

THE METAMORPHOSIS OF THE COAST
Resilient Landscapes and Climate Change

Miriam García García

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Foreword by
Josep Bohigas Arnau

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The research obtained an Honourable Mention on the 2nd Call of the Manuel de Solà-Morales European Prize of PhD thesis on Urban Planning with a jury consisting of Matthew Carmona (Bartlett School of Planning), José González-Cebrián Tello (A Coruña School of Architecture, ETSAC) and Montserrat Nogués i Teixidor (Fundación Arquia trustee).

Finally, it was distinguished with a **First Prize** in the 12th Biennial Competition of PhD thesis on Architecture, *arquia/tesis 2019*, whose jury was formed by Blanca Lleó Fernández (chairman, ETSAM-UPM), Carlos Guimarães (Oporto School of Architecture, Portugal), Jorge Tárrago Mingo (Navarra School of Architecture, UNAV), Montserrat Nogués i Teixidor (Fundación Arquia trustee) and Sol Candela Alcover (Secretary and Fundación Arquia Director).

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INTRODUCTION

PRESENTATION

We live in a post ecological era where nature no longer exists as an archetype separate from the human sphere. In this so-called Anthropocene era, for many, global warming, commonly known as climate change, is the most emblematic crisis.² The fact is that humans have turned the world into a planned, designed system, particularly since the 18th century and the Industrial Revolution. Furthermore, we have conceived it as a closed system. Yet the atmosphere, the oceans and the earth are open systems. With their biological, chemical and physical forces, they have at least ostensibly been able to absorb the global changes largely. This is no longer the case. Today it can be asserted that most of the global changes the planet is experiencing are spawned by human action. Of course, the physical, biological and chemical dynamics follow their cycles, but they are heavily impacted by human activity.

For French philosopher, sociologist and anthropologist Bruno Latour, recognising we live in the Anthropocene involves new relations between nature and culture. If we assume we inhabit a world that is increasingly designed and planned in the broad sense, we might be steered to thinking that the social and ecological problems our society is experiencing result from poor design or urban planning. Latour therefore urges us to take alternative roads to modernity. Roads that acknowledge the diversity of actors, be they human or not, uncertainties and conflicts that define the Anthropocene together with planetary constraints. Here, contemporary science spurs us to understand the land and cities as complex adaptive systems.

Open systems where causes and their effects are often far apart in time and in space given that the agents triggering the changes lie to a great extent away from the places where these causes and effects are manifested.

Innumerable factors have led us to the current state of global unsustainability, shall we call it. But beyond any doubt and looking at things from the standpoint of urban planning and architectural design, two of them are worth mentioning. First, a lack of understanding of how nature works, and second, the poor use of knowledge on the environmental scope of planned and designed actions. Ian L. McHarg has already aimed to draw attention to both of these issues in the course he developed and taught in 1957 at the University of Pennsylvania Department of Landscape Architecture called “Man and the environment”, which set the groundwork for writing the book *Designing with Nature*, published in 1969 and still required reading today.

From this wholistic perspective, one could think that the current challenge (to designing through nature) is one of working on landscapes highly impacted by human action in order to enhance both their biodiversity and their ability to adapt to the effects of climate change.

In this regard, coastlines are among those that need priority attention. They are places where modifications in the surface of the Earth can be detected the most quickly. They are more densely populated than inland areas, and furthermore, they have higher rates of demographic growth and urban development. This, together with the effects of climate change, significantly increases hazards and vulnerability there.

²
Jedediah Purdy: *After Nature:
A Politics for the Anthropocene*.

MOTIVATION

This emergency situation collides head on with the hegemonic treatment of coastlines around the world and particularly in Spain. While virtually all of Spain's coastal areas have planning and protection legislation, the planning is mainly aimed at rationalising urban development and paralysing disruptive development, a legacy from the speculative financial bubble of 1996-2006.³ I myself was unable to include proposals for adaptation to climate change in the Cantabria Coastal Management Plan (Plan de Ordenación del Litoral de Cantabria—2004) or the Galicia Region's Coastal Spatial Planning Plan (Plan de Ordenación del Litoral de Galicia—2011). This owed partly to the lack of social and political demand, but also to a lack of sufficient studies and a very complicated legal framework.

Yet there is now a certain consensus recognising that our civilization, highly *coastalised*, will experience the effects of climate change even more intensively over the next few decades.

Considering the rise in sea level forecast for the 21st century and for subsequent eras, coastal and lowland systems will very obviously experience increasing adverse impacts such as submersion, coastal flooding and erosion. Over the coming decades, goods and people exposed to coastal risks and to demographic pressure on coastal ecosystems due to population and economic growth and urban development will both increase.⁴

Unfortunately, climate change continues to be invisible for many, though its dynamics are accumulative until the time comes when conditions change suddenly, which is when they become visible to society. Most often, they occur in the form of natural disasters. The phenomenon is of course much more complex and subject to regional and local variations, as well as to the building of infrastructure,

the channelling of courses of water, overharvesting of aquifers, and so forth. In any event, it seems clear that the combination of climate change and human action along the coast certainly warrants new models that can be applied to planning and architectural design.

All of these circumstances encouraged me to embark, more than a decade ago, on research into the need to renew our agenda for the coastline falling in line with the current Anthropocene and global climate change. This marked the beginning, in 2015, of an adventure enabling a theoretical framework based on the discipline of landscaping to be built during my stay as a researcher and visiting professor at the University of Pennsylvania's Department of Landscape Architecture together with professor David Gouverneur.

Also inspiring were the words of architect Juan Navarro Baldeweg when, chairing a panel for a doctoral thesis at the Madrid School of Architecture (Escuela Técnica Superior de Arquitectura de Madrid, ETSAM), he sustained that our work as architects pools from a set of concepts supported by techniques and technology adapted to the context of the times. He vindicated the need to transform the profession of architecture through a novel, experimental conceptual framework, broadened through a new alphabet, a new visual encyclopaedia and typological models.⁵ By doing so, working in an era marked by the Anthropocene becomes a revolutionary opportunity to set the groundwork for that transformation. This research aims to make its own modest contribution to that cause.

³ Miriam García García: «El litoral español: más de un cuarto de siglo a la deriva».

⁴ IPCC: *Climate Change 2014: Impacts, Adaptation, and Vulnerability*.

⁵ Juan Navarro Baldeweg at the Carolina González Vives' PhD thesis defense: *Arquitectura antidesertización: fluidez, biodiversidad, hidrofilia y transpirabilidad*, on 27 November 2014 (Thesis supervisor: Iñaki Abalos Vázquez, ETSAM).

OBJECTIVE, HYPOTHESIS AND METHODOLOGY

This research, then, aims to renew the conceptual planning framework and the design of the coast in line with the current climate change context and to provide a set of tools for implementation.

Its initial hypothesis is based on the notion of the Anthropocene as the fruit of the conjunction between man and nature, between the natural and artificial realms, which explains why it is hybrid, and based on climate change as its most emblematic crisis. I consider the world in which we live to be a complicated, adaptive system whose changes, transformation and even disruptions constitute the groundwork for its evolution (development). I conceive the coast to be a social, regenerative and adaptive ecological system able to vary in morphological terms. If we accept all of these premises, then our way of relating to the coast cannot be one of mere protection, zoning, and building works and infrastructure that preclude adaptation while amplifying climate change related hazards.

The field of planning and design must undertake a cultural, political, physical and technical metamorphosis, and it must be able to transform the demand for simple, controllable, manipulatable infrastructure into renewed, synthetic landscapes, into hybrids of nature and culture thanks to architectural designs, ecology and technology. This is the only way forward to foster change enabling self-regulation, evolution, and therefore coastline resilience against climate change. This metamorphosis paves the way for a renewed conceptual framework for coastline planning and design and a new visual alphabet of strategies and techniques for coastline resilience.

Insofar as the methodology, it is known that scientific research can be elaborated based on both quantitative and qualitative methods. The former aim to compare a theory using hypotheses that arise from within it and thus obtain a representative sample of the phenomena under study. Conversely, the qualitative process consists of generating a theory based on proposals drawn from a set of cases. That is to say that the sample drawn need not serve as a demonstration, but merely show that it is representative of cases. This research takes the latter approach and its methodology therefore is qualitative. The set of propositions used as a starting point to establish the theoretical framework of this research should be understood as the framework for creation and learning. What follows briefly sets out these concepts that will be fully explained below.

FROM RISK TO RESILIENCE

Extreme climate events have become recurrent phenomena. They have monopolised the media and shown us once and again how systems of levees fail, how barriers are destroyed, and how the infrastructure and systems in place are unable to absorb the floods. Governments around the world, and particularly those in coastal areas, invest in plans to protect their cities and the effects of climate change. This protection normally comes in the form of costly infrastructure.

Yet the adaptation to climate change understood in the framework of complex systems shows that protection must be based on adaptability, that is, the ability to generate a creative response to disruptions from within the system itself. This requires policies, plans and designs that facilitate the transformation of systems and communities and invoke the notion of resilience in the face of hazard. Here, resilience has to do with the ability to adapt, change and learn from disruptive experiences.⁶

6
Crawford Holling: «Resilience
and Stability of Ecological
Systems».

The fact is that even when there may be recovery from a disruption, and this is fundamental, the interest of resilience as a tactic as opposed to defence lies in the achievement of certain transformations that unleash benefits in and of themselves, although the disruption may never occur or never occur as expected. To work on a resilience framework is to activate a system's ability to evolve or adapt. Applied to coastlines, this means that the idea is not so much to defend from nature as it is to work with it. To work in favour of ecological processes and dynamics. This involves new typological models that depart from the rigidity of hard, engineering-driven infrastructure and espouse more flexible, generative, soft and adaptive options that wed ecology with technology.

FROM DESIGN TO RESEARCH BY DESIGN

The need to manage uncertainty in our era involves not only a change in models, but rather a change in methodology, in how a project is planned and conceived. This in turn means going from the design itself to research through the project. That is to say, the project as an artistic act or abstract ideal taken from its context as a tactic, experimental process within a strategic, or if you prefer, scientific framework. It must be accepted that the problem architects and urban planners must solve when they face the effects of climate change is uncertain and unknown. And moreover, that no single response can address it. This is what is known as a *wicked problem*, and it means that analysis is not enough to understand the full ensemble of relationships within the system. New possibilities therefore arise when research is incorporated into the project as a tool for formulating questions. The idea is not for specific questions to be answered by the design (project), but rather for it to be used as part of the process of analysis and generation of future scenarios whose implementation may serve the objectives posed, regardless of the processes that may be unleashed.

This turns the project into the true driver of change and of future scenarios no longer based so much on the assumption of trends backed up by historical data as they are on generating hypotheses of one's own that take shape through designs for new landscapes to evolve over time and space.

FROM THE INFRASTRUCTURE

TO THE LANDSCAPE

A good deal of the attention given to ecosystems in contemporary architecture revolves around their conception as process-catalysing infrastructure which at the same time develop a technical brief as in the case, for instance, of streets, barriers and filters. Architects, urban planners, engineers and landscape architects have broadened their fields of operation and their creativity and imagined cities as they relate to nature. Soft infrastructure or infrastructure landscapes are put forward as tools to work with the forces of nature while cities' development models are revisited thanks to new interaction with the landscape, infrastructure and urban planning.⁷

Following this same line of thinking is the building of generative landscapes based on cycles, processes and flows that engender different forms and formats to interact with nature. These landscapes are also serving as a source and resource for ground-breaking synergies between the city and its medium. This is manifested in humidity levels, sediment transport, fertility levels and many other metabolic services. In managing and calibrating these exchanges, architecture becomes an element that guides productive capabilities and configures a legible record of complex landscapes.⁸ These symbioses unleash dynamic patterns in an ensemble of adapted ecologies that generate designs physically, conceptually, and in terms of time. These designs become veritable infrastructure, new synthetic landscapes.

⁷ Pierre Bélanger: «Redefining Infrastructure».

⁸ Julia Czerniak and George Hargreaves: *Large Parks*.

CASE STUDIES

In his article “How Climate Change Might Save The World: Metamorphosis” German sociologist Ulrich Beck argues that climate change could indeed save the world, but probably not as one would imagine. For Beck the idea is not to focus on the negative impact of climate change, the havoc it wreaks, but rather the unforeseen positive and emancipating impact of its disasters. Climate change is generating existential moments of decision-making and spawning new orders, structures and relationships: a veritable metamorphosis.⁹

But climate change is a slow, gradual phenomenon, at least from the standpoint of our existence on Earth as individuals. Therefore, if we want to learn about this metamorphosis, we need to identify exactly where the effects of climate change will be felt the most. Anthropological shockwaves are generated when people feel they have experienced a terrible disaster leaving indelible marks on their consciousness, marking their memories forever and fundamentally, irrevocably changing their future. These shockwaves give rise to a new way of being in the world, of conceiving the world and of acting. They generate cosmopolitan moments. They shatter institutionally built mindsets. And it is in situations like these that new cultural horizons can be studied to give rise to new legislation and technology as well as ground-breaking urban transformation and negotiations.¹⁰

The idea, then, was to identify coastlines where the threat of climate change would manifest itself so violently that the response to the challenge posed would have a global reach. Coastlines where the conceptual and metaphysical metamorphosis would make itself visible across borders and bring to light positions, models and technology from other parts of the world.

For these reasons, the cases chosen reflect a time of environmental and political crisis in the wake of two of the most catastrophic mediatised events that the United States has had to face over the last few decades: hurricane Katrina, which in 2005 left nearly two thousand dead in its wake as well as hundreds of thousands of displaced persons in Louisiana, Mississippi and Alabama and more than 100 billion dollars in material damages; and hurricane Sandy, which in October 2012 swept across the Northeastern United States (New York and New Jersey), leaving in its wake 186 deaths, more than 600,000 homes damaged, 200,000 small businesses closed and financial losses in more than 25 states amounting to 65.7 billion dollars. The search for responses to both hurricanes came through two international competitions for ideas: The Changing Course (2014-2015) and Rebuild by Design (2012-2015). Taken together, the two competitions marshalled 128 plus seven proposals from teams around the world and seven plus three were awarded.

Comparisons between and integration of the two proposals enunciated in the theoretic context and detailed analysis of the contributions made by the teams winning these competitions enable us to observe whether the *a priori* reflections expressed through three basic proposals that constitute a theoretical framework for this research are mere hypotheses, impossible to apply in the present context, or whether contrarily we find ourselves before a true metamorphosis of the coastline and moreover, whether we can put forward a range of typologies and technologies to conceive and design resilient landscapes with which to face the effects of climate change.

⁹ The word ‘metamorphosis’ comes from the Greek *μετα-* (*meta*) indicating alteration, and *μορφή* (*morphè*), form; these are the major structural and functional changes that some living beings experience over their lifetimes and which generally come hand in hand with transformations in their habitat and behavior. Ulrich Beck: “How Climate Change Might Save The World: Metamorphosis”.

¹⁰ Ulrich Beck: «Emancipatory Catastrophism: What Does it Mean to Climate Change and Risk Society?».

I finished writing my thesis—originally entitled *Towards a synthetic metamorphosis of the coast: designing resilient landscapes*—in the summer of 2017. Since then, this lexicon has continued to expand and I have been able to apply the ideas and tools described in the thesis—and now in this book—to different coastal environments in both my academic and professional work.

Miriam García, Spring 2021

This book finished printing in August 2022, seventeen years after Hurricane Katrina (August 2005) hit the United States coasts and almost ten years after Hurricane Sandy (November 2012).