

# TeMA

Journal of  
Land Use, Mobility and Environment

This special issue collects a selection of peer-review papers presented at the 8th International Conference INPUT 2014 titled "Smart City: planning for energy, transportation and sustainability of urban systems", held on 4-6 June in Naples, Italy. The issue includes recent developments on the theme of relationship between innovation and city management and planning.

Tema is the Journal of Land use, Mobility and Environment and offers papers with a unified approach to planning and mobility. TeMA Journal has also received the Sparc Europe Seal of Open Access Journals released by Scholarly Publishing and Academic Resources Coalition (SPARC Europe) and the Directory of Open Access Journals (DOAJ).

# INPUT 2014

papers selected

## Smart City

planning for energy, transportation  
and sustainability of the urban system

## SMART CITY

## PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

Special Issue, June 2014

**Published by**

Laboratory of Land Use Mobility and Environment  
DICEA - Department of Civil, Architectural and Environmental Engineering  
University of Naples "Federico II"

TeMA is realised by CAB - Center for Libraries at "Federico II" University of Naples using Open Journal System

Editor-in-chief: Rocco Papa  
print ISSN 1970-9889 | on line ISSN 1970-9870  
Licence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

**Editorial correspondence**

Laboratory of Land Use Mobility and Environment  
DICEA - Department of Civil, Architectural and Environmental Engineering  
University of Naples "Federico II"  
Piazzale Tecchio, 80  
80125 Naples  
web: [www.tema.unina.it](http://www.tema.unina.it)  
e-mail: [redazione.tema@unina.it](mailto:redazione.tema@unina.it)

# TeMA

Journal of  
Land Use, Mobility and  
Environment

TeMA. Journal of Land Use, Mobility and Environment offers researches, applications and contributions with a unified approach to planning and mobility and publishes original inter-disciplinary papers on the interaction of transport, land use and environment. Domains include engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science, and complex systems.

The Italian National Agency for the Evaluation of Universities and Research Institutes (ANVUR) classified TeMA as scientific journals in the Areas 08. TeMA has also received the Sparc Europe Seal for Open Access Journals released by Scholarly Publishing and Academic Resources Coalition (SPARC Europe) and the Directory of Open Access Journals (DOAJ). TeMA is published under a Creative Commons Attribution 3.0 License and is blind peer reviewed at least by two referees selected among high-profile scientists by their competences. TeMA has been published since 2007 and is indexed in the main bibliographical databases and it is present in the catalogues of hundreds of academic and research libraries worldwide.

## **EDITOR- IN-CHIEF**

Rocco Papa, Università degli Studi di Napoli Federico II, Italy

## **EDITORIAL ADVISORY BOARD**

Luca Bertolini, Universiteit van Amsterdam, Netherlands  
Virgilio Bettini, Università luav di Venezia, Italy  
Dino Borri, Politecnico di Bari, Italy  
Enrique Calderon, Universidad Politécnica de Madrid, Spain  
Roberto Camagni, Politecnico di Milano, Italy  
Robert Leonardi, London School of Economics and Political Science, United Kingdom  
Raffaella Nanetti, College of Urban Planning and Public Affairs, United States  
Agostino Nuzzolo, Università degli Studi di Roma Tor Vergata, Italy  
Rocco Papa, Università degli Studi di Napoli Federico II, Italy

## **EDITORS**

Agostino Nuzzolo, Università degli Studi di Roma Tor Vergata, Italy  
Enrique Calderon, Universidad Politécnica de Madrid, Spain  
Luca Bertolini, Universiteit van Amsterdam, Netherlands  
Romano Fistola, Dept. of Engineering - University of Sannio - Italy, Italy  
Adriana Galderisi, Università degli Studi di Napoli Federico II, Italy  
Carmela Gargiulo, Università degli Studi di Napoli Federico II, Italy  
Giuseppe Mazzeo, CNR - Istituto per gli Studi sulle Società del Mediterraneo, Italy

## **EDITORIAL SECRETARY**

Rosaria Battarra, CNR - Istituto per gli Studi sulle Società del Mediterraneo, Italy  
Andrea Ceudech, TeMALab, Università degli Studi di Napoli Federico II, Italy  
Rosa Anna La Rocca, TeMALab, Università degli Studi di Napoli Federico II, Italy  
Enrica Papa, University of Amsterdam, Netherlands

# TeMA

Journal of  
Land Use, Mobility and  
Environment

This special issue of TeMA collects the papers presented at the 8th International Conference INPUT 2014 which will take place in Naples from 4th to 6th June. The Conference focuses on one of the central topics within the urban studies debate and combines, in a new perspective, researches concerning the relationship between innovation and management of city changing.



## CONFERENCE COMMITTEE

Dino Borri, Polytechnic University of Bari, Italy  
Arnaldo Cecchini, University of Sassari, Italy  
Romano Fistola, University of Sannio, Italy  
Lilli Gargiulo, University of Naples Federico II, Italy  
Giuseppe B. Las Casas, University of Basilicata, Italy  
Agostino Nuzzolo, University of Rome, Italy  
Rocco Papa, University of Naples Federico II, Italy  
Giovanni Rabino, Polytechnic University of Milan, Italy  
Maurizio Tira, University of Brescia, Italy  
Corrado Zoppi, University of Cagliari, Italy

## SCIENTIFIC COMMITTEE

Emanuela Abis, University of Cagliari, Italy  
Nicola Bellini, Institute of Management, Scuola Superiore Sant'Anna Pisa, Italy  
Mariolina Besio Dominici, University of Genoa, Italy  
Ivan Blečić, University of Sassari, Italy  
Dino Borri, Polytechnic University of Bari, Italy  
Grazia Brunetta, Polytechnic University of Turin, Italy  
Roberto Busi, University of Brescia, Italy  
Domenico Camarda, Polytechnic University of Bari, Italy  
Michele Campagna, University of Cagliari, Italy  
Arnaldo Cecchini, University of Sassari, Italy  
Donatella Cialdea, University of Molise, Italy  
Valerio Cutini, University of Pisa, Italy, Italy  
Luciano De Bonis, University of Molise, Italy  
Andrea De Montis, University of Sassari, Italy  
Filippo de Rossi, University of Sannio (Dean of the University of Sannio), Italy  
Lidia Diappi, Polytechnic University of Milan, Italy  
Isidoro Fasolino, University of Salerno, Italy  
Mariano Gallo, University of Sannio, Italy  
Lilli Gargiulo, University of Naples Federico II, Italy  
Roberto Gerundo, University of Salerno, Italy  
Paolo La Greca, University of Catania, Italy  
Giuseppe B. Las Casas, University of Basilicata, Italy  
Robert Laurini, University of Lyon, France  
Antonio Leone, Tuscia University, Italy  
Anna Loffredo, Institute of Management, Scuola Superiore Sant'Anna Pisa, Italy  
Silvana Lombardo, University of Pisa, Italy  
Giovanni Maciocco, University of Sassari, Italy  
Giulio Maternini, University of Brescia, Italy

Francesco Domenico Moccia, University of Naples Federico II, Italy  
Bruno Montella, University of Naples "Federico II" (Director of DICEA), Italy  
Beniamino Murgante, University of Basilicata, Italy  
Agostino Nuzzolo, University of Rome, Italy  
Sylvie Occelli, IRES Turin, Italy  
Rocco Papa, University of Naples Federico II, Italy  
Maria Paradiso, University of Sannio, Italy  
Domenico Patassini, IUAV, Venice, Italy  
Michele Pezzagno, University of Brescia, Italy  
Fulvia Pinto, Polytechnic University of Milan, Italy  
Giovanni Rabino, Polytechnic University of Milan, Italy  
Giuseppe Roccasalva, Polytechnic University of Turin, Italy  
Bernardino Romano, University of L'Aquila, Italy  
Francesco Russo, Mediterranean University Reggio Calabria, Italy  
Michelangelo Russo, University of Naples Federico II, Italy  
Ferdinando Semboloni, University of Firenze, Italy  
Agata Spaziante, Polytechnic University of Turin, Italy  
Michela Tiboni, University of Brescia, Italy  
Maurizio Tira, University of Brescia, Italy  
Simona Tondelli, University of Bologna, Italy  
Umberto Villano, University of Sannio (Director of DING), Italy  
Ignazio Vinci, University of Palermo, Italy  
Corrado Zoppi, University of Cagliari, Italy

#### **LOCAL SCIENTIFIC COMMITTEE**

Rosaria Battarra, ISSM, National Research Council, Italy  
Romano Fistola, DING, University of Sannio, Italy  
Lilli Gargiulo, DICEA, University of Naples Federico II, Italy  
Adriana Galderisi, DICEA, University of Naples Federico II, Italy  
Rosa Anna La Rocca, DICEA, University of Naples Federico II, Italy  
Giuseppe Mazzeo, ISSM, National Research Council, Italy  
Enrica Papa, University of Amsterdam, Netherlands

#### **LOCAL ADMINISTRATIVE TEAM**

Gennaro Angiello, TeMA Lab, University of Naples Federico II, Italy  
Gerardo Carpentieri, TeMA Lab, University of Naples Federico II, Italy  
Stefano Franco, TeMA Lab, University of Naples Federico II, Italy  
Laura Russo, TeMA Lab, University of Naples Federico II, Italy  
Floriana Zucaro, TeMA Lab, University of Naples Federico II, Italy

## EIGHTH INTERNATIONAL CONFERENCE INPUT 2014

### SMART CITY. PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

This special issue of TeMA collects the papers presented at the Eighth International Conference INPUT, 2014, titled "Smart City. Planning for energy, transportation and sustainability of the urban system" that takes place in Naples from 4 to 6 of June 2014.

INPUT (Innovation in Urban Planning and Territorial) consists of an informal group/network of academic researchers Italians and foreigners working in several areas related to urban and territorial planning. Starting from the first conference, held in Venice in 1999, INPUT has represented an opportunity to reflect on the use of Information and Communication Technologies (ICTs) as key planning support tools. The theme of the eighth conference focuses on one of the most topical debate of urban studies that combines , in a new perspective, researches concerning the relationship between innovation (technological, methodological, of process etc..) and the management of the changes of the city. The Smart City is also currently the most investigated subject by TeMA that with this number is intended to provide a broad overview of the research activities currently in place in Italy and a number of European countries. Naples, with its tradition of studies in this particular research field, represents the best place to review progress on what is being done and try to identify some structural elements of a planning approach.

Furthermore the conference has represented the ideal space of mind comparison and ideas exchanging about a number of topics like: planning support systems, models to geo-design, qualitative cognitive models and formal ontologies, smart mobility and urban transport, Visualization and spatial perception in urban planning innovative processes for urban regeneration, smart city and smart citizen, the Smart Energy Master project, urban entropy and evaluation in urban planning, etc..

The conference INPUT Naples 2014 were sent 84 papers, through a computerized procedure using the website [www.input2014.it](http://www.input2014.it) . The papers were subjected to a series of monitoring and control operations. The first fundamental phase saw the submission of the papers to reviewers. To enable a blind procedure the papers have been checked in advance, in order to eliminate any reference to the authors. The review was carried out on a form set up by the local scientific committee. The review forms received were sent to the authors who have adapted the papers, in a more or less extensive way, on the base of the received comments. At this point (third stage), the new version of the paper was subjected to control for to standardize the content to the layout required for the publication within TeMA. In parallel, the Local Scientific Committee, along with the Editorial Board of the magazine, has provided to the technical operation on the site TeMA (insertion of data for the indexing and insertion of pdf version of the papers). In the light of the time's shortness and of the high number of contributions the Local Scientific Committee decided to publish the papers by applying some simplifies compared with the normal procedures used by TeMA. Specifically:

- Each paper was equipped with cover, TeMA Editorial Advisory Board, INPUT Scientific Committee, introductory page of INPUT 2014 and summary;
- Summary and sorting of the papers are in alphabetical order, based on the surname of the first author;
- Each paper is indexed with own DOI codex which can be found in the electronic version on TeMA website ([www.tema.unina.it](http://www.tema.unina.it)). The codex is not present on the pdf version of the papers.

## SMART CITY PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM Special Issue, June 2014

### Contents

- 1. The Plan in Addressing the Post Shock Conflicts 2009-2014.  
A First Balance Sheet of the Reconstruction of L'Aquila** 1-13  
Fabio Andreassi, Pierluigi Properzi
- 2. Assessment on the Expansion of Basic Sanitation Infrastructure.  
In the Metropolitan Area of Belo Horizonte - 2000/2010** 15-26  
Grazielle Anjos Carvalho
- 3. Temporary Dwelling of Social Housing in Turin.  
New Responses to Housing Discomfort** 27-37  
Giulia Baù, Luisa Ingaramo
- 4. Smart Communities. Social Innovation at the Service of the Smart Cities** 39-51  
Massimiliano Bencardino, Ilaria Greco
- 5. Online Citizen Reporting on Urban Maintenance:  
A Collection, Evaluation and Decision Support System** 53-63  
Ivan Blečić, Dario Canu, Arnaldo Cecchini, Giuseppe Andrea Trunfio
- 6. Walkability Explorer. An Evaluation and Design Support Tool for Walkability** 65-76  
Ivan Blečić, Arnaldo Cecchini, Tanja Congiu, Giovanna Fancello, Giuseppe Andrea Trunfio
- 7. Diachronic Analysis of Parking Usage: The Case Study of Brescia** 77-85  
Riccardo Bonotti, Silvia Rossetti, Michela Tiboni, Maurizio Tira
- 8. Crowdsourcing. A Citizen Participation Challenge** 87-96  
Júnia Borges, Camila Zyngier
- 9. Spatial Perception and Cognition Review.  
Considering Geotechnologies as Urban Planning Strategy** 97-108  
Júnia Borges, Camila Zyngier, Karen Lourenço, Jonatha Santos

- 10. Dilemmas in the Analysis of Technological Change. A Cognitive Approach to Understand Innovation and Change in the Water Sector** 109-127  
Dino Borri, Laura Grassini
- 11. Learning and Sharing Technology in Informal Contexts. A Multiagent-Based Ontological Approach** 129-140  
Dino Borri, Domenico Camarda, Laura Grassini, Mauro Patano
- 12. Smartness and Italian Cities. A Cluster Analysis** 141-152  
Flavio Boscacci, Ila Maltese, Ilaria Mariotti
- 13. Beyond Defining the Smart City. Meeting Top-Down and Bottom-Up Approaches in the Middle** 153-164  
Jonas Breuer, Nils Walravens, Pieter Ballon
- 14. Resilience Through Ecological Network** 165-173  
Grazia Brunetta, Angioletta Voghera
- 15. ITS System to Manage Parking Supply: Considerations on Application to the “Ring” in the City of Brescia** 175-186  
Susanna Bulferetti, Francesca Ferrari, Stefano Riccardi
- 16. Formal Ontologies and Uncertainty. In Geographical Knowledge** 187-198  
Matteo Caglioni, Giovanni Fusco
- 17. Geodesign From Theory to Practice: In the Search for Geodesign Principles in Italian Planning Regulations** 199-210  
Michele Campagna, Elisabetta Anna Di Cesare
- 18. Geodesign from Theory to Practice: From Metaplanning to 2nd Generation of Planning Support Systems** 211-221  
Michele Campagna
- 19. The Energy Networks Landscape. Impacts on Rural Land in the Molise Region** 223-234  
Donatella Cialdea, Alessandra Maccarone
- 20. Marginality Phenomena and New Uses on the Agricultural Land. Diachronic and Spatial Analyses of the Molise Coastal Area** 235-245  
Donatella Cialdea, Luigi Mastronardi
- 21. Spatial Analysis of Urban Squares. ‘Siccome Umbellico al corpo dell’uomo’** 247-258  
Valerio Cutini



- 22. Co-Creative, Re-Generative Smart Cities.  
Smart Cities and Planning in a Living Lab Perspective 2** **259-270**  
Luciano De Bonis, Grazia Concilio, Eugenio Leanza, Jesse Marsh, Ferdinando Trapani
- 23. The Model of Voronoi's Polygons and Density:  
Diagnosis of Spatial Distribution of Education Services of EJA  
in Divinópolis, Minas Gerais, Brazil** **271-283**  
Diogo De Castro Guadalupe, Ana Clara Mourão Moura
- 24. Rural Architectural Intensification: A Multidisciplinary Planning Tool** **285-295**  
Roberto De Lotto, Tiziano Cattaneo, Cecilia Morelli Di Popolo, Sara Morettini,  
Susanna Sturla, Elisabetta Venco
- 25. Landscape Planning and Ecological Networks.  
Part A. A Rural System in Nuoro, Sardinia** **297-307**  
Andrea De Montis, Maria Antonietta Bardi, Amedeo Ganciu, Antonio Ledda,  
Simone Caschili, Maurizio Mulas, Leonarda Dessena, Giuseppe Modica,  
Luigi Laudari, Carmelo Riccardo Fichera
- 26. Landscape Planning and Ecological Networks.  
Part B. A Rural System in Nuoro, Sardinia** **309-320**  
Andrea De Montis, Maria Antonietta Bardi, Amedeo Ganciu, Antonio Ledda,  
Simone Caschili, Maurizio Mulas, Leonarda Dessena, Giuseppe Modica,  
Luigi Laudari, Carmelo Riccardo Fichera
- 27. Sea Guidelines. A Comparative Analysis: First Outcomes** **321-330**  
Andrea De Montis, Antonio Ledda, Simone Caschili, Amedeo Ganciu, Mario Barra,  
Gianluca Cocco, Agnese Marcus
- 28. Energy And Environment in Urban Regeneration.  
Studies for a Method of Analysis of Urban Periphery** **331-339**  
Paolo De Pascali, Valentina Alberti, Daniela De Ioris, Michele Reginaldi
- 29. Achieving Smart Energy Planning Objectives.  
The Approach of the Transform Project** **341-351**  
Ilaria Delponte
- 30. From a Smart City to a Smart Up-Country.  
The New City-Territory of L'Aquila** **353-364**  
Donato Di Ludovico, Pierluigi Properzi, Fabio Graziosi
- 31. Geovisualization Tool on Urban Quality.  
Interactive Tool for Urban Planning** **365-375**  
Enrico Eynard, Marco Santangelo, Matteo Tabasso

- 32. Visual Impact in the Urban Environment.  
The Case of Out-of-Scale Buildings** 377-388  
Enrico Fabrizio, Gabriele Garnerò
- 33. Smart Dialogue for Smart Citizens:  
Assertive Approaches for Strategic Planning** 389-401  
Isidoro Fasolino, Maria Veronica Izzo
- 34. Digital Social Networks and Urban Spaces** 403-415  
Pablo Vieira Florentino, Maria Célia Furtado Rocha, Gilberto Corso Pereira
- 35. Social Media Geographic Information in Tourism Planning** 417-430  
Roberta Floris, Michele Campagna
- 36. Re-Use/Re-Cycle Territories:  
A Retroactive Conceptualisation for East Naples** 431-440  
Enrico Formato, Michelangelo Russo
- 37. Urban Land Uses and Smart Mobility** 441-452  
Mauro Francini, Annunziata Palermo, Maria Francesca Viapiana
- 38. The Design of Signalised Intersections at Area Level.  
Models and Methods** 453-464  
Mariano Gallo, Giuseppina De Luca, Luca D'acierno
- 39. Piano dei Servizi. Proposal for Contents and Guidelines** 465-476  
Roberto Gerundo, Gabriella Graziuso
- 40. Social Housing in Urban Regeneration.  
Regeneration Heritage Existing Building: Methods and Strategies** 477-486  
Maria Antonia Giannino, Ferdinando Orabona
- 41. Using GIS to Record and Analyse Historical Urban Areas** 487-497  
Maria Giannopoulou, Athanasios P. Vavatsikos,  
Konstantinos Lykostratis, Anastasia Roukouni
- 42. Network Screening for Smarter Road Sites: A Regional Case** 499-509  
Attila Grieco, Chiara Montaldo, Sylvie Ocelli, Silvia Tarditi
- 43. Li-Fi for a Digital Urban Infrastructure:  
A Novel Technology for the Smart City** 511-522  
Corrado Iannucci, Fabrizio Pini
- 44. Open Spaces and Urban Ecosystem Services.  
Cooling Effect towards Urban Planning in South American Cities** 523-534  
Luis Inostroza

- 45. From RLP to SLP: Two Different Approaches to Landscape Planning** 535-543  
Federica Isola, Cheti Pira
- 46. Revitalization and its Impact on Public. Space Organization A Case Study of Manchester in UK, Lyon in France and Łódź in Poland** 545-556  
Jarosław Kazimierzczak
- 47. Geodesign for Urban Ecosystem Services** 557-565  
Daniele La Rosa
- 48. An Ontology of Implementation Plans of Historic Centers: A Case Study Concerning Sardinia, Italy** 567-579  
Sabrina Lai, Corrado Zoppi
- 49. Open Data for Territorial Specialization Assessment. Territorial Specialization in Attracting Local Development Funds: an Assessment. Procedure Based on Open Data and Open Tools** 581-595  
Giuseppe Las Casas, Silvana Lombardo, Beniamino Murgante, Piergiuseppe Pontrandolfi, Francesco Scorza
- 50. Sustainability And Planning. Thinking and Acting According to Thermodynamics Laws** 597-606  
Antonio Leone, Federica Gobattoni, Raffaele Pelorosso
- 51. Strategic Planning of Municipal Historic Centers. A Case Study Concerning Sardinia, Italy** 607-619  
Federica Leone, Corrado Zoppi
- 52. A GIS Approach to Supporting Nightlife Impact Management: The Case of Milan** 621-632  
Giorgio Limonta
- 53. Dealing with Resilience Conceptualisation. Formal Ontologies as a Tool for Implementation of Intelligent Geographic Information Systems** 633-644  
Giampiero Lombardini
- 54. Social Media Geographic Information: Recent Findings and Opportunities for Smart Spatial Planning** 645-658  
Pierangelo Massa, Michele Campagna
- 55. Zero Emission Mobility Systems in Cities. Inductive Recharge System Planning in Urban Areas** 659-669  
Giulio Maternini, Stefano Riccardi, Margherita Cadei

- 56. Urban Labelling: Resilience and Vulnerability as Key Concepts for a Sustainable Planning** 671-682  
Giuseppe Mazzeo
- 57. Defining Smart City. A Conceptual Framework Based on Keyword Analysis** 683-694  
Farnaz Mosannenzadeh, Daniele Vettorato
- 58. Parametric Modeling of Urban Landscape: Decoding the Brasilia of Lucio Costa from Modernism to Present Days** 695-708  
Ana Clara Moura, Suellen Ribeiro, Isadora Correa, Bruno Braga
- 59. Smart Mediterranean Logics. Old-New Dimensions and Transformations of Territories and Cites-Ports in Mediterranean** 709-718  
Emanuela Nan
- 60. Mapping Smart Regions. An Exploratory Approach** 719-728  
Sylvie Occelli, Alessandro Sciuillo
- 61. Planning Un-Sustainable Development of Mezzogiorno. Methods and Strategies for Planning Human Sustainable Development** 729-736  
Ferdinando Orabona, Maria Antonia Giannino
- 62. The Factors Influencing Transport Energy Consumption in Urban Areas: a Review** 737-747  
Rocco Papa, Carmela Gargiulo, Gennaro Angiello
- 63. Integrated Urban System and Energy Consumption Model: Residential Buildings** 749-758  
Rocco Papa, Carmela Gargiulo, Gerardo Carpentieri
- 64. Integrated Urban System and Energy Consumption Model: Public and Singular Buildings** 759-770  
Rocco Papa, Carmela Gargiulo, Mario Cristiano
- 65. Urban Smartness Vs Urban Competitiveness: A Comparison of Italian Cities Rankings** 771-782  
Rocco Papa, Carmela Gargiulo, Stefano Franco, Laura Russo
- 66. Urban Systems and Energy Consumptions: A Critical Approach** 783-792  
Rocco Papa, Carmela Gargiulo, Floriana Zucaro
- 67. Climate Change and Energy Sustainability. Which Innovations in European Strategies and Plans** 793-804  
Rocco Papa, Carmela Gargiulo, Floriana Zucaro

- 68. Bio-Energy Connectivity And Ecosystem Services.  
An Assessment by Pandora 3.0 Model for Land Use Decision Making** 805-816  
Raffaele Pelorosso, Federica Gobattoni, Francesco Geri,  
Roberto Monaco, Antonio Leone
- 69. Entropy and the City. GHG Emissions Inventory:  
a Common Baseline for the Design of Urban and Industrial Ecologies** 817-828  
Michele Pezzagno, Marco Rosini
- 70. Urban Planning and Climate Change: Adaptation and Mitigation Strategies** 829-840  
Fulvia Pinto
- 71. Urban Gaming Simulation for Enhancing Disaster Resilience.  
A Social Learning Tool for Modern Disaster Risk Management** 841-851  
Sarunwit Promsaka Na Sakonnakron, Pongpisit Huyakorn, Paola Rizzi
- 72. Visualisation as a Model. Overview on Communication Techniques  
in Transport and Urban Planning** 853-862  
Giovanni Rabino, Elena Masala
- 73. Ontologies and Methods of Qualitative Research in Urban Planning** 863-869  
Giovanni Rabino
- 74. City/Sea Searching for a New Connection.  
Regeneration Proposal for Naples Waterfront Like an Harbourscape:  
Comparing Three Case Studies** 871-882  
Michelangelo Russo, Enrico Formato
- 75. Sensitivity Assessment. Localization of Road Transport Infrastructures  
in the Province of Lucca** 883-895  
Luisa Santini, Serena Pecori
- 76. Creating Smart Urban Landscapes.  
A Multimedia Platform for Placemaking** 897-907  
Marichela Sepe
- 77. Virtual Power Plant. Environmental Technology Management Tools  
of The Settlement Processes** 909-920  
Maurizio Sibilla
- 78. Ecosystem Services and Border Regions.  
Case Study from Czech – Polish Borderland** 921-932  
Marcin Spyra
- 79. The Creative Side of the Reflective Planner. Updating the Schön's Findings** 933-940  
Maria Rosaria Stufano Melone, Giovanni Rabino

- 80. Achieving People Friendly Accessibility.  
Key Concepts and a Case Study Overview** 941-951  
Michela Tiboni, Silvia Rossetti
- 81. Planning Pharmacies: An Operational Method to Find the Best Location** 953-963  
Simona Tondelli, Stefano Fatone
- 82. Transportation Infrastructure Impacts Evaluation:  
The Case of Egnatia Motorway in Greece** 965-975  
Athanasios P. Vavatsikos, Maria Giannopoulou
- 83. Designing Mobility in a City in Transition.  
Challenges from the Case of Palermo** 977-988  
Ignazio Vinci, Salvatore Di Dio
- 84. Considerations on the Use of Visual Tools in Planning Processes:  
A Brazilian Experience** 989-998  
Camila Zyngier, Stefano Pensa, Elena Masala

# TeMA

Journal of  
Land Use, Mobility and Environment

TeMA SI INPUT 2014  
Print ISSN 1970-9889, e- ISSN 1970-9870

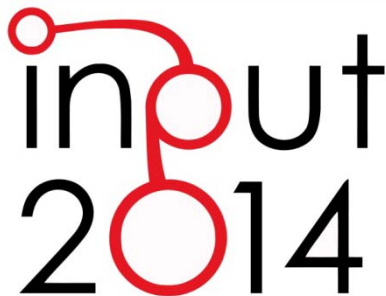
DOI available on the online version

Licensed under the Creative Commons Attribution  
Non Commercial License 3.0  
[www.tema.unina.it](http://www.tema.unina.it)

SPECIAL ISSUE

Eighth International Conference INPUT  
Smart City - Planning for Energy, Transportation and Sustainability  
of the Urban System

*Naples, 4-6 June 2014*

The logo for the INPUT 2014 conference. It features the word "input" in a lowercase, sans-serif font, with the "i" and "o" connected by a red line that forms a stylized shape. Below "input" is the year "2014" in a larger, bold, sans-serif font. The "0" in "2014" is also connected to the red line above it.

## INTEGRATED URBAN SYSTEM AND ENERGY CONSUMPTION MODEL: PUBLIC AND SINGULAR BUILDINGS

ROCCO PAPA<sup>a</sup>, CARMELA GARGIULO<sup>b</sup>, MARIO R CRISTIANO<sup>c</sup>

Department of Civil, Building and Environmental Engineering  
University of Naples Federico II

<sup>a</sup>e-mail: [rocco.papa@unina.it](mailto:rocco.papa@unina.it)

<sup>b</sup>e-mail: [gargiulo@unina.it](mailto:gargiulo@unina.it)

<sup>c</sup>e-mail: [mario.cristiano@unimol.it](mailto:mario.cristiano@unimol.it)  
URL: <http://dice.dip.unina.it>

### ABSTRACT

The present paper illustrates the results of the first steps of a study on one aspect investigated as the preliminary step of the definition of the analysis - comprehension model of the relation between: city, buildings, and user behavior, for the reduction of energy consumption within the research project "Smart Energy Master" for the energetic governance of the territory (PON\_MIUR n. pos. 04a2\_00120 CUP Ricerca: E61H12000130005), at the Department of Civil, Building and Environmental Engineering - University of Naples Federico II, principal investigator prof. Carmela Gargiulo.

Specifically the literary review aimed at determining if, and in what measure, the presence of public and singular buildings is present in the energy consumption estimate models, proposed by the scientific community, for the city or neighborhood scale .

The difficulties in defining the weight of these singular buildings on the total energy consumption and the impossibility to define mean values that are significant for all subsets and different types as well as for each one, have forced model makers to either ignore them completely or chose a portion of this specific stock to include.

### KEYWORDS

SEM, Smart Energy Master, Energy, Public, Singular, Buildings

## 1 INTRODUCTION

Nations and governments have initiated strategies and actions to reduce our dependence from non renewable sources and our global energy consumption because of climatic change, and the necessity to translate our society to an ecologically sustainable model.

Some studies (EU Commission 2011) cite that cities and their surroundings areas consume the 80% of final energy in the European Union and more than two thirds of the population lives in urban areas.

Others (European Institute for Energy Research EIFER 2012a, 2012b) that on the European continent, cities are currently responsible for approximately 70% of the overall primary European energy consumption, and this share is expected to increase to 75% by 2030.

Analysis of the building stock of the EU (EU Report 2010) has shown that a large part, about 60%, was produced between the sixties and the eighties and anyway after the second world war. In the countries of the Mediterranean basin this percentage grows to about 70- 75 %. In Italy specifically the percentage is about 65%. These buildings, produced in a time before energy consumption reduction legislation, inspired by the energy crisis of the seventies came into effect, present a very low energy performance.

Since efficiency of the use of energy represents one of the main mechanisms for the reduction of CO<sup>2</sup> emissions, and the building sector weighs heavily on the total consumption there are ample margins of potential energy savings.

The studies on energy consumption of the building sector are usually divided in residential and non residential, and the focus of the literary review has been on the later.

The phenomenon of high energy consumption and low energy efficiency of public buildings is common, which means there is a great energy saving potential; these include the public service sector and buildings.

The service sector, in the major industrialized countries, has a very important role in the economy but only a marginal one in the ranking of the energy consumption of the various sectors.

It is less energy intensive than the residential, transport, and industry sectors, amounting to an estimated 13-15% of the total energy consumption; but its energy demands have been in constant growth in the past years<sup>1</sup>.

In Italy a recent study (Rapporto Annuale sull'Efficienza Energetica, 2013) has estimated the specific Energy consumption of buildings (kWh/year/m<sup>2</sup>) of the service sector depending on the different functions and services offered that include hotels, schools, malls, retail buildings, offices, restaurants and other services.

The energy intensity of these buildings varies from a minimum of 112-114 kWh/year/m<sup>2</sup> for offices, restaurants and other services, to a maximum of 182 kWh/year/m<sup>2</sup> for hotels.

Function plays an important part in the energy consumption profile of a building but it not the only defining characteristic. Indeed, it is well known (Fabbri et al., 2012) that energy building behavior is not only related to the construction period but also to the architectural, morphological and technological solutions that characterize each building.

### 1.2 MODELLING THE BUILT ENVIRONMENT

To comprehend a complex and dynamic system, such as the built environment and its relation to energy consumption, we need a model to interpret the relevant data collected and to inform decision making.

---

<sup>1</sup> Energy consumption of non residential buildings, that include service functions, commerce, and public administration are in continuous and strong growth from 9.5 Mtep in 1995 to 20 Mtep in 2010. In 2010 the energy and electricity use intensity of the service sector have registered and increase of 1.8% and 0,5% respectively compared to the year before.



Scale, resolution and relevance of the data vary and so do the measurement units; a direct comparison and correlation is difficult.

The multidimensional nature of the objectives, projects and energy policies adds another peculiar facet to the problem. Ordinary methods used in economic – behavior analysis are not adequate to describe the energetic- environment relation.

The availability of data and the costs involved in collecting them are key to defining the data that can be collected for energy consumption models designed for existing buildings.

For individual buildings energy consumption models generally require an amount and resolution of data that are not practical or economical to collect for large numbers of buildings.

Multi-building models need to be based on data inputs capable of providing a robust and computationally practicable methodology, giving results with an acceptable degree of accuracy.

And, in the absence of individual building surveys, these data inputs will be governed ultimately by access to suitable sources of mass data.

Because data may be difficult to access, it may be necessary to infer input values for a model, basing the inferences on relationships to other data that are both appropriate, accessible, robust and should have a verifiable provenance. For example, thermal performance of building envelopes may be inferred from the age of a building, due to the influence of building regulations.

The models used to evaluate the energy demand of the existing built patrimony can be divided in three groups (Heiple S. et al 2008, Kavgić M et al 2010):

- top-down: that use energy consumption data on an urban scale, that compared to the climatic information and the results of the statistical and population surveys are used to determine the mean value of consumption of buildings. These models are able to compare different economic variables, but they do not allow us to distinguish the spatial energy consumption variations;
- bottom-up: they use the data produced by the simulation of each building depending on their specific characteristics; the results are then collated to determine the energy consumption of the neighborhood or city or to evaluate the energy savings brought by requalification interventions. To get good results on an urban scale they need great quantities of data;
- hybrid: study the energy demand of some prototype buildings and they extrapolate them to evaluate the consumption of the city. Through a detailed spatial representation of the built environment, introducing the socio-economic data it is possible to associate to each building its consumption so that it may be compared to benchmark values. Reference buildings can also be generated through simulation, using default values for certain key inputs. Such a simulated standard can create a scale of comparison based on particular code or market standards.

The basic building information such as building age, building area, operating hours, the number of office workers and the climatic conditions all affect the building energy consumption, but the impact of climatic conditions on the energy consumption is very complex to integrate in the analysis.

## 2 PUBLIC AND SINGULAR BUILDINGS

As decision makers are under pressure to take large-scale actions to reduce energy consumed of regions, districts, or building sub-sectors as a whole; studies aimed at extending building level models to quantify energy consumption of a neighborhood, district, or city region have come into closer scrutiny.

The building stock has not been designed as a single unit of either construction, or operation, so energy consumption modeling of the stock covers many more combinations of variables than a single building.

Energy consumption in buildings is heavily dependent on the functions housed and the number of users; therefore buildings that house public or specialized private services or that cater to multiple and numerous users will be very different from the more frequent residential buildings.

Public buildings should be considered in a wider sense: they are necessarily both publicly owned and those used by the public.

Amongst them buildings for:

- offices,
- sports,
- education,
- healthcare,
- mixed public use,
- penitentiaries,
- barracks,
- museums
- churches

To which we should add buildings for:

- public events and conference centers,
- cultural events and shows
- hospitality and tourism

we should exclude solely social housing since it can be assimilated to generic residential functions.

Within the non-residential sector the diversity in terms of typology is vast (Buildings Performance Institute Europe 2011), and compared to the residential one it is more usual to have multiple functions coexisting in the same building.

Building age, ownership, and use pose unique challenges which affect assessment design. On a mechanical level, energy consumption patterns in non-residential buildings are vastly different from those in residential ones.

Thus, primary classification of nondomestic buildings generally follows its function. Producing a numerous range; even a simple classification, such as the N-DEEM model, is based on ten primary categories of nondomestic buildings. Each primary class or bulk type is attributed to an expected value of energy intensity, which is sometimes derived by aggregating energy intensity of sub-categories. For example, in the N-DEEM model, the primary category of health comprises of surgeries, health centers, nursing homes, and hospitals. In a different approach, (Coffey et al. 2009) sub-categorize buildings based on age and maintenance quality of a building.

Another example is the German portion of the TABULA project (Amtmann et al 2012), that has identified four main parameters to define non-residential buildings: utilization, construction use, compactness/size of the building and the mechanical systems. Eleven categories have been identified together with four different construction year classes, chosen by considering special architectural characteristics and building materials typical of the construction periods.

The case of this form of standardization based on building use rather than its construction and physical characteristics is strong in the context of non-domestic buildings where variability in energy consumption between two buildings is dominated by the demand for activity related services (Prez-Lombard L 2008).

In the “Europe’s buildings under the microscope” survey (B.P.I.E 2011), a broad classification of the sector focused on seven categories: educational buildings, offices, hospitals, hotels and restaurants, sports

facilities, wholesale and retail trade services buildings and other types of energy consuming buildings. And in each, a wide division between various subcategories is evident. The retail and wholesale buildings comprise the largest portion of the non-residential stock in the European panorama. Since heating and cooling conditions may differ substantially from other categories due to large areas of wholesale buildings often being used only for storage purposes, these buildings are dissimilar from others. Within the subcategory retail and wholesale also pronounced differences were pointed out: within this sector there is no homogeneity in terms of size, usage pattern (use hours) and construction style. This requires special attention when looking at the retail and wholesale sub-sectors.

The survey states that office buildings are the second biggest category with a floor space corresponding to 25% of the total non-residential floor space. These buildings have similar heating and cooling conditions to residential buildings although their use is more limited in terms of time. Time defines educational buildings as well, which count for less than 20% of the entire non-residential floor space, since they are reported to have a similar usage pattern.

Hospitals, which weigh little on the total floor space balance, 7% of total non-residential floor space, weigh instead heavily on the energy balance since they have continuous usage patterns, where energy demand can vary substantially depending on the services provided, from consultation rooms to surgery rooms.

Another variability factor for existing buildings is the wide variety of technologies that are tied usually to the construction era; we could broadly divide them in:

- historical buildings (masonry)
- built between the twenties and the forties (mixed masonry and brick)
- built between the forties and the eighties (concrete non insulated structures)
- built after the eighties (concrete insulated structures)

Public buildings for their number, exemplary value, direct intervention possibility and ample energy saving margins are of crucial interest for their potential to initiate a improvement of the urban fabric.

Therefore this part of the built environment has a central role in the norms that originate from the Energy Performance of Buildings Directive (EPBD) and the definitions relative to Nearly Zero-Energy Buildings in fact the article 9, paragraph 1, of the EPBD directive, sanctions that member States must: "provide so that:

- a) within the 31<sup>st</sup> of December 2020 all new buildings are Nearly Zero-Energy;
- b) from the 31<sup>st</sup> of December 2018 all new buildings used and owned by public entities are Nearly Zero-Energy".

For existing buildings in general the directive stipulates that following the example of the public sector strategies should be implemented to transform them in Nearly Zero-Energy buildings.

At the moment we are falling behind the timetable since the implementation plan isn't defined yet, in Italy an official definition of Nearly Zero-Energy has not been postulated (Progressi realizzati dagli stati membri in materia di edifici a energia quasi zero, 2013) and in general "*The measures to reduce emissions and to increase renewable energy are effective "only in theory", rather than in reality*" (Gargiulo et al 2012).

The attention on this sector is evident but, primarily because it is the dominant overall consumer of energy within the building stock and it plays a critical role in meeting overall carbon-reduction targets set by governments, a vast majority of published literature on the topic of consumption modeling and energy conservation strategies deals with the domestic building stock.

Another possible reason for the lack of studies on the presence of public and singular buildings within the building stock may be that large-scale assessment of the non-domestic sector is often infeasible or difficult due to the aforementioned sheer diversity of use, activities, and ownership structures within it.

But since variability in energy consumption between two buildings is dominated by the demand for activity related services (Prez-Lombard et al. 2008) the use of standardization based on building use rather than its construction and physical characteristics is strong in the context of non-domestic buildings.

Some studies conducted in Italy (Caputo et al. 2013) have tried to broaden the analysis scope of the building stock including non residential commercial buildings and the sources of energy consumption include heating, cooling, cooking, domestic hot water, lights and appliances.

Adopting some simple hypothesis taken from the UNI TS 11300 norms, the energy consumption, the efficiency of the characteristics of the building stock are assumed; in particular from the UNI TS 11300-2, (2008) the typical efficiencies of heating systems reported in and the typical efficiencies and UNI TS 11300-3, (2010) of cooling systems.

To determine the percentage of the building stock to be attributed to residential or commercial use, statistical data provided by the National Census, which is focused on residential utilization, was used and further elaborated.

Taking the “total dwelling area” of each census tract, the net total residential volume was calculated and the gross residential volume was estimated based on the correction factor reported in the standard UNI TS 11300-1 (2008).

The volume of commercial buildings was then estimated as the difference between the total building volume obtained by the dimensional data extracted from the maps and the residential volume available for each census tract.

Still the study did not consider the service sector or other buildings such as schools, hospitals, barracks, churches, etc.

Because of the sheer size of the assets involved and the functional diversification of the public buildings it appears obvious that they are an important quota of the entire built environment, even if smaller by far than the residential building one. Therefore an improvement in their energy efficiency can contribute to the effectiveness of energy policies.

We should consider as well the peculiar characteristics of this part of the built environment that can deliver, for equal volumes, larger energy savings than those obtained by other segments of the built environment because of:

- specific high energy use functions;
- the use of buildings adapted to functions different from the original ones;
- the higher energy demand per volume unit that derives from scarce control of public spending
- low maintenance of the buildings and mechanical systems

to initiate actions to reduce the energy consumption through retrofits, a complete analysis of the energy consumption of this sector is fundamental to determine as well if:

- The magnitude of the supply contract with the energy provider is commensurate to the requirements for each building
- how energy demands change during the seasons and the time of day to corroborate the intervention strategies decisions
- compare the specific energy consumptions of different buildings to identify anomalies
- compare the detailed energy consumption of each building with the benchmark values for the specific building type.

Concerning methodological issues, retrofit actions are likely to be practically complex because they include other concepts, such as economic and aesthetic considerations, besides the energy and environmental aspects. The final choices depend on a variety of environmental technological and economic mechanisms.

### 3 PRELIMINARY RESULTS

Considering these difficulties, in the data collection moment, specific attention is needed to choose the parameters and indicators useful for our analysis. Briefly we shall describe the preliminary considerations that have guided our choices on this topic.

First a list of possible sources of relevant data was drawn, from these records we have then chosen the parameters that could bring us nearer to our optimal analysis data set.

Geomorphic data is easily collected through the consolidated instruments that are essential to the preliminary steps of any urban plan, determining surfaces, heights, volumes; still these needed to be enriched with info about use typologies. The presence of public and singular buildings was highlighted and in general the percentage of non residential functions for each edifice was quantified.

Therefore the following parameters are collected for the creation of the model:

*Name of the parameter: Total floor area.*

- typology: descriptive
- measurement unit: sq.m.
- description: Total floor area, is the sum of all useful floor areas of each storey above and below ground, usable attic included.
- calculation or survey method: survey from aerial photogrammetry
- ease or calculation and comparison: high

*Name of the parameter: construction era.*

- typology: descriptive
- measurement unit: range
- description: the construction era of the building useful to estimate the construction technologies
- calculation or survey method: survey from aerial photogrammetry building is hypnotized within the approximate era of the neighborhood
- ease or calculation and comparison: high

*Name of the parameter: Net floor area.*

- typology: descriptive
- measurement unit: sq.m.
- description: Net floor area, is the sum of all net floor areas of each storey above and below ground, usable attic included; estimated subtracting from the total floor area the external walls and the vertical connections.
- calculation or survey method: estimated percentile bearing on the total floor area derived from the construction era
- ease or calculation and comparison: high

*Name of the parameter: building height.*

- typology: descriptive
- measurement unit: m.

– description: building height, the vertical distance of the highest roof eave above the mean finished grade of the ground adjoining the building.

– calculation or survey method: survey from aerial photogrammetry

– ease or calculation and comparison: high

*Name of the parameter: number of floors.*

– typology: descriptive

– measurement unit: n.

– description: the number of above ground storeys.

– calculation or survey method: survey from aerial photogrammetry

– ease or calculation and comparison: high

*Name of the parameter: air-conditioned volume.*

– typology: descriptive

– measurement unit: cubic meters.

– description: the total building volume served by the mechanical systems.

– calculation or survey method: building footprint per building height

– ease or calculation and comparison: high

*Name of the parameter: number of units.*

– typology: descriptive

– measurement unit: n.

– description: the number of functional units of each building.

– calculation or survey method: data from land registry

– ease or calculation and comparison: low

*Name of the parameter: form factor.*

– typology: descriptive

– measurement unit: n.

– description: surface to volume ratio.

– calculation or survey method: survey from aerial photogrammetry

– ease or calculation and comparison: high

*Name of the parameter: façade orientation.*

– typology: descriptive

– measurement unit:

– description: degrees of the main building façade relative to the north.

– calculation or survey method: survey from aerial photogrammetry

– ease or calculation and comparison: high

*Name of the parameter: degree days.*

– typology: descriptive

– measurement unit: GG

– description: the sum of the average temperature on any given day, subtracted from the base temperature.

– calculation or survey method: from charts present in the norms

– ease or calculation and comparison: high

*Name of the parameter: energy intensity.*

- typology: performance
- measurement unit: kWh/sq.m./year
- description: the total energy used by the building per square meter each year.
- calculation or survey method: dividing the estimated energy consumption per unit of floor surface.
- ease or calculation and comparison: medium

*Name of the parameter: function.*

- typology: descriptive
- measurement unit: list
- description: the prevalent use of the building.
- calculation or survey method: survey from aerial 45° photogrammetry.
- ease or calculation and comparison: medium

*Name of the parameter: education level.*

- typology: descriptive
- measurement unit: list
- description: the type of educational function housed in the building.
- calculation or survey method: data from relevant public agency .
- ease or calculation and comparison: high

*Name of the parameter: education level.*

- typology: descriptive
- measurement unit: list
- description: the type of educational function housed in the building.
- calculation or survey method: data from relevant public agency .
- ease or calculation and comparison: high

*Name of the parameter: healthcare service type.*

- typology: descriptive
- measurement unit: list
- description: the type of healthcare service housed in the building.
- calculation or survey method: data from relevant public agency .
- ease or calculation and comparison: high

But, due to the extreme difficulty of retrieving data related to the age of each building, the age of the building, as mentioned, is hypnotized within the approximate era of the neighborhood; the kind of building technologies and the mechanical systems, each profoundly tied to energy consumption, have been momentarily excluded from the model.

To determine the energy intensity of each typology, consumption data needs to be collected from multiple energy suppliers and then geo referenced.

This data is collected by public offices but it is not introduced in a geographic information system and is therefore not useful to extrapolate the information we need; an accurate correlation on the building scale is needed that expurgates individual consumptions for privacy reasons.

#### 4 CONCLUSIONS

Even if there aren't comprehensive models that include singular buildings, there are many studies that have considered the energy consumption of each subset and specific building type.

Analyzing the work done in this direction it is apparent that high energy use buildings, present as a small percentage of the building stock, still represent a large portion of the end use of thermal and electrical energy use on an urban scale.

Dividing the non residential building stock in commercial and service sectors, on the one side, and singular and public buildings on the other, it is evident that two different approaches are needed to include them in an urban energy model.

The first are characterized by ample surfaces with almost homogeneous hourly usage and comparable energy intensities; therefore they can be estimated and evaluated using prototypical example models as benchmarks for the whole sector, taking into account the specific and common considerations on building age, technologies, localization etc. that are used for the residential sector.

On the other hand singular and public buildings for their intrinsic extraordinary characteristics are more difficult to include. Energy intensity, hourly usage, end use of energy, user presence differ widely; therefore it's necessary to develop for each subset and building type a specific modeling unit that can consider its particular characteristics and be plugged in the global model as needed.

For each building type the specific energy intensity must be evaluated and tied to the characteristic that drives energy consumption; this characteristic may not be the overall surface of the building unit.

Still these analysis methods implement a partial view of the problem since they, for example, consider energy consumption tied to built volume, use, technological characteristics of the building envelope and ignore the type, age and control strategy of the mechanical systems.

Another critical point is the difficulty to correlate energy use in the building stock with the presence of onsite renewable source energy generation.

Because of their exemplary value, for public buildings, a repository of energy certification documentation is being created; even if the rating is a useful indicator to compare a building relative to another of the same type, or its expected benchmark, it does not correspond to its actual energy use and therefore it is not useful as a data source for energy consumption.

Still it could be useful for the definition of the technological characteristics of the building envelope and the mechanical systems if the simplified rating system, which infers characteristics from age, was not used.

#### REFERENCES

EU Report, Housing Statistics in the European Union (2010).

EU Commission – Directorate General for Regional Policy, Luxembourg. (2011). Cities of tomorrow: Challenges, visions, ways forward (112 pp.). Luxembourg: Publications Office of the European Union., ISBN 978-92-79-21307-6.

EIFER (European Institute for Energy Research),2012a. <http://www.eifer.uni-karlsruhe.de/S>.

EIFER (European Institute for Energy Research),2012b.“EIFER2.0”. [http://www.eifer.uni-karlsruhe.de/IMG/pdf/120417\\_eifer\\_broschuere\\_ansicht\\_web.pdf](http://www.eifer.uni-karlsruhe.de/IMG/pdf/120417_eifer_broschuere_ansicht_web.pdf).

Europe's buildings under the microscope: A country-by-country review of the energy performance of buildings 2011, Buildings Performance Institute Europe (BPIE). ISBN: 9789491143014

In-Ae Yeo, Seong-Hwan Yoon, Jurng-Jae Yee, Development of an urban energy demand forecasting system to support environmentally friendly urban planning, Applied Energy, Volume 110, October 2013, Pages 304-317, ISSN 0306-2619, <http://dx.doi.org/10.1016/j.apenergy.2013.04.065>.



Fabrizi, K., Zuppiroli, M., Keoma, A., 2012. Heritage buildings and energy performance: mapping with GIS tools. *Energy and Buildings* 48, 137–145, <http://dx.doi.org/10.1016/j.enbuild.2012.01.018>.

Heiple, S. and Sailor, D. J. 2008. Using building energy simulation and geospatial modeling techniques to determine high resolution building sector energy consumption profiles. *Energy and Buildings*, 40:1426–1436.

Kavgic, M., Mavrogianni, A., Mumovic, D., Summerfield, A., Stevanovic, Z. and Djurovic- Petrovic, M., 2010. A review of bottom-up building stock models for energy consumption in the residential sector. *Building and Environment*, 45, 1683-1697.

Ruchi Choudhary Energy analysis of the non-domestic building stock of Greater London Energy Efficient Cities Initiative, Department of Engineering, University of Cambridge, UK

Ruchi Choudhary A Probabilistic Model For Assessing Energy Consumption Of The Non-Domestic Building Stock Proceedings of Building Simulation 2011: 12th Conference of International Building Performance Simulation Association, Sydney, 14-16 November

Prez-Lombard L, Ortiz J, Pout C. A review on buildings energy consumption information. *Energy Buildings* 2008;40(3):394e8.

Paola Caputo, GaiaCosta n, Simone Ferrari 2013 A supporting method for defining energy strategies in the building sector at urban scale

Coffey, B., Borgeson, S., Selkowitz, S., Apte, J., Mathew, P., and Haves, P. 2009. Towards a very low energy building stock: Modeling the us commercial building stock to support policy and innovation planning. *Building Research and Information*, 37(5 - 6):610 – 624.

Amtmann, M. et al 2012 Typology Approaches for Non-Residential Buildings in Four European Countries - Existing Information, Concepts and Outlook" countries: Austria, Bulgaria, Germany, Greece, Poland [http://episcopo.eu/fileadmin/tabula/public/docs/report/TABULA\\_TR3\\_D9\\_NonResidentialBuildings.pdf](http://episcopo.eu/fileadmin/tabula/public/docs/report/TABULA_TR3_D9_NonResidentialBuildings.pdf)

Gargiulo C., Pinto V., Zucaro F. (2012) "City and mobility: towards an integrated approach to resolve energy problems", in *TeMA Journal of Land Use Mobility and Environment*, ISSN 1970- 9870, Vol.5-n°2 *The Resilient City* pp 23-53

Gargiulo C., Pinto V., Zucaro F.(2013), "EU Smart city governance" in *TeMA Journal of Land Use Mobility and Environment*, ISSN 1970-9870, Vol.6-n°3, *Smart City: researches, projects and good practices for networks and infrastructure* pp 355-370.

## AUTHORS' PROFILE

Rocco Papa

Full Professor of Land Use Planning at the Department of Civil, Architectural and Environmental Engineering at University of Naples "Federico II". Editor-in-Chief of the Scientific Journal *TeMA - Land Use, Mobility and Environment* since 2007. Director of the Department of Urban and Regional Planning DiPIST of University of Naples "Federico II", from 1999 to 2005. Chairman of the Urban Transformation Company Bagnoli futura S.p.A from 2006 to 2010. Vice-Mayor of the Municipality of Naples, from 2001 to 2006. City Councilor for Livability (appointed to Town Planning and Historical Centre) for the Naples Municipality, from 1997 to 2001. Research activity, carried out continuously since 1974, has developed according to the following four main lines: the study of the interactions between urban and mobility systems; the management and governance of metropolitan areas; the safeguard of environmental quality in highly urbanized areas; the experimentation of new protocols for urban planning tools connected with the updating of techniques, methods and models of analyses, interpretation, planning and governance of territory. As City Councilor for Livability (appointed to Town Planning and Historical Centre) for the Naples Municipality he has developed in detail the following projects: the approval and implementation of the new Master Plan of Naples; the approval and implementation of the Local Master Plan for the area of Bagnoli-Coroglio and the establishment of the Urban Transformation Company Bagnoli futura SpA, and the restoration and requalification of the "Real Albergo dei Poveri" and of the "SS. Trinità delle Monache", the implementation of the Line 1 and Line 6 of the Metropolitan Railway. He is the author of more than 100 publications.

Carmela Gargiulo

Associate professor of Urban Planning Techniques at the University of Naples Federico II. Since 1987 she has been involved in studies on the management of urban and territorial transformations. Since 2004, she has been Member of the Researcher Doctorate in Hydraulic, Transport and Territorial Systems Engineering of the University of Naples "Federico II". She is Member of the Committee of the Civil, Architectural and Environmental Engineering Department of the University of Naples "Federico II". Her research interests focus on the processes of urban requalification, on relationships

between urban transformations and mobility, and on the estate exploitation produced by urban transformations. On these subjects she has co-ordinated research teams within National Project such as Progetto Finalizzato Edilizia - Sotto progetto "Processi e procedure" (Targeted Project on Building – Subproject "Processes and procedures), from 1992 to 1994; Progetto Strategico Aree Metropolitane e Ambiente, (Strategic Project Metropolitan Areas and Environment) from 1994 to 1995; PRIN project on the "Impacts of mobility policies on urban transformability, environment and property market" from 2011 to 2013. Scientific Responsible of the *Project Smart Energy Master for the energy management of territory financed by PON 04A2\_00120 R&C Axis II, from 2012 to 2015*. She is author of more than 90 publications.

Mario R. Cristiano

Engineer, PhD and Fulbright Scholar, he studies the technological aspects of the building process, learning from examples set by historical buildings and the integration of advanced technologies that cross over from other fields of study, as they relate to the perusal of quality and sustainable environments. Part of the Smart Energy Master research project, at the University of Studies of Naples, he studies the definition of the energy consumption model of the building stock, to include non-residential, public and singular buildings. He is the author of more than 30 publications.