSICAL

Flood defence is not necessarily the best option when building in the floodplain, as building higher defences might result in greater catastrophes downstream. Development Masterplans could include low lying green spaces designed to absorb flooding with minimal damage, often serving as zones for biodiversity, leisure etc.

There is also the need for cohesion between the various levels of the planning process (national, regional and local level), in addition to the Environment Agency and the other coastal and flood defence operating authorities.

### GOVERNMENT GUIDANCE

There is a plethora of information being published in relation to the climate change issue, however the following are the key drivers that is beginning to influence the way in which development is being undertaken: The Stern Review on the Economics of Climate Change, PPS1: Delivering Sustainable Development (and the draft Climate Change supplementary guidance), PPS3: Housing and PPS25: Development and Flood Risk, the Draft Climate Change Bill; new Building Regulations on Flooding and The London Plan Review 2008.

### PLANNING VS DESIGN

The mitigation of flooding itself is a two-fold process with the need for both planning and design to work together.

### PLANNING & DEVELOPMENT

- The location of any proposed development is key – whether or not planning guidance and policy (PPS, RSS, and LDDs) allow development in areas that are prone to flooding.
- Flood risk assessments – Regional Flood Risk Appraisals (RFRAs), Strategic Flood Risk Assessments (SFRAs), Site-specific Flood Risk Assessments (FRAs) – need to be prepared on a regional basis to guide strategic planning decisions.
- The 'Sequential Test' is a useful tool for analysing the consequences for existing and proposed development sites within high risk areas. This should ensure that more vulnerable property types such as residential will not be allocated to areas at high risk of flooding (PPS25)



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GREENWICH MILLENNIUM VILLAGE IS A JOINT VENTURE BETWEEN COUNTRYSIDE PROPERTIES AND TAYLOR WOODROW. GREENWICH PENINSULA ITSELF IS ONE OF THE LARGEST DEVELOPMENT SITES IN LONDON AND ONE OF EUROPE'S BIGGEST REGENERATION PROJECTS. THE IMPORTANCE OF A NATURAL ENVIRONMENT HAS ALSO BEEN RECOGNISED THROUGHOUT THE DEVELOPMENT. THREE MAIN AREAS OF PARKLAND HAVE BEEN CREATED INCLUDING AN ECOLOGY PARK, AND EXTENSIVE WORKS HAVE BEEN CARRIED OUT TO IMPROVE THE RIVERSIDE.

Development and Flood Risk), unless the design respects the principles of protection (i.e. raised ground floors etc).

- The 'Exception Test' may be applied following the Sequential Test (developments may then be allowed in such areas if they provide wider community benefits etc).
- The Environment Agency (EA) – Councils are now required to consult EA on all planning applications in flood zones, with the EA having stronger powers to direct a refusal for planning permission where appropriate. EA have also set up a taskforce (Thames Estuary 2100) to largely investigate flood defence measures beyond the Thames Barrier (likely to be replaced by 2030).

Whilst more robust and consistent policy is considered to be positive, we do have concerns regarding the level of detailed design that is required at the outline planning stage. By way of example, the quantum of information previously required for reserved matters application is now required to be front-ended into planning applications. This needs huge resolve and collaboration from all partners from the outset. This is a significant challenge for all stakeholders primarily in light of the shortfall in new housing supply in the UK. Indeed, approximately 165,000 new homes are being developed annually although at least 225,000 new homes need to be produced each year. The challenge therefore is for the planning system to support the additional homes outlined in Government forecasts. Indeed Kate Barker's next review of the planning system is eagerly awaited and is expected to support a step change resulting in the delivery of more new homes to meet demand.

## DESIGN

Sustainable developments should also promote innovative architectural design that can be flexible for changing needs, in addition to benefiting from technological improvements in construction methods and services.

Buildings within areas prone to flooding can be designed in such a way as to positively respond to this threat, whether dry proofing/flood resistant or wet-proofing/flood resilient. Raising the habitable spaces to first floor level, above car parking and other spaces that can withstand flooding is another practical solution for consideration.

The Netherlands is a prime example of a nation at the front line in terms of serious threat from sea levels rising, with 70% of the land below sea level. Innovative design for new housing has included the development of an "amphibious building" that rises and falls with the tide, similar to that of a house boat.

How realistic an option this is for new homes within the floodplain of the Thames Gateway to be built on telescopic legs for example, is an unknown quantity. It is likely that a more passive approach to design would have a better long-term effect on the public realm and residents, e.g. flood resistant / flood resilient design.

There are also opportunities to be gained from planning and designing for flood risk – improved quality of life with areas for water (small flood plains etc), with wildlife habitats improving the ecology of a development. By way of example SuDs (Sustainable Drainage Systems) can make a valuable contribution to the public realm and the creation of place. However, this aspiration has to be balanced with the requirements of PPS3 (increased density etc) and the adoption and maintenance of open space thereafter.

The UK needs to learn from European examples of how climate change strategies are woven into high quality and well designed sustainable communities. For this to work, improved and joined-up national and regional policy is paramount, if we are to collectively embrace this significant shift in our way of life within the UK. It will take more than purely a Section 106 contribution on a site specific basis to influence such a behavioural change. Indeed, a 'top-down' process from Central Government to local community

accountability is imperative for sustainable communities to be wholly embraced.

Consideration must also be given to water run-off, flood water storage etc and the inherent problems of impermeability of existing developments / dwellings (paved areas, roads etc) which can result in flash flooding – particularly in conurbations such as London, where there is an ever increasing problem when rain water cannot disperse naturally back into the water table. The water therefore then runs off the impermeable surfaces and into the antiquated drainage/sewer systems that cannot cope, indeed the need for future-proofed infrastructures strategies is vital.

Whilst, my observations are primarily based around water, this aspect cannot be considered independently from the broad issues of sustainability i.e. local and site wide gas, electricity and more recently renewables infrastructure and how each of these components are woven into the masterplan. Indeed, the principles of good urban design, orientation and the provision of comfortable microclimates for residents, users and visitors requires sensitive and careful layering of many functions to a make a new community truly sustainable.

There are a number of developments built to a high level of sustainability already being undertaken within the Thames Gateway, including my Company's projects at Greenwich Millennium Village, Greenwich and St Mary's Island, Chatham Maritime, Kent as well as Ingress Park by Crest Nicholson and Royal Arsenal, Woolwich by Berkeley Homes. Furthermore the development of Barking Reach, London by Bellway Homes and our own scheme at Fresh Wharf, Barking demonstrate innovative strategies to climate change mitigation on a significant and repeatable scale.

### MEASURES BEING TAKEN BY COUNTRYSIDE PROPERTIES – BUILDING A SUSTAINABLE FUTURE

As an innovative, responsible developer Countryside Properties is continually evolving as a business and is developing practices that will ensure development meets, and where commercially viable, exceeds the required environmental sustainability standards.

Local planning policies are now beginning to demand higher levels of sustainability, examples of which include the groundbreaking 'Merton Rule' (PPS22) which requires developers to ensure at least 10% of all energy production for new development comes from renewable energy sources based on site.

Policies such as the above need to be applied 'across the board' to ensure continuity and certainty within the development sector. The recently published Code for Sustainable Homes provides a roadmap for the consistent

application of measures, with a target of all new homes to be carbon zero by 2016. Furthermore, the Draft Climate Change policy that will supplement PPS1 further strengthens the policy framework to deliver sustainable homes and work places. In principle we support this progressive and joined-up approach, with our Company making good progress towards meeting these recently published requirements. However, they will be highly challenging and we need the supplier base for renewable technologies to be much more robust than it is today. The long-term management of the site-wide infrastructure associated with renewable energy sources is another area for consideration.

Furthermore, we are already experiencing a change in the development process as a result of the threats of climate change. As a part of the planning process the EA now require more information in outline planning applications, to ensure that development does not conflict with flood plains, that drainage strategies meet their requirements, and that SuDs (Sustainable Drainage Systems) are adequately provided for. SuDs opportunity plans are now often required as a part of Design Codes. Design Codes are required for many large/major developments; to include SuDs, water efficiency (at source) and recycling measures. Codes are then to be approved before any reserved matters applications (details) are submitted/approved.

### WHAT ELSE NEEDS TO BE DONE?

#### Education

What is the public perception of the climate change phenomena and its likely affects on development needs?

We know that consumers are becoming more aware of the serious environmental problems that might be associated with climate change. In terms of Sustainability, research suggests that home buyers are in favour of the introduction of sustainable practices when choosing their next property ('Eco Chic or Eco Geek? The Desirability of Sustainable Homes'), indeed 4 in 5 of those surveyed were interested in sustainable housing; and aware that it would go some way to influencing climate change.

It would appear that the underlying reasons for this way of thinking are more economic rather than a concern for the environment per se. Should we therefore be focussing more on the cost of living in line with the consumer? Surely we must integrate a better balance of the economic, social and environmental drivers and the resulting benefits that new sustainable communities can bring.

Indeed, our experience at the Millennium Village at Greenwich has shown that these principles can be adopted. For example some 87% of residents use the tube to work,

while there is a much higher ratio of bicycles than there are cars per home. In addition to this, a 65% reduction in primary energy consumption has been achieved, and good passive design through the orientation of buildings maximises solar gain. Other environmental benefits include the reduction in construction waste and water consumption. All of these factors are contributing to the development of a wonderful new community that has been recognised by RIBA and CBE Building for Life awards.

### Infrastructure

With the issue of impermeability of rain water in mind (flash flooding as a result of surface run-off, etc) there needs to be investment into the drainage / sewers of London to alleviate flash flooding. A new barrier built at the mouth of the Thames Estuary might prove one way of mitigating against severe flooding of the Thames Gateway and beyond, however this is a reactive measure, rather than prevention.

### Other points for consideration

With only 1% of the water in the world being suitable for drinking, freshwater flooding is a significant problem. This invaluable commodity is also under threat from rising global temperatures – as the water falls from the sky it has less time to seep through the soil and repeat its cleansing cycle, rushing over the land collecting pollutants etc before then evaporating.

Fresh water shortage and the issue of flooding are both factors that need consideration when considering the location of any development. Indeed, whilst these are challenges we all face, I believe the development sector can deliver climate change mitigation strategies for new and existing communities. However it cannot achieve this independently of the various statutory authorities and interested stakeholders. We need to look towards countries such as Holland to learn from them and understand how excellent economic, social and environmental infrastructure models can be designed, constructed and maintained for the benefit of future generations.

This holistic approach to better land use planning, combined with a reduction in personal consumption, is an imperative for us all. Indeed, current consumption levels in the UK are a source of concern for its citizens' well-being and the finite resources of the planet. It is considered therefore, that in partnership with Government all stakeholders have a part to play in making our way of life more sustainable and to create a greater sense of local inclusion and place.

New developments must be designed to respect their unique environment and the characteristics of its location in order to create a sense of place. The development industry is in a period of significant change and this is presenting a challenge with enormous opportunity for us all.

There is no doubt that we must respond to the increasing concerns that people have about the effects of climate change and the importance of living more sustainably must all seriously consider changes in our culture and lifestyles to reduce our ecological footprint.

With the considerable progress being made in information technology for example, it should be possible for people to work from home, if not all the time at least part of the time. The results of increased working from home would be significantly advantageous, with fewer cars on the road resulting in less congestion and ultimately reducing CO<sub>2</sub> emissions.

We as a company have already found that high sustainability standards add value to the development and are important when selling new homes. We believe that sensitive masterplanning and high quality design within the Thames Gateway will provide new sustainable communities, which are 'future-proofed' for climate change and for generations to come.

# CONCLUSIONS

**'It will never be possible to prevent flooding entirely - what we can do is manage floods. This means reducing both the likelihood of flooding and its impact when it does occur.'**

Environment Agency

When looking at how we manage water and design in its close proximity, the immense scale of the challenge of flooding that we are now facing becomes clear. Climate change, and its many effects - including increasing sea levels, more severe precipitation and increased flood risk - is already being felt, however its true effects will be measured in decades. This is the timeframe within which planning, design and development should operate. The buildings and places that we create in the next five or ten years will form the backbone of the Thames Gateway for the next five decades and beyond. Created and evolved communities will themselves exist way beyond our usual timeframe and thought horizon.

The patterns of development are being set now. Planning, design and construction has not evolved sufficiently to face a future of increased flood risk with confidence. However, as we have seen from the contributors, new thinking is coming to the fore, innovation is taking place, and the vision that has been lacking in the Thames Gateway is beginning to surface. The long-term view that is necessary in taking account of climate change also enables us to view other issues with the same horizon of opportunity - facilitating new solutions to spatial planning and the location of settlements, best practice in building design, infrastructure development, and environmental flood defence.

This is an important debate that resonates not only across the UK, but for most coastal and low-lying regions across the globe. We are at the right time to evolve a new relationship to water, to ask questions of perceived wisdom in policy, design and construction, and to begin to look towards a flooded future with confidence and imagination.

## EMERGING THEMES

Our contributors raise a number of cross-cutting themes that form the basis for hypothesising what the future may look like under the conditions of climate change and increased flood risk, and form a number of both recommendations and questions that can form the core of the subsequent debate.

### TAKING THE LONG VIEW: COMBATING CLIMATE CHANGE

The change in perception regarding the seriousness and need to combat climate change in the last 18 months has been nothing but revolutionary - amongst not only seasoned environmentalists, but also policy makers and economists, to home builders, architects and the public. It is very likely that 2006 will be remembered as the year in which consciousness of the global climate's tipping point reached its own tipping point.

The level of carbon 'literacy' is improving, and people are beginning to understand their place in reducing carbon dioxide and other greenhouse gasses. However, this is only one front in the battle against climate change. Heat, extreme weather, flooding, climate fluctuations - these are the battlegrounds that will follow. We must plan, design, build and adapt homes and workplaces that continue to inspire in their form and function, but remain cool in summer, warm in winter, dry and safe, not only today but in the projected futures of 2020, 2050 and well beyond.

In trying to knit together mitigation and adaptation measures, we are forced to consider fresh approaches towards managing the impacts of climate change. This is not a problem with a quick, technical fix.

Any successful strategy to curb climate change and react to its effects must be inherently long-term in nature. This requires a change of perspective – too often we are drawn to the short-term and a reactive approach. Taking a longer-term view begins to open up opportunities outside of reacting to climate change, towards making use of a strategic vision and future aspirations. A longer-term view can anticipate the future and present need to adapt current planning and practices and react to the changing flood risk. It opens up exciting linkages between infrastructure development and funding, transport and regeneration, land-use choices, technical innovation and a more organic approach to the development of the Thames Gateway.

“PERHAPS THE MOST SIGNIFICANT IMMEDIATE EFFECT OF CLIMATE CHANGE IS THE LEVEL OF UNCERTAINTY THAT WE ARE FORCED TO DEAL WITH. IF THE EFFECTIVENESS OF OUR HISTORIC STRATEGY OF SIMPLY ATTEMPTING TO SUBJUGATE THE FORCES OF NATURE IS THROWN INTO DOUBT CAN WE REPLACE IT WITH AN APPROACH THAT IS MORE ADAPTIVE, FLEXIBLE AND SENSITIVE TO OUR CHANGING ENVIRONMENT?”

### LEARNING TO LIVE WITH WATER

At present we rely on an exclusive principle to water and development that mitigates risk through engineering, tidal defence and drainage systems.

“By designing for probability we leave ourselves open to an event that has a low chance of happening but is catastrophic if it does”

We develop in the belief that we are largely free from risk – this affects our design choices, the construction materials we use, where we want to live, what we demand of our homes and our attitude towards both open space and open water. This is based on applying our existing ways of thinking to a changing world. While we relish adjacency to water, reflecting the important role it has played throughout our history, the way we develop remains very unforgiving of changing flood risk.

In the final analysis, it is not just barriers, walls, engineering and concrete that will protect Londoners. Strong and clear planning policy has a vital role, but we can currently discern little integration or co-ordination between the multitude of different master plans and local development frameworks, and the increasing number of overlapping strategies.

However, we can develop a more flexible and sophisticated approach. If we accept coastal change, can we develop more temporary structures that take into account the changing risk and future threats? Are we confident enough to use environmental flood protection such as salt marsh where appropriate, perhaps even returning land to a more natural state, and manage but not concrete over our flood plains?

## DESIGN CHALLENGES AND RECOMMENDATIONS

Much more can be done to investigate and promote innovative building and landscape designs that can be flexible to allow for changing needs, and benefit from technological improvements in construction methods and services.

### LIVING WITH FLOOD RISK

“As flooding becomes less predictable due to climate change should we change our minds set to ‘what if the flood happens tomorrow’ and start from the outset to design for the ‘worst case’ to minimise and manage the impact?”

- Promote design solutions that can positively respond to the threat of flood risk, whether by dry proofing and providing flood resistance, or wet-proofing and increasing flood resilience.
- Explore historic and international approaches to minimising the consequences of flooding.
- Review and strengthen minimum standards of mitigation set by regulatory authorities.
- Assess the impact of raising habitable spaces to first floor level, above car parking and other spaces that can withstand flooding.

### NEW METHODS AND STRUCTURES

“Design can offer a great deal to alleviate the potential effects of flooding and designing for flood risk invites innovation and creative solutions”

- Temporary, portable, recyclable and disposable architectural solutions should be developed further.
- Explore and promote the logic of standardisation and offsite mass production and their roles in increasing flood resilience and resistance.
- Develop the flexibility to alter buildings, looking at options that would allow people to live with occasional flooding by further adapting their homes in the future.
- Investigate the use of moveable structures that could offer opportunities to increase above ground living space and extend the use of structures.

## POLICY CHALLENGES AND RECOMMENDATIONS

“It is imperative that there is cohesion between the various planning policies and other strategies to ultimately provide developers and other professionals involved in the development process with a clear set of guidance”

### PLANNING FOR FLOOD RISK

“Dealing effectively with flood risk needs to be coordinated between a number of different levels, from national, to regional level, down to local levels and, finally, to the level of the individual property”

- National planning policy needs to take a more flexible view of land used for managing flood risk, and its designation, management and protection.
- Masterplans should be encouraged to include low lying green spaces designed to absorb flooding with minimal damage, often serving as zones for biodiversity, amenity and leisure.

- Greater use of design codes should be explored for large or significant developments; to include SuDs, water efficiency and recycling measures.
- Consider the development of an architect's guide to designing for flood risk.

### ENSURING FUTURE PROTECTION

“It cannot be purely physical measures that protect Londoners in the future”

- Address the need for a visionary strategic plan for future flood risk, addressing rising water levels and future London growth.
- Encourage a transparent discussion to work towards a clear decision on future infrastructure needs and London-wide protection.
- Ensure London-wide contingency and emergency plans are in place, along with increased public awareness, to ensure safety and the ability to implement a rapid and effective return to normality.
- Support the Environment Agency project to prepare a strategy for flood risk management in the Thames Estuary until 2100.

### A NEW VISION FOR THE THAMES GATEWAY: MAKING THE MOST OF OPPORTUNITY

“A powerful, comprehensible, flexible and imaginative strategy should be developed”

- Ensure clarity and cohesion between the various levels of the planning process (national, regional and local level), in addition to the Environment Agency and the other coastal and flood defence operating authorities operating in the region.
- Meet the need for a long-term strategy to protect the existing environment, population, economic and social infrastructure, as well as the area's rich character of open spaces and biodiversity.
- Promote a design strategy led by individual and existing communities rather than planning for only the Thames Gateway as a whole, which risks ignoring the complexities of the Estuary.

## CONCLUSIONS

There is little doubt that the Thames Estuary and the Thames Gateway as a whole represents a fantastic opportunity for architectural design and place making, largely due to the challenges the area is now facing. Often it is by solving the most difficult problems that the most innovative and long lasting solutions are created.

Sensitive masterplanning, clear guidance, visionary leadership and high quality design are the raw ingredients that will deliver new sustainable communities in the Thames Gateway, 'future-proofed' against climate change, and create a positive notion of design and life style when living with water.

## EPILOGUE

# WATER MUSIC

BY REG WARD

It is almost universally accepted that redistribution of the world's water resources is already occurring, and this will have both immediate and gradual but long-lasting impacts on the shape of future developments.

Part of the beauty of the Thames Gateway is that it cannot be easily described by a single masterplan, owing to its intrinsically organic nature and the timescales attached to its processes of change. This means that a powerful, comprehensible, flexible and imaginative strategy should be developed in response. This will expose the early decisions that will need to be made, particularly in infrastructure and utilities, without prejudicing its evolutionary development and design solutions suited to both time and place. As more localised visions turn from apparitions into projects they will develop as understudies to the strategic thinking and the full drama of scenic and development potential will gradually be revealed.

The preceding essays show well how individual approaches of a specialised nature can contribute towards the formation of a strategy robust enough to achieve the desires of communities, both old and not yet thought of, underscored with the fundamental thesis that we must make room for water. Nature has the upper hand but that need not cause distress. In the Netherlands, the most vulnerable country in Northern Europe, the Dutch Government not only freely admits this, but is under little illusion that designing well into the future is their best way forward.

In the United Kingdom we still engage in illusion. This is evident in two principle ways. Firstly, there seems to be a general assumption that flood defences will protect property forever, and that it is the population's inalienable right to expect such protection to be endlessly constructed, reconstructed and repaired no matter the cost. Secondly, despite the acknowledgement that climate change is a potentially catastrophic reality, too many still act as if the gradual and seemingly inconsequential rate of change may be comfortably ignored. Yet the thinking expressed in this report demonstrates how a subtle but far-sighted approach can displace pessimism with optimism and opportunity.



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Flood risk, even without climate change, is considerable right across the Gateway and beyond. Several questions arise simultaneously in our treatment of this risk. The existing barrage at Woolwich has a limited life-span yet its purpose, to defend Metropolitan London, will not disappear. And Metropolitan London's boundaries continue to expand down the Thames Corridor to the East. So let us finally make a distinction between the controlled river and the estuary and the sea. For me, the logical place for this to occur is at the Gateway City located at Tilbury and Gravesend where North and South may meet across the river. It is here that all the creative ingenuity of civil and marine engineers, architects and land artists, the development industry and local government along with their agencies can combine their ambitions. By building a new barrage and protecting London upstream, and allowing room for water downstream in the Estuary, a new and exciting context may be created. Such a visionary decision could confound illusion and ensure that living with water, in safety and a sublime environment, is not a statistical exercise. The Royal Institute of British Architects has many talented existing and future members who, in companionship with their colleagues from other related professions, should be at the forefront of this challenge.

Although the project may look toward the future, and assuming that places have genuinely responded to the changes to water levels and temperature, and the natural environment carefully nurtured and cultivated, the story does not stand still in time. River estuaries and coastlines all over the world will have to adapt to change simultaneously. Some places will disappear naturally and be replaced elsewhere. Personally and in the short term, I should like to explore other locations, perhaps the Essex coast up to Ipswich. The interaction between land and water under changing and unpredictable circumstances will remain a complex subject which will result in a whole raft of new and innovative ideas. If this work on the Thames can become a paradigm for further thought, and that real action is taken on the ground, I believe that the progress that becomes visible will be its own endorsement.

## Reg Ward

Reg Ward was the first Chief Executive of the London Docklands Development Corporation from 1981 to 1988. Reg played a major part in developing the idea of the Docklands Light Railway, London City Airport and Canary Wharf. He is now viewed as the main driver behind the extraordinary change and development in London Docklands, and remains a regular contributor to debates on urban regeneration and the future of the Thames Gateway.

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