

New holistic approach for PV plants design

Original

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(Article begins on next page)

the Future *Urban Legacy* Lab

a report
2017-2021



HOW TO: read this book

TONE OF VOICE

Hello! This is the RED BOX, the voice that will guide you through all this publication. There will be different red boxes visible all around the book as a guide to the topics. They are the narrative voice accompanying the reading.

The voice can function as an introduction, or describe quantities and facts of a given subject.

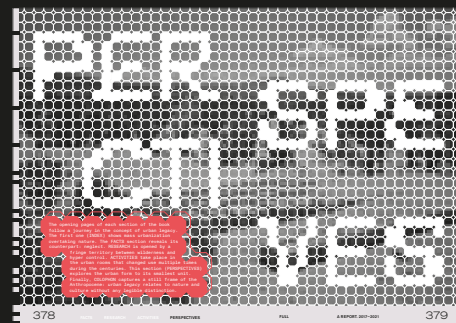
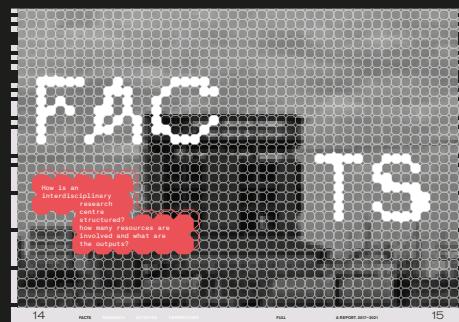
As the red box suggests, there will be a guidance in all the book based on hints, little stories and numeric informations. This first part in black background is an introduction to all the different elements you will find in the book.

HOW TO: read this book

BOOK STRUCTURE

The book is divided in 4 main chapters which are: **FACTS, RESEARCH, ACTIVITIES, PERSPECTIVES.**

Every chapter is guided through it's specific color and contains various formats of text, subchapters, deepening on the topics and explanations of specific projects.



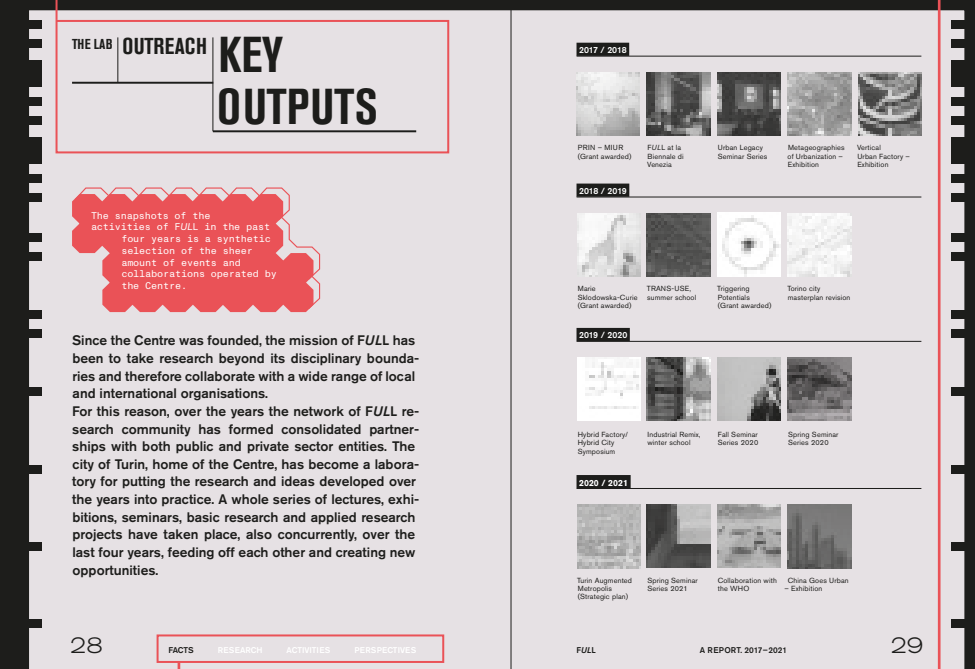
HOW TO: read this book

PAGES STRUCTURE

Every page has guidance tools to help the navigation of the book:

The chapters and sub chapters are guided also through little crumb threads.

The lateral color, which draws on the fore edge of the book a pattern representing **FULL's** logo, can help in the navigation through the chapters (colors refer to different chapters).



Here you can find the position of the chapters and in which chapter you are.

HOW TO: read this book

CHAPTERS CONTENTS | some advices referred to the Research chapter

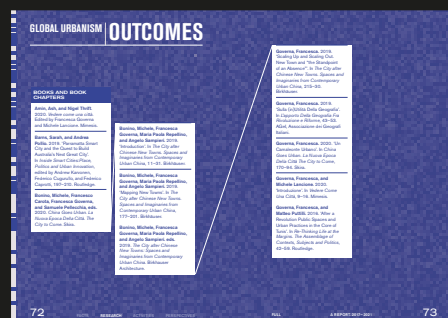


Please, pay attention to the higher complexity of structure of the **RESEARCH ISSUES**: you will find eight sub-parts referring to eight **ISSUES**.

Please also note that every issue will have a **specific code** to follow that you can check on page 40.



Every issue contains a certain number of researches explained. Each research has a shorter or longer description, depending on the author's preference.



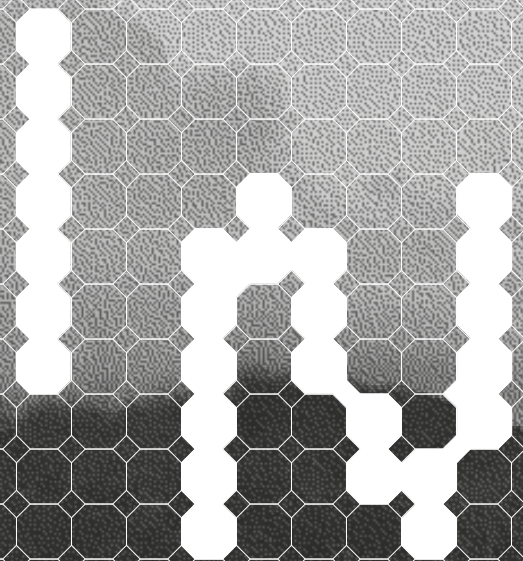
Every issue has an ending **annex page** called **OUTCOMES**. The subchapter has diverse typologies of bibliographic content.



You will see **KEYWORDS** appearing as taken from quotes during lectures and seminars hosted by **FULL**. They are linked to the issues but they can be considered as an interlinked glossary.

The keywords are the following:
INTERDISCIPLINARITY, REPRESENTATION, SQUATTING, HERITAGE, EFFICACY, CULTURE, TRADITION, TOOLS, TECHNOLOGY, LEGACY, MORPHOLOGY, HYBRID, SPECIFICITY, PRODUCTIVITY, ARTIFICIAL INTELLIGENCE, PLATFORM ECONOMY, RENOVATION, RIGHTS, INNOVATION, REAL ESTATE, CULTURAL HERITAGE, PLANETARISM, CARTOGRAPHY, UNESCO, NOSTALGIA.

In addition to the chapters, positioned at the end of every **ISSUE** of the **RESEARCH** chapter there will be green background pages containing a **glossary**.



Full

One of the main challenges of FULL is to combine consistent research with a rich program of talks, lectures, and teaching. In this table of contents the activities of the Centre are separated by the research section for clarity, but in reality are mutually interconnected.

FACTS

14

Here we present our organization. With an overview of all the relevant information about the research centre.

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RESEARCH

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A detailed account of our research production, made of research projects, applied researches and PhD researches.

RESEARCH ISSUES	40
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GLOBAL URBANISM	50
NON – PERFORMING LEGACIES	80
ECONOMIC ORGANIZATION AND URBAN SPACE	136
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ACTIVITIES

316

During the past four years FULL hosted numerous events and talks. We invited guests from the most diverse disciplinary fields. These kind of activities unfolded in different media and can be found on our Vimeo channel and our Podcast channel.

TEACHING	320
SCHOOLS	334
LECTURE SERIES	346
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PERSPECTIVES

378

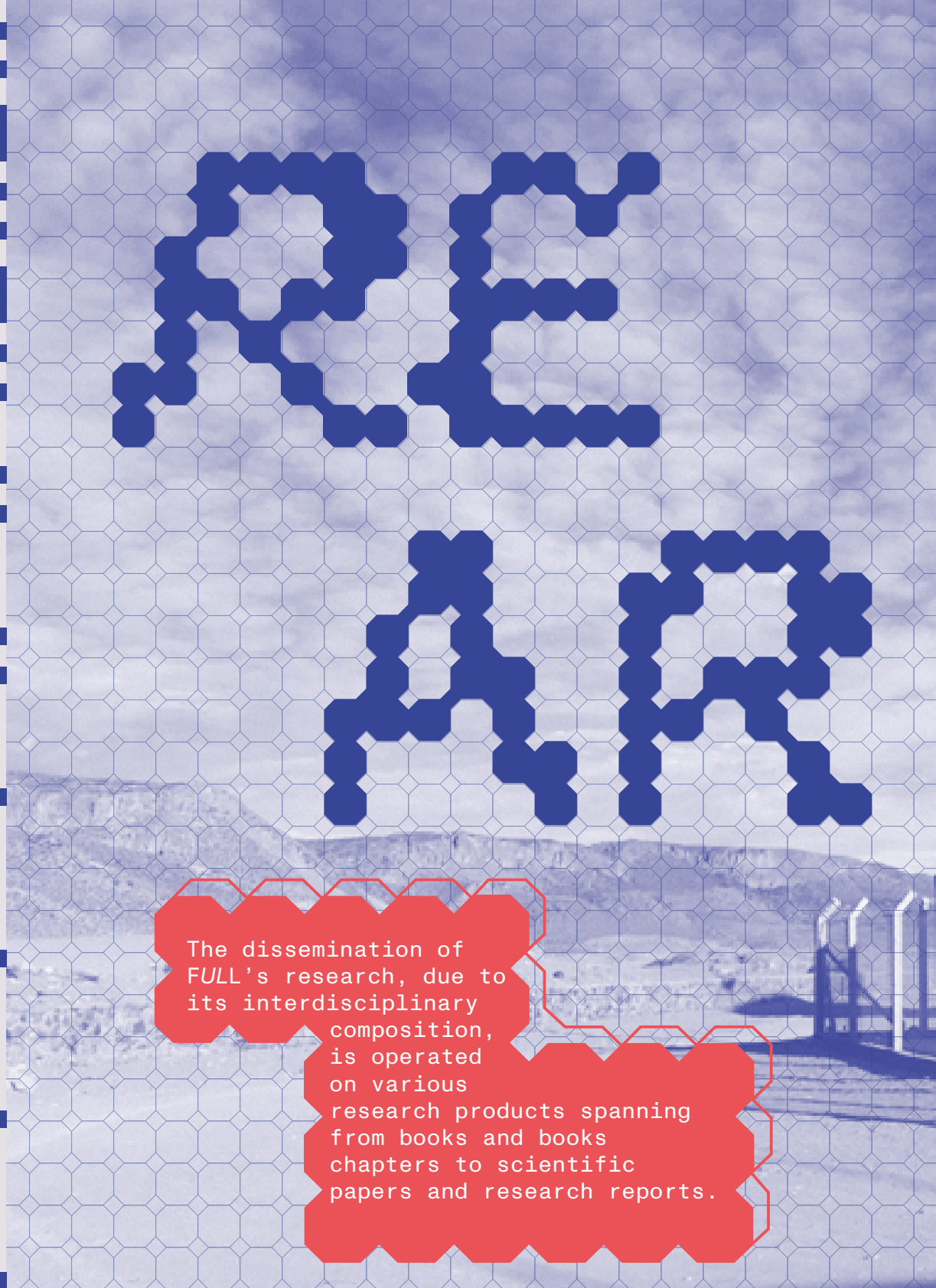
Here we discuss the trajectory described by FULL during the years and some possibilities for the future.

A CONVERSATION WITH FULL RESEARCHERS	380
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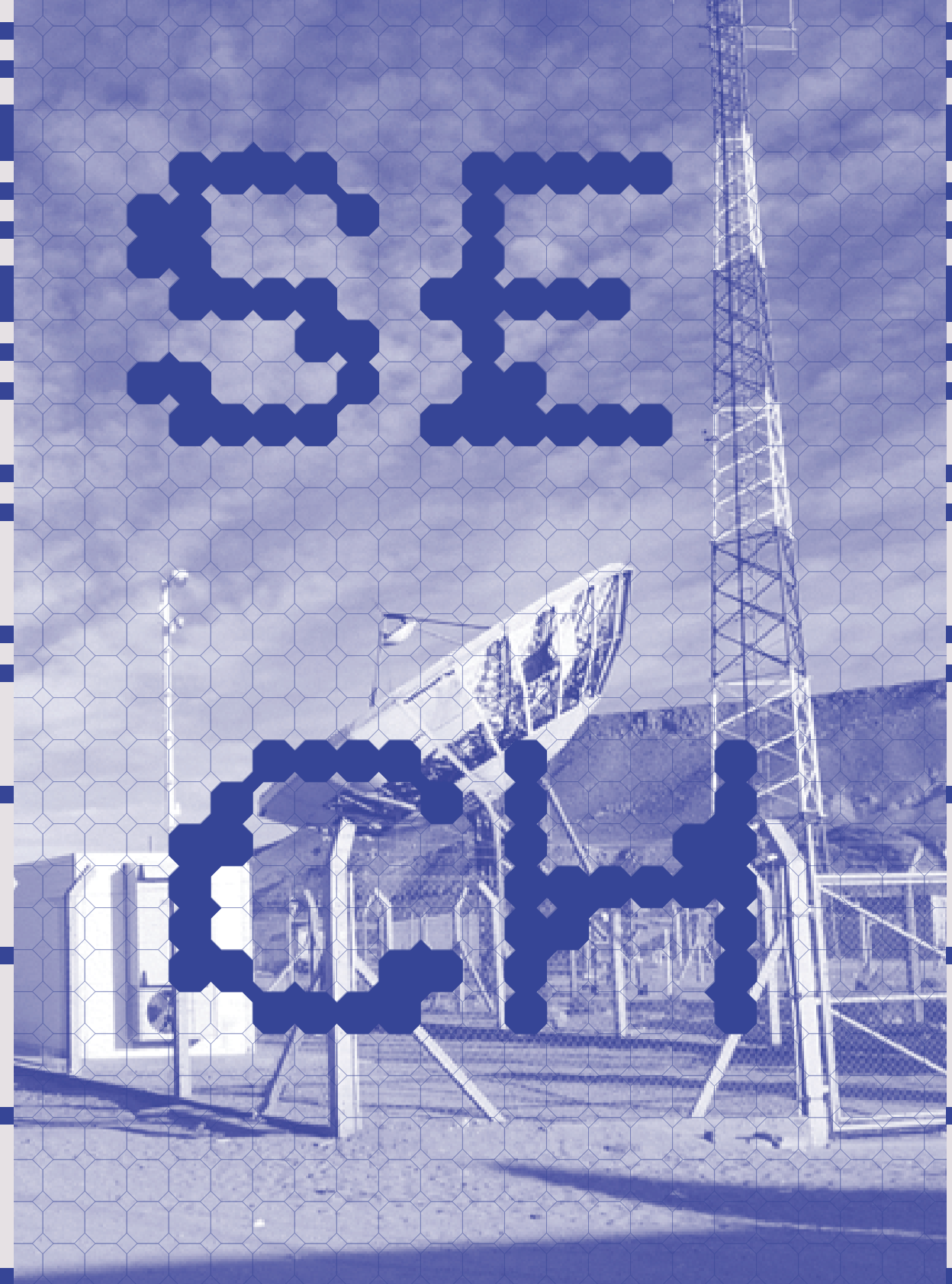
COLOPHON

400

BIOGRAPHIES	402
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The dissemination of FULL's research, due to its interdisciplinary composition, is operated on various research products spanning from books and books chapters to scientific papers and research reports.



RESEARCH ISSUES

We grouped our vast research production in eight main issues. Each issue aims to provide answers to global research issues related to the environment, territories and the city.

GU

= acronym of the research issue

GU

GLOBAL URBANISM

SURGE. Chinese Financialisation and Urban Change in East Africa (Marie Skłodowska-Curie Action)

Rescaling the Belt and Road Initiative: urbanisation processes, innovation patterns and global investments in urban China

Hinterlands of the green transition. Atacama, lithium and the extended geographies of the zero-emission city

Infrastructure scripts. History and futures of urbanisation along the Ethio-Djibouti Railway

50

KEYWORDS

LEGACY
REAL ESTATE
CARTOGRAPHY
NOSTALGIA

NPL

NON-PERFORMING LEGACIES

80

Adaptive reuse scenarios

The buildings inside the Cittadella of Alessandria

Geophysical surveys and preventive archaeology. Ground-penetrating radar survey of pre-existing structures in the Bergoglio district (AL) under the Piazza D'Armi (Parade Ground)

Reactivation of non-performing cultural heritage

Manufacturing Technology and Competence Center Turin

Adaptive Remediation

Loft Working

The Potential of form. Assessing the transformative potential of existing buildings in post-functional Europe

The Workspace [R]evolution. The comeback of Incubator and its role in the New Urban Economies

KEYWORDS

CULTURAL
HERITAGE
HERITAGE
UNESCO
TRADITION

EOU

ECONOMIC ORGANIZATION AND URBAN SPACE

136

Italy is the Air(bnb). The uneven diffusion of short-term rental markets between urban locations and selective tourism destinations

Seizing local entrepreneurial opportunities in the platform-based era. Airbnb, gig entrepreneurs and middlemen

Impact of Covid-19 on the strategic choices and performance of hosts. An empirical investigation on peer-to-peer accommodation platforms

Urban retail

Agglomeration and the Italian North-South divide

Shifting the triangle

University research funding, patenting and technological impact, European Patent Office (Academic Research Programme)

Airbnb in the real estate financial chain. Housing and policies in Southern Europe post-crisis territories

Retail, Agglomeration and urban Morphology

KEYWORDS

PLATFORM
ECONOMY
HYBRID

TUL

TRANSFORMATIVE URBAN DESIGN AND LANDSCAPE

166

Re-coding. Rethinking the rules of cities

Turin Augmented Metropolis

A new regional regeneration model in Lombardy

Reconstructions. Design tools after emergencies. Seismic transitions, from temporariness to permanence

Servitude of form. Comparative urban property and building rules

KEYWORDS

MORPHOLOGY
SPECIFICITY
PRODUCTIVITY
RIGHTS

NHI

NEW HOUSING ISSUES

200

Contemporary rentscales

New Domestic Rentscape. A Critical Insight into Middle-class Housing

Community-led housing development. A key ingredient for a new housing architecture and policy

Tailor-made housing. How to improve housing affordability and adequacy through innovation of the cohousing model

KEYWORDS

CULTURE
SQUATTING

DT

DIGITAL TECHNOLOGIES AND DATA SCIENCE FOR CITIES

222

Urban mobility

Digital Open Urban Twin /
3D city model

Augmented reality heritage

Triggering Potentials. The enhancement
of urban cultural heritage as a strategy
to reactivate city regeneration
processes.5G USE CASE. Smart Tourism.
The potential of the 5G infrastructure to
enable micro-localized content for
tourism

5GAA demo

City Twin. Digital urban models
between description and abstractionMobility applications for a smart city
environment

KEYWORDS

TECHNOLOGY
TOOLS
ARTIFICIAL
INTELLIGENCE
INNOVATION

UC

URBAN CLIMATE ACTIONS

266

Design Management Dynamic
Tool (DMDT)

Urban Agriculture

Holistic approach for large PV plants
design and operation

Architecture for urban agriculture

Smart Energy Solutions
for Sustainable Cities and Policies

KEYWORDS

INTERDISCIPLINARITY
RENOVATION

PPC

POST-PANDEMIC CITY

292

Severe Acute Respiratory Infections
Treatment CentreRe-school. Rethinking the school,
starting with spaces

Real Estate Innovation Manifesto

Next Generation Urban River Park

KEYWORDS

REPRESENTATION
PLANETARISM

INTER-DISCIPLINARY MAP

GLOBAL URBANISM

SM AD UDP BME EPG

NON-PERFORMING LEGACIES

CRA HA RA AD
UDP BME EPG AG

ECONOMIC ORGANIZATION AND URBAN SPACE

SM AD UDP BME EPG

TRANSFORMATIVE URBANISM AND LANDSCAPE

SM AD AT UDP
EPG BPS SEE

NEW HOUSING ISSUES

CRA AD BME

DIGITAL TECHNOLOGY AND DATA SCIENCE FOR CITIES

SM AD AT UDP
BME EPG NA IPS TC

URBAN CLIMATE ACTIONS

SM AD AT UDP
BME BPS

POST-PANDEMIC CITY

SM AD AT EPG

DEPARTMENT OF ARCHITECTURE AND DESIGN

CRA Conservation and restoration of architecture

HA History of architecture

RA Representation of architecture

SM Surveying and mapping

AD Architectural design

AT Architectural technology

UDP Urban design planning

DEPARTMENT OF CONTROL AND COMPUTER ENGINEERING

NA Numerical analysis

IPS Information processing systems

TC Telecommunications

INTERUNIVERSITY DEPARTMENT OF REGIONAL AND URBAN STUDIES AND PLANNING

UDP Urban design planning

BME Business and management engineering

EPG Economic and political geography

DEPARTMENT OF ENVIRONMENT, LAND AND INFRASTRUCTURE ENGINEERING

AG Applied geophysics

SEE Sanitary and environmental engineering

DEPARTMENT OF ENERGY "GALILEO FERRARIS"

TIS Thermal engineering and industrial energy systems

BPS Building physics and building energy systems

Every research issue requires a variety of disciplinary expertises borrowed from each of the seven departments.

DEPARTMENT OF MANAGEMENT AND PRODUCTION ENGINEERING

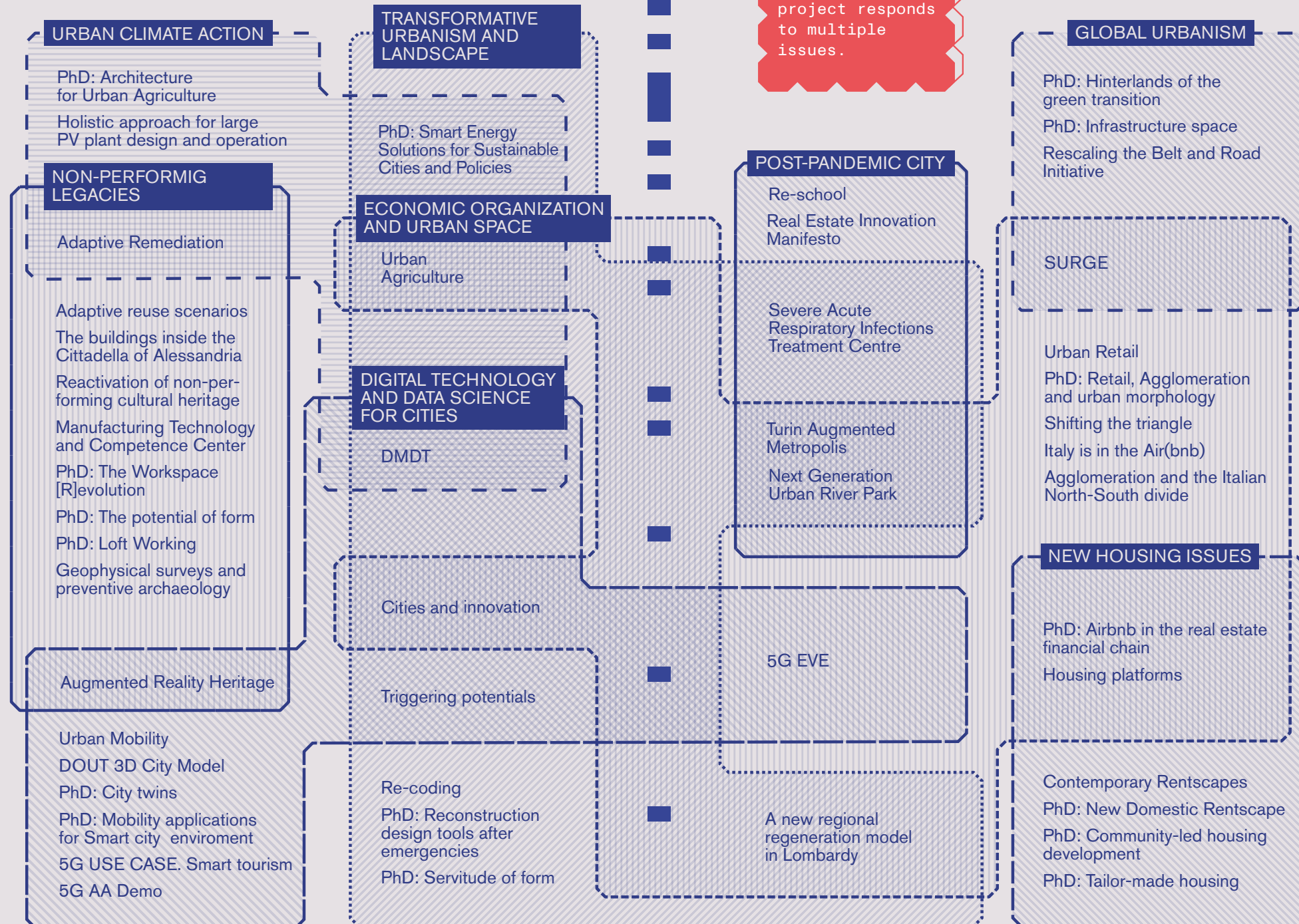
BME Business and management engineering

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS

IPS Information processing systems

TC Telecommunications

The following map shows the connections and intersections of FULL's research. In most of the cases a single project responds to multiple issues.



URBAN CLIMATE ACTIONS

UCA

How does climate change the economy and design of cities?

This research issue is interdisciplinary by definition. The holistic response to climate change can only be formulated through a socio-technical understanding of the phenomenon.



Even if sustainability and climate change are cross-sectional issues with *FULL*'s research, some projects more than others address these matters directly. Albeit with the risk of falling into conventional understandings of climate change, the investigations produced have in common their critical approach that aims to debunk sustainability

in its symbolic form and focus on design opportunities. The *DMDT* software development is an example of optimisation aimed at a holistic view of sustainability that includes all the United Nations Sustainable Development Goal (UN SDG) guidelines. The research on the feasibility of extensive solar power stations follows suit in proposing energy produc-

tion as an opportunity to transform the landscape and produce sustainable environments. The extensive research on *Urban Agriculture* – starting with PhD research and continuing through a post-doc – adds new ‘building materials’ to the possible design palette of urban planners and architects, casting light on the pros and cons of this peculiar productive sector.

URBAN CLIMATE ACTIONS

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Architecture for urban agriculture	280
Smart Energy Solutions for Sustainable Cities and Policies	284

Holistic approach for large PV plant design and operation

TYPE
Applied Research

YEAR
2021

TEAM

Scientific coordinator:
Elena Vigliocco

Work group:

Mauro Berta,
Alessandro Casasso,
Luca Davico,
Enrico Fabrizio,
Antonia Spanò,
Filippo Spertino,
Paolo Tamborrini,
Roberta Taramino,
Tiziana Tosco,
Elena Vigliocco,
Giulio Zotteri



The mitigation of the potential impacts of renewable plants on the environment, biodiversity and communities is the key to making renewables sustainable in the long run. In particular, the large land use of utility scale photovoltaic (hereinafter, PV) plants could suffer from social acceptance problems and requires the protection of land from potential biodiversity loss, habitat fragmenta-

The progressive increase in temperature reminds us of the urgency of using renewable energy sources. What are the strengths and weaknesses of photovoltaic systems?

tion, water stress, etc. This is worsened in all contexts where marginal or industrial lands are insufficient or not available. The principal goals of the

research project are focused on field demonstrations and innovative methodologies aimed at utility-scale PV impact mitigation through a multidisciplinary approach able to take into account: (1) multi-purpose land use (crops/flora and vegetation); (2) wildlife habitat and biodiversity preservation; and (3) conservation of ecosystem services. The approach is based much less on a logic of reaction to criticalities and much more on a proactive approach aimed at identifying opportunities for creating shared value (CSV) between private PV companies and regions. These activities are focused on dialogue with stakeholders and socio-environmental analyses, in order to identify effective interventions that meet local needs and production targets.

New holistic approach for PV plants design

Elena Vigliocco

To act innovatively in a region, it is necessary to design together both the artefact and the relationships that affect it. With reference to the UN 2030 Agenda for Sustainable Development, the concepts of prosperity and collaboration take on programmatic relevance, requiring a shift from an approach that asks how to achieve a result to one that thinks about the motivation for action. The value of an innovation, in this case the large-scale

photovoltaic plant, is therefore not only measurable through the economic feedback or the degree of novelty that this innovation brings to the market, but also by the value and benefit it brings socially, environmentally and certainly economically. The relationship between the project and the region shifts the attention from the observation of the region as the context for the project to the region as the object of intervention, understood as a relational system, highlighting the proactive and generative role of new practices to activate new economies and sustainable processes from an environmental, economic and social point of view. Attention has therefore shifted not so much to the region as to the relational networks established within it; a shift can be identified from the physicality of the products, to the idea of region, to the relationship with users. This means that to act innovatively in a region, it is necessary to design together both the artefact and the relationships that affect it. This requires a different approach, calling for innovative action, moving from an approach that questions how to achieve a result to one that works by reasoning about the motivation for such action. The value of an innovation, in fact, is not measurable through the economic feedback or the degree of novelty that this innovation brings to the market, but by the value and benefit it brings socially, environmentally and certainly economically. It is thus possible to move from a techno-centric to a human-centred perspective. It is therefore essential to identify a design methodology, capable of guiding the idea of the region, analysing its needs and requirements, and thus bringing out its potential and values useful for the development of innovative concepts and projects. In this way, the design process can be managed by virtuously involving both material and non-material aspects and, knowing what exists in the area, connecting and re-evaluating knowledge, research and enterprise. In view of the fact that the location phase of large-scale PV plants, due to its complexity, but above all due to the delicacy of certain highly emotive aspects, cannot be tackled using assessment methods that use exclusively one-dimensional criteria such as technical or economic ones. For this reason, the working group includes seven

disciplinary areas: Architectural Design (with Mauro Berta and Elena Vigliocco); Systemic Design (with Paolo Tamborrini); Environmental Sociology (with Luca Davico); Topography (with Antonia Spanò); Environmental Engineering (with Alessandro Casasso and Tiziana Tosco); Energy (with Enrico Fabrizio and Filippo Spertino); and Management Engineering (with Giulio Zotteri and Roberta Taramino).

The work plan is divided into four parts within which the different disciplinary components will be able to dialogue with one another.

The four Work Packages (WP) are broken down into:

- **ANALYSIS OF THE STATE OF THE ART (WP1)**, which will collect data on the collective opinion that local communities have developed in relation to three selected case studies following the implementation of large-scale photovoltaic plants.
 - **PVP THEORETICAL MODEL (WP2)**, relating to the four interpretative clusters of the holistic analysis, which will diagram an interpretative map/model (D1) of the input data related to the design of a large PV plant.
 - **PVP EMPIRICAL MODEL (WP3)**, which will map an area of interest through the state of the art and resource analysis, identifying strengths and weaknesses, critical issues and opportunities.
 - **HOLISTIC MODEL FOR LARGE PHOTOVOLTAIC PLANTS (WP4)**, which will develop an operational toolkit applicable in other similar contexts (D2) that will be elaborated in relation to the state of the art (WP1) and the results of empirical mapping (WP3).
- There are two expected deliverables: D1 – Holistic map/model for PV plants (WP2, month 8); D2 – Visual data report (holistic matrix) for PV plant (WP4, month 18).