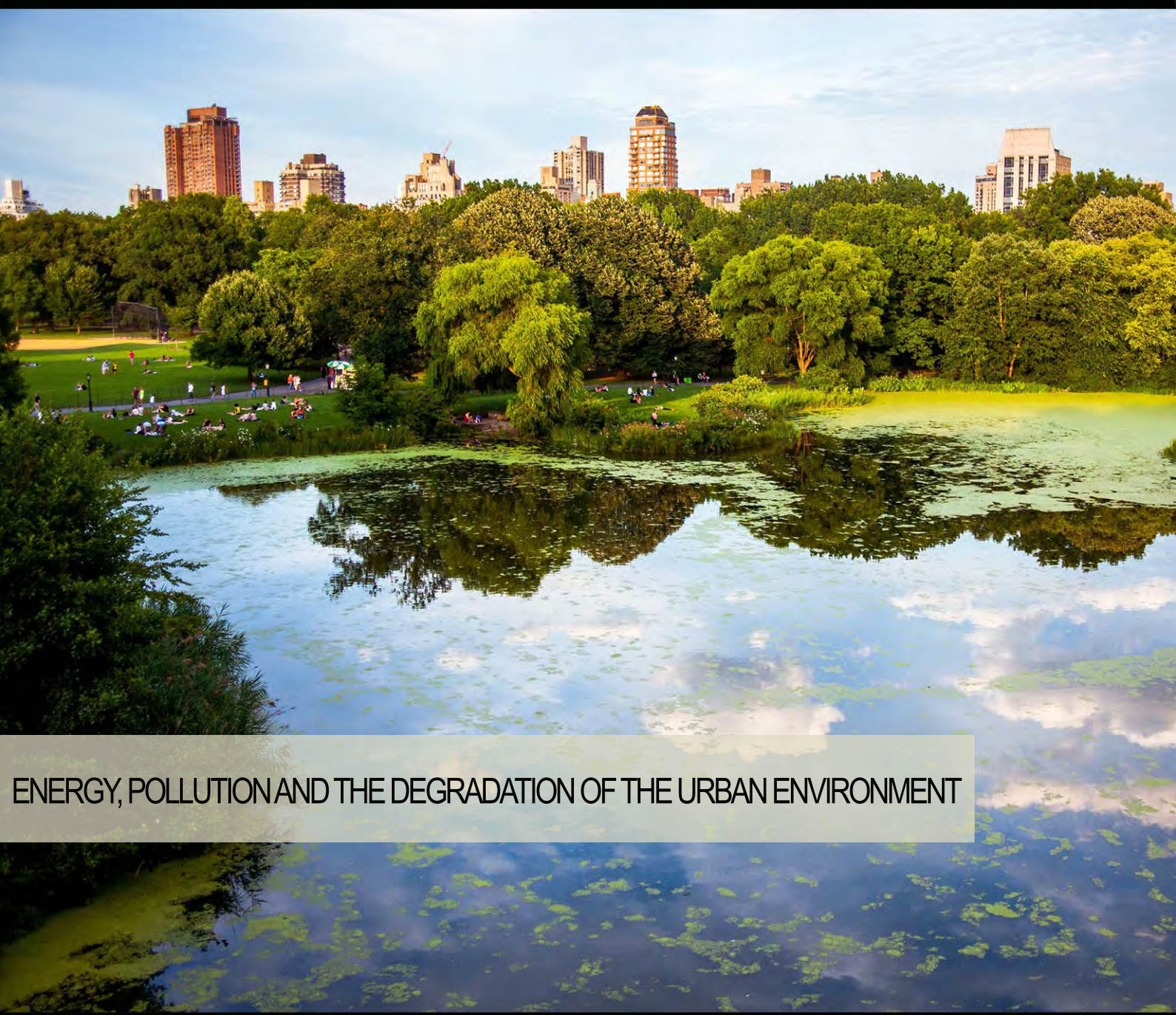


TeMA

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ENERGY, POLLUTION AND THE DEGRADATION OF THE URBAN ENVIRONMENT

ENERGY, POLLUTION AND THE DEGRADATION OF THE URBAN ENVIRONMENT

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ENERGY, POLLUTION AND THE DEGRADATION OF THE URBAN ENVIRONMENT 2 (2016)

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EDITORIAL PREFACE:

ENERGY, POLLUTION AND THE DEGRADATION OF THE URBAN ENVIRONMENT

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Cities are facing important environmental, social and economic problems. Local climate change and the urban heat island phenomenon rise the temperature in the urban environment, and increase the energy consumption for cooling, deteriorate the levels of indoor and outdoor thermal comfort and increase the concentration of harmful pollutants like the tropospheric ozone. In parallel, atmospheric pollution and chemical and biological contamination in the urban environment threatens the human health and worsen the quality of life of urban citizens (Santamouris, 2015).

Important social and economic problems in our cities like poverty and in particular energy poverty and social deprivation oblige a large part of urban citizens to live under unacceptable conditions that threaten their lives (Kolokotsa, Santamouris, 2015).

UHI and Global Climate Change in combination with the expected increase of the earth's population may increase the cooling energy demand of the building sector up to 2500 % by 2050. An extremely high number of new power plants will be required to satisfy the huge peak power load and the whole demand. Tremendous investments are required to satisfy the demand while if conventional fuels are used, the related environmental and economic problems will be aggravated. Mitigation and Adaptation Technologies should contribute highly to counterbalance the additional energy needs

High ambient temperatures increase the mortality rate and the corresponding hospital admissions. The threshold temperature over which mortality increases rapidly varies as a function of the adaptation of the local population. In Med region is close to 31 C, in Northern Europe, is 23 C. Use of mitigation and adaptation techniques to improve the built environment have a very positive impact on health.

During the last years, important research has been carried out aiming to mitigate the local and global climate change in cities, decrease the energy consumption of the urban buildings and eradicate the problem of energy poverty (Santamouris, 2016). In particular, the development of advanced mitigation technologies, involving the use of reflective materials, advanced chromic surfaces, and green facades and roofs, have offered very significant technical tools for urban scientists (Akbari et al., 2015). Demonstration projects of large scale have shown that it is quite feasible to reduce the temperature of our neighbourhoods by 1,5 to 2 K, with a very reasonable budget (Santamouris, 2014). Continued research efforts aim to develop more efficient urban techniques and technologies, presenting a much higher potential for climate change mitigation.

The development of advanced know how on urban mitigation technologies paves the way for global and holistic retrofitting plans for cities aiming to improve the urban climate and fight urban overheating. Studies in Europe shown that the cost of global mitigation plans is affordable and may range between 200 to 4000 Euros per citizen depending on the characteristics of the city, with an average cost close to 2000 Euros per person. The scientific community together with the local authorities have to prepare and implement global mitigation plans. Eradication of the energy poverty in the urban environment is one of the main challenges we face actually in the developing but also in the developed world. The tremendous increase of the urban population expected up to 2050 in Asia and Africa will put in stress the urban systems and will require the adoption of effective and smart policies to face the problem. The whole problem has serious social, economic and technological dimensions and should be faced in an integrated and holistic way. Failure to consider all issues in an integrated and holistic way may inevitably result in higher energy consumption, more urban problems and social discrepancies.

Research on Climatic Mitigation technologies should explore interrelationships and links with advanced ICT technologies like Smart City Information Networks, Intelligent Urban Management, and also with Efficient Green Supply Networks, Zero Energy Settlements, Alternative Labor and Education Technologies, etc., in order to uncover new information about how our cities work and develop and provide integrated urban solutions that will improve the quality of citizen life by providing direct and personal services.

Climatic Change Research should become smarter and have access to the exploding amount of urban data. Digital data is expected to double every two years from now until 2020. How researchers and technology providers leverage and share this data will be a competitive differentiator.

Research on climatic mitigation technologies should not be seen in an isolated way. It should be part of a global research aiming to face the global challenges in the urban environment and in particular the economic turmoil, the climatic change, the increased urbanisation and the urban sprawl, the increasing age of the population and the problem of poverty.

Minimization of the energy consumption, eradication of the energy poverty and mitigation of the urban heat island is an unequivocal choice that will create substantial opportunities for future growth and will alleviate the population from the consequences of the specific problems and will create benefits and opportunities.

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URBAN RETROFIT AND RESILIENCE: THE CHALLENGE OF ENERGY EFFICIENCY AND VULNERABILITY

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ABSTRACT

Urban retrofit is becoming increasingly established as one of the most effective solutions to contain the energy consumption of the existing building stock, to reduce vulnerability to natural and man-made risk and generally improve the quality of built space. However, the planning of retrofit interventions at urban scale should take account of the actual feasibility of measures lest they remain only on paper.

This contribution supplies an overview of the many issues related to the subject of urban regeneration, proposing a procedure to identify practical interventions to minimize costs and maximize benefits, in terms of energy efficiency, an increase in resilience and improvement in the quality of the building stock. This procedure was applied to a case study of a neighborhood in the city of Naples, a high-density urban area which is particularly vulnerable to volcanic and seismic risk, and to risks due to climate change.

KEYWORDS:

Retrofit; resilience, urban vulnerability, property enhancement, energy efficiency.

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城市翻新和适应力:

能源效率和脆弱性方面的挑战

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摘要

城市翻新正日益成为控制现有建筑群的能源效率、降低对自然和人为风险的脆弱性以及从整体上改善建筑空间质量的最有效解决方案之一。但是，城市范围内的翻新干预计划要考虑措施的实际可信性，以免它们只存在于纸面上。本文概括了与城市改造话题有关的一些问题，并提出了一个用于识别实用干预措施的程序，从而在能源效率、提高适应力以及改善建筑群质量方面实现成本的最小化和效益的最大化。该程序应用于那不勒斯某街区的案例分析中，这是一个高密度的市区，特别是易遭受火山、地震及气候变风险。

关键词:

翻新、适应力、城市脆弱性、房屋加固、能源效率

1 INTRODUCTION

In recent years, the reduction in energy consumption has assumed a strategic role in development models for cities and urban communities in the industrialized West. On the one hand, the economic crisis and on the other, the consequences of climate change have driven technicians and researchers to study these phenomena with the aim of setting up concrete, workable solutions (approaches, methods, procedures, policies, etc.) in the short and medium term (Hulme et al., 2002).

According to the international scientific community, environmental sustainability and energy efficiency today represent two cardinal points on which to build cities and society in the immediate future. Yet is making a city energy-efficient in an area which is vulnerable to natural risks enough to make it really sustainable? The IPCC's Fifth World Report (IPCC, 2013) shows the strict linkage between global warming due to greenhouse gas emissions and destructive climatic events such as floods, water bombs, heat waves and drought. And if cities are the places with the highest carbon footprint (Newman, Kenworthy, 1995), they are also places where the risk of natural and/or man-made events with catastrophic consequences is also highest (Galderisi, 2014).

The possibility of concretely inverting the current trend and formulating a model of sustainable development has to take into account, also in the presence of a drastic reduction in polluting emissions, the pervasiveness and frequency of humankind's actions *vis-à-vis* planetary warming in recent decades (EC, 2013). Alongside mitigation interventions, it is necessary that substantial "adaptation" measures of urban systems to climate change be set in train. However, the risks linked to rapid climate change under way are not the only threat to the safety of cities. There are whole regions which, due to their geographical location, have always been exposed to other types of natural risks such as seismic risk and volcanic risk. The building stock in such areas is unsuited to dealing with such events, in so far as most of the buildings existing in Europe and North America were erected before the introduction of legislation to reduce constructional vulnerability (Cheung et al., 2001; Clemente, 2013). Further, the existing building stock, which is old, poorly maintained and inefficiently constructed (Van der Heijden, 2014), is responsible for 40% of primary energy consumption (Baker & Steemers, 2000). This is attested by the spread of retrofit practices to renovate and improve the existing building stock (Dixon & Eames, 2013). Clearly, the complexity and extent of the challenge facing cities in the near future cannot be solved without a holistic approach to the issues of energy saving, adaptation to climate change and a reduction in urban vulnerability to natural and man-made risks. These are matters of enormous social and economic importance which affect millions of buildings and which entail very high costs, costs which cannot be met by public resources alone. It is also widely held that sums invested to reduce energy consumption have excessively long economic return times (Jones et al., 2013) and that interventions to reduce vulnerability do not significantly increase the market value of the real estate involved (Erdik, 2002). In both cases we are dealing with somewhat unattractive investments since they are conditioned by slow and scant financial returns. On the other hand, it is worthy underline that as stated in the 7th chapter of the Fifth Assessment Report on Climate Change, there is a limited number of research on «the effectiveness and cost-efficiency of climate related energy policies and especially concerning their interaction with other policies in the energy sector» (IPCC, 2014). Ultimately, to ensure the concrete feasibility of interventions which are presented as necessary, it is worth setting up intervention programs and integrated sets of works which consider not only the reduction in energy consumption and resilience to natural and man-made risks, but also the increase in value of the existing building stock, allowing, for example, for increases in the volumes of existing structures, changes in use, and significant interventions on overall urban quality. This contribution aims to provide a coherent framework of the latest scientific advancements which study the types of intervention to improve energy efficiency, whether in the construction field or in city planning and, at the same time, promote energy saving, to significantly enhance the capacity of cities to cope with extreme events, with a holistic approach and in a context of operational

integration which is rarely applied. In the second part of the paper, in light of the considerations made, a case study is examined so as to verify in the field the effectiveness of the procedure proposed: a neighborhood in an area subject to various natural risks. The factors contributing to the various phenomena in question are analyzed, proposing an illustrative program of interventions that integrate energy efficiency and reduction in urban vulnerability from the standpoint of real estate enhancement, with the aim of improving the quality of the context for which the urban retrofit intervention is proposed.

1.2 STATE OF THE ART

Although in the last few decades many efforts have focused on defining measures to reduce consumption at the building scale, only recently has there been increased awareness of the need to undertake measures at the urban scale (Dunham-Jones & Williamson, 2008; Dixon & Eames, 2013, Papa et al., 2016). Isolated episodes of energy savings in buildings, albeit successful, have proved insufficient to respond concretely to the problem. It is not only a question of size: to think that such interventions can be scaled up automatically to the urban context overlooks the complexity of the matter (Dixon et al., 2014). Indeed, it is now widely held that the urban form and especially its settlement density greatly affect energy consumption (Owen, 1986, Papa et al., 2016), as confirmed in the 12th chapter of the IPCC's Fifth Assessment Report, which highlights that «the urban scale also provides unique opportunities for policy integration between urban form and density, infrastructure planning, and demand management options» (IPCC, 2014).

As for the relationship between urban texture and energy consumption, Ratti, Baker and Steemers (2005), conducted a study focusing on the design, construction and occupational performance within three cities: London, Toulouse and Berlin. This research give an insight on how urban morphology plays a determinant role in the definition of energy consumption. They provided a predicting model to verify which parameter could describe best the relationship between urban form and energy consumption and suggest that passive to non-passive indicator is more suitable for this purpose than surface-to-volume ratio at the urban scale.

A study conducted by a French research group (Maïzia et al., 2009) into 18 types of building aggregations in six different cities in France showed that the benefits which may be conferred by a compact urban form are much more limited than is generally thought. Rather, there emerged the close correlation between building density and exposure: it was shown that the effects of compactness are more significant in new settlements, where building orientation may be optimized according to heat gains, than in historic aggregations.

From another research conducted in 2001 in Hong Kong (Hui et al., 2001) emerges that there is no single formula to obtain an energy efficient urban form. Urban "densification", indeed, may have both positive and negative effects on total energy demand: if on the one hand the concentration of buildings makes the application of solar collectors and PV power systems more difficult, on the other dense urban fabric enables to optimize renewable energy resources.

However, the spatial organization of a settlement, does not only affect energy consumption. Indeed, with reference to the relationship between urban form and climate change, various contributions (Givoni, 1989; Cervero & Kokelman, 1997, Holden & Norlan, 2005, Salat & Nowacki, 2010) have shown that urban form affects the particular microclimate which is perceived inside a settlement and which is the subject of a specific discipline termed "urban climatology". Of these, two researchers from the University of Manchester (Smith and Levermore, 2008) explain how the effects of global warming are more greatly felt in urban areas due to the lack of night-time cooling, the scarcity of vegetation and overheating due to human activities. Moreover, compactness may cause an increase in the "heat island" effect in so far it not only limits the flow of winds but also increases the concentration of radiation due to albedo.

As regards measures of adaptation to climate change, it must be take into account that, as mentioned before, global warming produces not only direct effects on temperature: one of the most worrying

consequences is the sea level rise that, between 1901 and 2010, has been estimated on average 19 cm, i.e. more than the average rate of the last two millennia (IPCC, 2013). Not only, also the contrast of the amount of precipitations among regions and between wet and dry seasons has increasingly intensified, causing extreme events such as heat waves, droughts and flash floods. In this context, several cities which are particularly vulnerable to environmental risk are equipped with plans of adaptation to climate change, with a view to protecting their own citizens from catastrophic events and continuing to enable their economies to prosper. Of these cities, in 2012 Rotterdam, with its long tradition of coping with difficult environmental contexts, drew up the Climate Change Adaptation Strategy (2012), which aims to map out development paths that adapt to the various effects of climate change, from the increase in sea level to heat waves, obtaining at the same time maximum benefits from interventions. The most interesting aspect is cost minimization, envisaging the systematic implementation of adaptation measures whilst carrying out maintenance works and making changes, seeking to maximize benefits in economic terms, both as regards suitable potential businesses for the area, and especially in terms of urban quality and an increase in the market value of building stock.

With regard to reducing the seismic vulnerability of buildings, the economic factor is of fundamental importance for implementing interventions, as shown by the study carried out by two researchers from the Department of Seismic Engineering of Bogazici University, Istanbul, estimating the possible damage to the building stock after a strong earthquake (Erdik, 2002). According to the above study, the cost of possible interventions of overall retrofit to reduce building vulnerability would amount to as much as 40% of the replacement value, also entailing disruption due to the evacuation of lodgings for several months. At the same time, it was ascertained that retrofit measures do not increase the market value or rental value of property. Therefore, for the owners it would be an investment without financial returns, and any incentive for private property owners to implement interventions is likely to have little effect. Nevertheless, the benefits in terms of safeguard of human lives and savings in social costs arising from a probable earthquake, would accrue to the whole community. A practicable route is to restrict the field of action, mapping particularly vulnerable buildings and infrastructures and intervening first and foremost on them (Polese et al., 2008). For this purpose, the "Preliminary Study of Instruments to Apply Seismic Regulations in Historic Centers", drawn up by the Higher Council for Public Works (CONSUP, 2012), proposes a multi-dimensional assessment of urban vulnerability. In other words, on the one hand, the direct vulnerability of buildings and infrastructures is assessed, i.e. the likelihood of seismic damage resulting, for example, from the construction year, from building flaws, from the geo-morphological state of the subsoil able to amplify seismic effects. On the other, seismic behavior is assessed, considering the city as an urban system, thus taking account of the hierarchical and territorial role of the system's individual components, which bring about a different level of exposure not only of individual units but of the whole urban system or some of its subsystems. Consider, for example, the strategic role of a hospital or business district, or the concentration of people in a certain moment of the day in a historic centre, or at a given time of year in a holiday resort. Thus, according to the CONSUP, the levels of damage vulnerability of a city may be estimated through a combination of assessments of each functional subsystem, thereby restoring the overall level of vulnerability (Cremonini, 2015).

As regards reducing vulnerability to volcanic risk, extensive research confirms the importance of identifying particularly vulnerable contexts, both for planning consolidation interventions and for drawing up possible evacuation plans (Corradi et al., 2015). In this context, in recent years, PLINIUS Study Centre of the University of Naples has set down a simulation model to estimate, in probabilistic terms, the direct and indirect economic impacts of Type 1 sub-Plinian eruptions of Mt Vesuvius and the volcanic complex of the Campi Flegrei (Zuccaro et al., 2013). Such impacts have been compared to those of similar scenarios which,

however, envision risk mitigation interventions such as the seismic adaptation of buildings facing onto escape routes, consolidation of roofing to protect from damage from falling ash and the protection of particular strategic buildings. "Avoided risk", corresponding to the cost of reconstruction, would amount to billions of euros against mitigation interventions at a cost at least one order of magnitude lower. Restricting the field to particularly vulnerable units is an essential step forward but it does not automatically ensure that measures are implemented. In consideration of the approaches proposed by the above research projects on the relationship between the urban form and energy consumption, between urban form and climate change and, further, on the relationship between city and vulnerability to climatic, seismic and volcanic risk, an experiment was conducted, as reported herein, on a state residential building complex. Intervention classes are proposed to reduce consumption, vulnerability to climatic volcanic and seismic risk, which, at the same time, take account of aspects related to the microclimatic welfare of dwellings, urban quality and the creation of economic value of the existing building stock.

2 RETROFIT MEASURES: A REVIEW

To answer the above questions, we propose a review of retrofit measures set up and tested in various environmental contexts worldwide. With regard to measures to reduce vulnerability to risks connected to climate variations, they considerably vary according to the effect to tackle, related to the specific territorial context of the settlement. Indeed, there are four main effects directly or indirectly connected to global warming: floods, flash floods, heat waves and droughts, which can often weaken the yet uncertain balance of urban ecosystems. Each of these effects can be addressed through specific measures for each territorial context, which can be often reduced to a few integrated actions. It is worthy underline that each intervention should include not only the reduction of risk during the event, minimizing economic and social costs, but also should improve the recovering capacity after the disturbance (resilience).

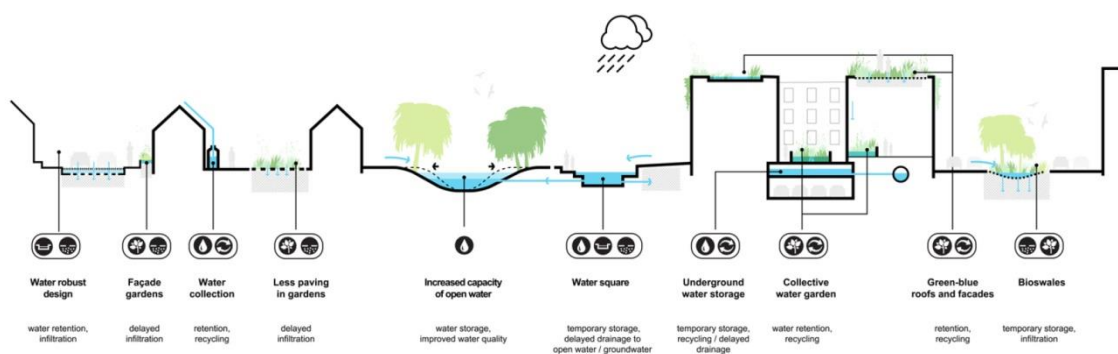


Fig. 1 Scheme for the catchment and reuse of rainwater drawn up in the Rotterdam Adaptation Plan



Figs. 2 and 3 Chelsea Creek (London), 2015. View of one of the accesses to habitations and Masterplan

it is generally possible to use the term "blue-green" measures to describe this group of measures (Voskamp & Van de Ven, 2015), i.e. the set of interventions to increase the permeable surface of constructed spaces (roads, squares, roofs and facades of buildings), creating systems of rainwater catchment, storage and disposal. Indeed, the ever-increasing extremes of seasonal climatic events entails the occurrence, in the same geographical context, of abundant rainfall in very short times during the wet seasons and, in parallel, the total absence of rainfall for very long periods during dry seasons. Creating interventions which mitigate this temporal variation in water availability means, amongst other things, increasing the infiltration capacity and the channeling of water into suitably designed places, which may be positioned both in open spaces, like water squares or small channels, and in underground storage places or in outdoor tanks. If properly applied, such measures could, on the one hand, avoid flooding in the event of intense rainfall and, on the other, allow the re-use of stored water for hygiene purposes or for irrigation and also ensure storage to mitigate temperatures when there is little or no rainfall.

With regard to the possibility of reducing the impacts of a natural seismic or volcanic event, it might be rightly pointed out that it is not possible, at present, acting on its hazard, i.e. on the likelihood that an event occurs with a certain intensity, over a certain time, contrary to climate-related risks, for which it is possible to plan mitigation measures, though in the long terms. Humankind can only affect vulnerability of urban systems, (primarily buildings and infrastructures), i.e. on their inclination to damage and exposure, i.e. on the quantity and quality of man-made elements exposed to a seismic event, including population (Corradi et al., 2015). Measures to reduce risk are thus aligned on these two pathways, planning interventions to reduce the risk assessed on the basis of these two possible expected scenarios. Measures to be implemented will generally have to upgrade the existing stock of building and infrastructure to meet new safety standards or at least ensure acceptable levels of structural resistance to protect persons and goods, through structural improvement and retrofit (Clemente, 2013). Conversely, measures to reduce exposure aim at limiting concentration of people and activities in vulnerable places to natural events. Since it is impossible to limit human activities and concentration of people, it is necessary to analyze the functional organization of settlements and locate activities in sites which are geographically not exposed to a possible natural event (Cremonini, 2015). Another important action regards the improvement of emergency services to favor first rescue, both by means of "Early Warning" systems and the improvement of evacuation systems. If, as already mentioned, in order to reduce urban vulnerability, a mapping of the vulnerable buildings is fundamental ("domography"), to encourage rescue operations it may be useful a mapping of vulnerable people residing in a territory exposed to natural hazards ("demography"), planning special interventions in places where old and disable people are more concentrated (Corradi et al., 2015).

The main measures to reduce vulnerability to seismic risk concern consolidation and seismic adaptation (retrofit) using technologies to improve the response of structural elements to the earthquake (Giovinazzi et al., 2006), taking due note of the particularities of each building (Zuccaro et al., 2013), and/or modify the geomorphological conditions of the subsoil which come into play in the seismic acceleration expected (Barocci, 2015). Interventions in buildings chiefly consist in global or partial strengthening of structural parts (Cheung et al., 2007), while interventions in the subsoil aim to change the way in which seismic waves are propagated through the soil which, according to the specific stratigraphy, may appreciably amplify local effects (Lombardi, 2015). As regards setting up measures to contain volcanic risk, while it may be true that areas closest to the volcano cannot but make evacuation plans for the inhabitants and provide for the relocation of firms to safe areas, it is in the most outlying zones, subject to pyroclastic flows, that interventions to reduce vulnerability may actually have positive effects (INGV, 2012). Indeed, the phenomena that occur in phases prior to the eruption involve the need to remain indoors, sheltering from ash fall, which is why roofing consolidation

becomes a fundamental measure to mitigate risk. Moreover, the hazard level may increase considerably due to the high probability of concurrent rains which could cause damage not only to the roofs of buildings but also to infrastructures of various types, such as the electricity grid, the telecommunications network, civil infrastructures (roads, railroads, airports and stations), as well as cause the blockage of the network for water provision and disposal. It is thus worth enhancing systems to protect infrastructures and provide for excess capacity of disposal systems so as not to diminish their performance in the event of ash fall and intense rainfall. In addition, sites need to be earmarked at some distance from urban areas, in which to store the ash temporarily once the event has run its course. Finally, the particular aspect of volcanic risk concerns combined vulnerability, i.e. the possibility that the eruption triggers collateral processes such as earth tremors, rainfall with dissolved pyroclastics, lahar, flooding and landslides, the latter months or even years after the eruption (INGV, 2012), which is why combined effects of the various risks need to be taken into account.

The review of interventions listed undoubtedly represents a set of essential and immediate measures, if one considers the results in terms of protecting human lives and goods. However, they should also meet people's everyday needs in terms of environmental comfort and quality of life in the relevant urban contexts. For this purpose, solutions are proposed to enhance perceived welfare and improve urban quality overall.

2.1 ENERGY SAVING, MICROCLIMATIC WELFARE, IMPROVEMENT IN QUALITY OF LIFE

In light of the considerations made in the sections above, we propose a review of possible interventions to improve the quality of life and microclimate welfare of city users whilst containing energy consumption. Indeed, setting up interventions and instruments able to control the urban microclimate allows the twofold objective to be achieved, i.e. save energy and enhance thermo-hygrometric welfare, thereby improving the quality of life of the citizenry. Generally speaking, one of the fundamental objectives is to mitigate temperature differences between urban and rural areas due to the heat island effect, thus maximizing benefits from the difference in temperature between day and night (Landsberg, 1981; Oke, 1987). Following a holistic approach, measures to control urban areas bioclimatically concern both urban design and aspects related to the performance of individual buildings (Smith & Levermore, 2008).

As regards the bioclimatic quality of the urban layout, the form of the settlement plays a fundamental role (Ratti et al., 2005). However, the mere orientation of buildings on the basis of the heliothermic axis may often lead to a relative rigidity in the layout of buildings. For this reason, at times, a radial geometry may for example be preferable to one with parallel rows, correcting unfavorable orientations by means of architectural and typological solutions (Dispoto, Gargiulo, 2015). Attention to prevailing winds may also profoundly affect both open spaces and welfare perceived within buildings, creating for example lines of trees for protection from prevailing winds or orientating road axes at an angle of 45° to the prevailing wind direction, interspersed with parks, green areas or water courses to enhance the cooling effect of the wind (Sandberg et al., 2003). Building design should take account of the compactness ratio (s/v) to limit dispersion, both of the correct arrangement of spaces and plant. Service spaces should be located to the North and the more inhabited environments to the South, as should the systems of energy production (solar heating panels, photovoltaic panels, energy roofs etc.). Although the reduction in energy consumption constitutes a major incentive to create the operations listed, the long return times of investments, especially as regards measures on the building shell, have resulted in a low propensity among owners to undertake interventions. It thus becomes necessary to introduce objectively feasible retrofit measures which can immediately generate economic benefits.

2.2 IMPROVEMENT IN URBAN QUALITY AND PROPERTY ENHANCEMENT

As already pointed out, the feasibility of the above interventions is strictly linked to the possibility of creating economic value which activates transformation processes at both building and urban scale. Among the

activities that can best trigger such processes is the change in intended use and the increase in volume. The change in intended use is an interesting urban regeneration tool because it allows value creation without using other land. At the same time, it is possible to combine various types of intervention to mitigate vulnerability and save energy, which differ according to the intervention concerned: open spaces, ground floors, intermediate floors or the roof space of offices. This approach is actually recommended, taking into consideration that «well-designed systemic and cross-sectoral mitigation strategies are more cost-effective in cutting emissions than a focus on individual technologies and sectors» as stated in the Summary for Policymakers of the IPCC's Fifth Assessment Report (IPCC, 2014).

With regard to the ground floor, storage rooms can be converted into flats through insulation of the side walls and the flooring, thereby obtaining an improvement in heat/energy performance also in the floors above. By the same token, conversion of uninhabitable roof space into lofts represents a particularly interesting procedure especially in areas neighboring those affected by possible volcanic phenomena insofar as it would allow an improvement in the performance of the whole building through insulation of the horizontal upper closure, but could be combined with interventions to improve the load-bearing capacity of the roof. The increase in volume represents another important incentive for carrying out interventions. In particular, think of those interventions that do not involve further land use but that can provide important results in terms of optimizing heating gains: an example is the construction of south-facing solar greenhouses, with suitable screening, which maximize the contribution of the sun's rays both in winter and in summer. The expansion of flats would also be useful to improve the performance of the building in terms of the S/V ratio¹ and the benefits in terms of related energy saving. In sum, the retrofit measures identified represent solutions to specific needs to reduce risk, pursue objectives to improve urban quality and create economic value. The set of measures is organized schematically in Table 1.

OBJECTIVES	RISKS	SOLUTIONS	MEASURES
- Reduction in urban vulnerability	Climatic risks	<u>Drought</u> <u>Water bombs</u> <u>Heat islands</u> Floods	Increase in permeable surface area; catchment systems; rainwater storage and disposal
			Green paving; creation of water courses/storage areas for water; green roofs; blue roofs; construction of safe havens for the disadvantaged; BEMS/Automatic warning systems
	Natural risks	Seismic risk	Improvement in behavior of buildings to earthquake; creation of safe havens
		Volcanic risk	Structural improvement in roof cover for ash loads; creation of water collection sites in case of blockage; creation of ash accumulation sites; creation of safe havens for disadvantaged categories; BEMS/Automatic warning systems; energy self-sufficiency systems
- Improvement in quality of life - Improvement in microclimatic welfare - Energy saving		Improvement in shell insulation; control of natural vegetation; production of renewable energy; optimization of exposure	Screening; solar greenhouses; green roofs; solar chimneys; ventilation chimneys; heat insulation; ventilated walls; replacement of fixtures; replacement of boilers; photovoltaic panels; heat collectors; teleheating; green paving; creation of water courses/water storage sites
- Improvement in urban quality - Economic exploitation			Increase in volume; change in building use

Tab.1 Scheme of retrofit measures for each of the set objectives

1 S/V. A building with a low S/V value is considered desirable energy wise because it has a lower dispersive surface area per unit of usable space.

3 CASE STUDY: ANALYSIS OF VULNERABILITY AND ENERGY CONSUMPTION IN A NAPLES NEIGHBORHOOD

The brief and undoubtedly inexhaustive survey of interventions proposed constitutes a portfolio of possible applications to be combined according to environmental and socio-economic contexts. So as to be able to assess the benefits of such measures, in terms of performance improvement and response at the same time to various needs, the groupwork of the TeMALab laboratory of the Department of Civil, Architectural and Environmental Engineering (DICEA) of the University of Naples Federico II has set up a study to shed light on the links between energy consumption and the physical characteristics of urban settlements (Papa et al., 2106). To undertake such elaborations we chose a neighborhood in a densely inhabited area which, both by supplies and location, has high vulnerability levels: a neighborhood in the city of Naples, one of the most densely inhabited metropolitan areas in Europe, within which an urban environment with homogeneous constructional, settlement and morphological characteristics was identified, namely Rione Gemito in the Arenella neighborhood, a complex of 29 buildings, erected between 1946 and 1948, social building, from a project by Marcello Canino and Alfredo Sbriziolo. Conceived to house the homeless from the Second World War, the complex is designed in a cross-shape where the buildings are arranged lengthwise along two rows either side of a broad tree-lined avenue (via Altamura), according to a late 19th-century pattern of an ordered residential neighborhood (La Gala, 2006).

The building complex was particularly suitable for being studied not only because of the substantial constructional and functional homogeneity of its buildings but also for the possibility of finding information on the levels of risk to which the area is potentially subject. Using in-depth analysis of the documents and studies conducted in this context, a picture was outlined of the possible vulnerability level of the area to several natural risks, namely:

- risks connected to climate change, such as flooding and water bombs: the expected performance of the infrastructure network for rainwater treatment is low and could be insufficient to withstand huge flows, due to exceptional precipitation, far higher than those actually planned for. In particular, the 2000 report on the state of the Naples subsoil, the fruit of a survey conducted by a technical committee appointed by the Municipality of Naples, which analyzes, amongst other things, the state of the Municipal water treatment network, stresses that the sewage of the whole complex of buildings in Rione Gemito ends up in the channel "Arena S. Antonio" (fig. 9), described by the same report as being "insufficient in many stretches, [...] both with regard to flood discharges with a thirty-year return period, and with respect to those with a two-year return period" (Comitato Tecnico, Comune di Napoli, 2000). It appears evident that in such conditions, the system of rainwater disposal will soon no longer be able to withstand increasingly intense water discharges due to phenomena linked to climate change, highlighted in the previous sections;
- seismic risk: a recent study by the Department of Structures for Engineering and Architecture (DIST, ex DAPS) of the University of Naples Federico II, for the purpose of defining criteria for the static control of buildings in reinforced concrete built in Naples in the years 1950-1970, showed the poor static conditions of several buildings in Rione Gemito (tab. 2). In such conditions it may be hypothesized that the performance response of the structures could also be compromised in the presence of low-magnitude seismic events, compatible with the levels expected in the area falling within seismic zone 2, i.e. "zone with average seismic hazard where fairly strong earthquakes may occur" (Decree of the President of the Council of Ministers no. 3274/2003, amended by the Resolution of the Campania Regional Government no. 5447 of 7.11.2002).

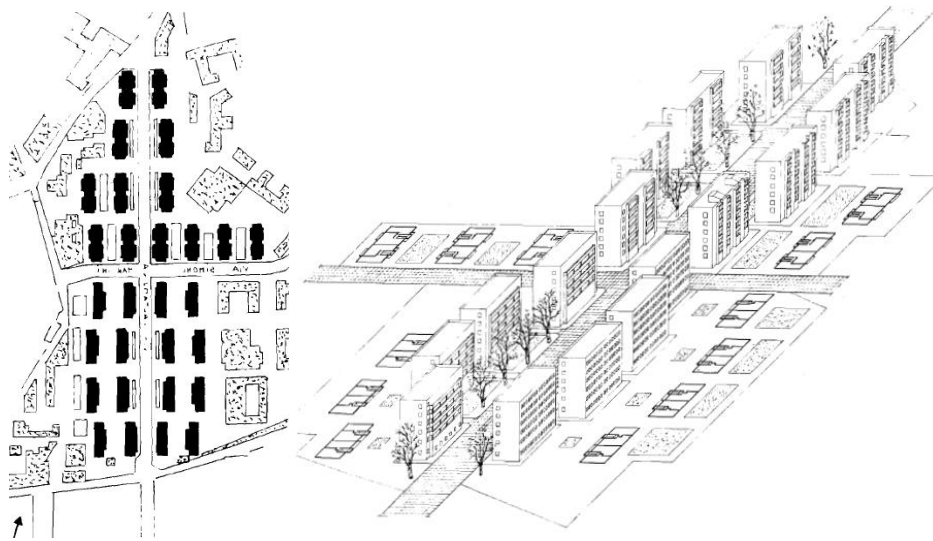


Fig. 4 and 5 Rione Gemito, plan and prospect



Fig. 6 One of the buildings of Rione Gemito



Figs. 7 and 8 Rione Gemito, plan. From: Sergio Stenti, Napoli moderna, città e case popolari 1868-1980, CLEAN edizioni, 1993

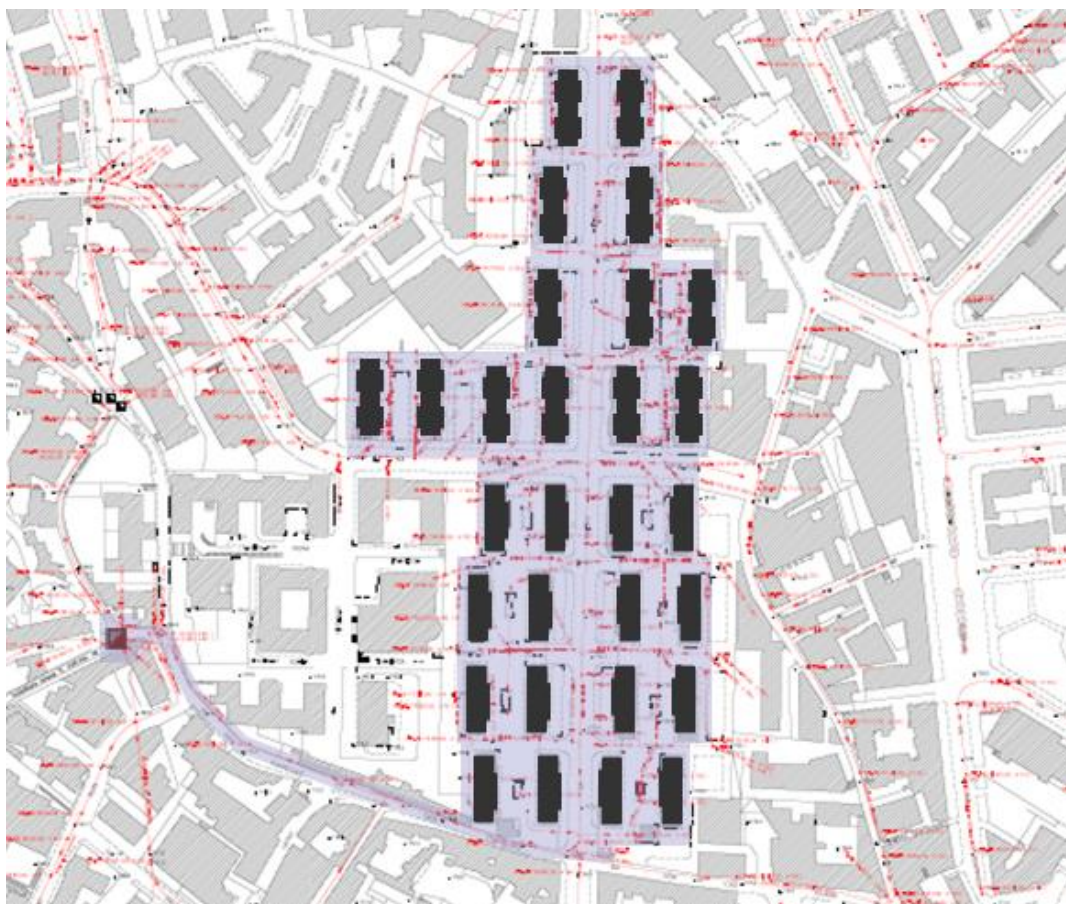


Fig. 9 Plan of the Rione Gemito sewage network

ADDRESS	DAMAGE	DESCRIPTION	MATERIAL
Via Altamura 12 is 19	Plaster detached	Plaster detached on facade	RC
Via Altamura 12 is 19	Plaster detached	Plaster hazardous on outer facade	RC
Via Altamura 1 is 5	Ceiling damaged	Partial collapse of SAP ceiling, detachment	RC
Via Altamura 2 is 28	Ceiling damaged	Damage to SAP ceiling	RC
Via Altamura 2 is 25 sc. H-G	Ceiling damaged	Damage to ceilings	RC
Via Altamura 2 is 24 sc. E	Ceiling damaged	Damage to roofing cover	RC
Via Altamura 14 is 20 scala T	Ceiling damaged	Damage to ceiling	RC
Via San Giacomo dei Capri 21, Sc A	Ceiling damaged	Damage to roofing cover	RC
Via Altamura 2 is 22	Ceilings and pillars damaged	Damage to ceilings, staircase, pillars, cellars	RC
Via Altamura 2 is 27-29	Pillar damaged	Detachment of iron covering	RC

Tab. 2 Classification of damage recorded in the buildings in Via Altamura (Rione Gemito).

- volcanic risk: the Arenella neighborhood falls within the Yellow Zone according to the 2015 Amendment of the National Emergency Planning for Volcanic Risk in the Campi Flegrei and comes within the curve of 10 and 5 cm of volcanic ash accumulation according to the Forecast Scenarios of Possible Eruptions of Vesuvius (INGV, 2012) (fig. 10). In such scenarios, the presence of damage to bearing structures emerging from the DIST study could cause partial or total collapses of roofing, besides causing damage to civil structures, hydraulic systems, the system of rainwater drainage, telecommunications and the electricity network. Moreover, there is the high probability of eruptive events generating other hazardous phenomena, thereby increasing risk factors: we refer, for example, to earthquakes that usually precede and accompany eruptive activity, to *“deposition due to the fallout of dissolved pyroclastites close to steeply sloping areas, to flooding caused not only by intense rainfall but also by the reduction in soil permeability due to the deposit of fine ash emitted during the eruption”* (INGV, 2012).

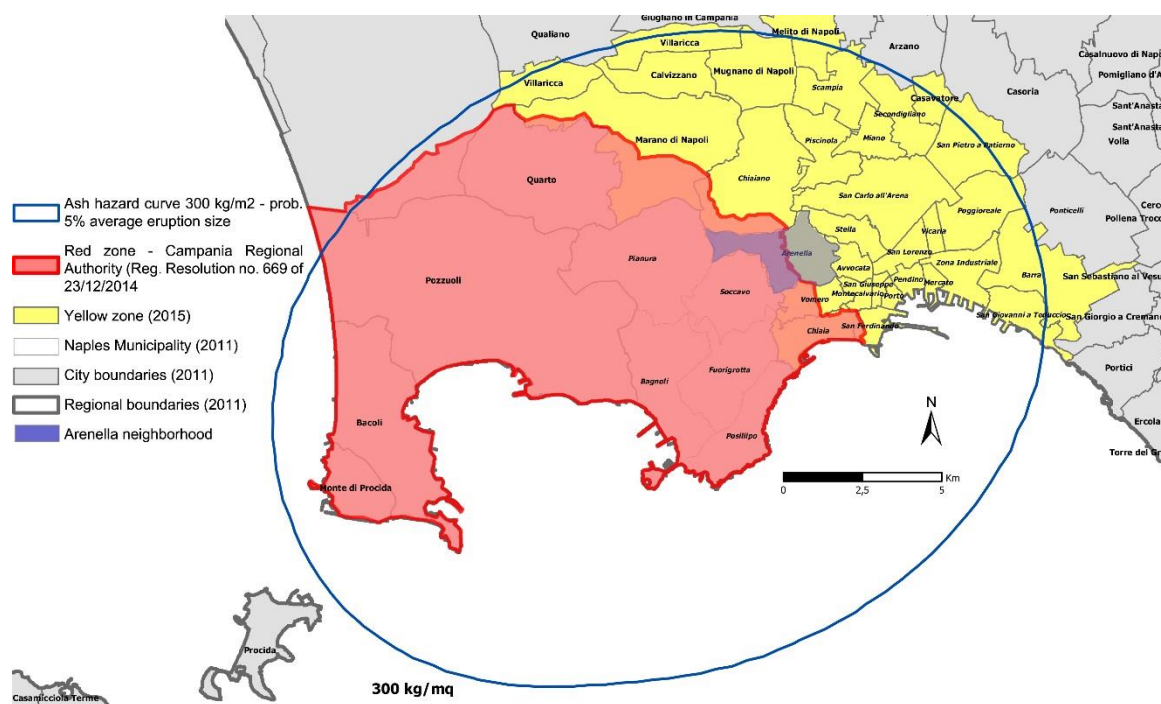


Fig. 10 Campi Flegrei, Map showing the boundary of the "yellow zone"

Analysis of the possible risks to which the study area is potentially exposed leads to identifying measures that require the unified control and management of the project choices to be taken. It is therefore important to stress that one of the fundamental aspects for interventions to be effectively and coherently undertaken is that the area to undergo changes is owned by - or under the control of - a single owner (or group of owners), developers or a public authority. Indeed, only in such circumstance is it possible to carry out an organic project, in which conflict and personal interests are kept to a minimum, and where economic resources may be identified unequivocally. Precisely after such consideration, the choice of case study fell on Rione Gemito, a social housing complex owned by the Istituto Autonomo di Case Popolari of the Naples Provincial Authority. These conditions open the way to a prospect of greater project feasibility, given that the area concerned may undergo public interventions, thereby increasing the property value to the benefit of the State.

3.1 STUDY OF THE RELATIONSHIPS BETWEEN ENERGY CONSUMPTION AND PHYSICAL URBAN CHARACTERISTICS: ANALYTICAL PROCEDURE

In light of the above considerations, with a view to identifying integrated intervention proposals to satisfy different requirements, energy consumption of the area in question needs to be analyzed so as to propose solutions which can pursue the set objectives most effectively. In this context an analytical procedure is proposed, set up by the TeMALab laboratory of the Department of Civil, Architectural and Environmental Engineering (DICEA) of the University of Naples Federico II, in order to investigate the possible implications on energy consumption of specific characteristics of urban areas. The working group carried out a study on the whole neighborhood of Arenella to determine, on the one hand, the possible physical factors which combine to increase or decrease consumption (tab. 4) and, on the other, whether for areas with similar settlement characteristics lower or higher consumption may be achieved than in the whole neighborhood. The analytical procedure in this study was structured in various phases:

- data retrieval and choice of the statistical unit of reference. The set of information extracted primarily from ISTAT sources or from calculations using data supplied by local authorities was arranged and organized with respect to the statistical unit of reference identified in the census block;
- georeferencing of information relative to the physical characteristics of the buildings and total and mean consumption of electrical energy and gas by census block;
- choice of environmental variables. Following the arrangement of the information gathered, variables that might allow a better understanding of the area's physical characteristics were calculated. Of these, 29 were then selected relative to the neighborhood's physical, functional, constructional and social characteristics;

	VARIABLES	DESCRIPTION
1	Sup_SEZ_ha	Surface area of the 2011 census block [ha]
2	Sup_cop_edf_res	Covered surface area of residential buildings [ha]
3	Rapp_sup_cop_edf_res_Sup_SEZ	Ratio of residential building covered area by census block
4	Vol_tot_edf_res	Residential building volume total [m3]
5	Dens_Vol_tot_edf_res	Residential building volume total/land surface area
6	Alt_med_edf_res	Mean height of residential buildings [m]
7	Media_N_piani	Mean no. of stories per residential buildings
8	N_abtz	Number of dwelling units
9	Dens_N_stanz	Number of dwelling units in land area/Land surface area
10	N_stanz	Number of rooms
11	Dens_N_stanz	Number of rooms in land area/Land surface area
12	SupAbtzSez	Total surface area of dwellings as at 2001 [ha]
13	Ind_util_res	Land use index for residential buildings (SUL dwellings, Land area)

Tab 4 Part of the list of area variables

- construction of a matrix in which the rows are represented by census blocks and the columns by area variables and energy consumption;
- multivariate statistical PCA analysis (Principal Component Analysis) to identify, from a large number of variables, a small number of so-called latent variables;

- identification of five principal components able to explain about 75% of total variables. These components are represented in the form of axes which express a synthetic index of area variables (tab. 5);
- correlation of physical characteristics with energy consumption through projection of the latter upon the principal components, in their quality as illustrative variables;
- statistical analysis of groups (clustering). The individual census blocks are grouped into five clusters on the basis of homogeneity of values of the associated variables (physical and consumption), with respect to the mean values found in the whole neighborhood;
- identification of the energy consumption component within each group and understanding of its relation to the components of physical characteristics;
- representation of clusters in the area and data interpretation (fig. 11).

The analytical procedure proposed was reiterated after the first results, allowing for different area contexts. Below we illustrate the first results and subsequent calculations which were required with a view to in-depth investigation of the area in question.

VARIABLES	AXIS 1	AXIS 2	AXIS 3	AXIS 4	AXIS 5
Vol_tot_edf_res	0.25	-0.92	0.10	-0.23	-0.05
SupOccRes	0.29	-0.91	0.07	-0.27	-0.02
SupAbtzSez	0.31	-0.90	0.08	-0.28	-0.03
N_stanz	0.31	-0.90	0.07	-0.28	-0.03
N_abitz	0.30	-0.90	0.07	-0.28	-0.04
P2011	0.26	-0.88	0.08	-0.28	-0.01
MediaDiComptz	0.29	-0.37	-0.03	0.50	-0.41
Sup_SEZ_ha	-0.33	-0.29	0.62	0.14	0.03
IGnR	-0.40	-0.22	0.64	0.17	-0.03
GnPR_ok	-0.55	-0.15	0.64	0.20	0.05
Ind_copert	0.69	-0.13	-0.28	0.33	-0.12
raggio di inf# sup# verde	-0.43	-0.11	0.65	0.22	0.13

Tab 5 Part of the tables of PCA referring to the identification of the main axes

3.2 FIRST RESULTS

The objective of the analysis undertaken was to ascertain whether and to what extent energy consumption was determined by area characteristics. From preliminary analysis of the matrix of correlations between physical variables and energy consumption there emerge no direct correlations. By contrast, principal component analysis restores a fairly coherent picture of the area characteristics, defined by “axes” or principal components:

- Axis 1: The first axis presents a variance of 30.26%. Hence it is the axis which supplies the most information on the area. The variables with a significant correlation concern the mean height of residential buildings, density, property value and glass surfaces. This axis may thus be interpreted as describing local building density. It does not present significant correlations with consumption.
- Axis 2: The second axis presents a variance of 23.80% and refers to population variables, number of dwellings and rooms and the surface area of dwellings in the census blocks. It is an axis which may be defined approximately as that which best quantifies the population and dwellings.

- Axis 3: The third axis shows a variance of 9.83% and refers to the variable of green surface area per census block and the surface area in hectares of the block. It may be maintained that this axis yields the quantity of the green surface area vs. the area of the census block.
- Axis 4: The fourth axis shows a variance of 6.71% and presents only one statistically significant value relative to the variable of the mean compactness ratio of residential buildings, understood as the ratio between the surface area of the building shell and its volume.
- Axis 5: The fifth axis has a variance of 4.17%. It does not present statistically significant values.

In order to understand how the physical characteristics described by the above axes are aggregated and arranged in the area and which of these groups have the highest consumption, the second phase in the study, consisting of cluster analysis, allows identification, with a hierarchical algorithm, of five classes (or clusters) which, under an initial interpretation, are defined as follows:

- Cluster 1: Residential areas with medium building density. This group is characterized by medium-size census blocks, with a medium-low density of residential buildings, a low index of area use for residential buildings and consumption slightly above average.
- Cluster 2: Residential areas with high building density. This group identifies smaller census blocks, with a high cover index, high buildings, higher property value and scarce presence of green areas.
- Cluster 3: Residential areas with a high employment index. Falling within this cluster are very small census blocks, with a very high building density and especially a high employment index for residential buildings. The areas in this cluster have higher property values than cluster 2 and present lower energy consumption.
- Cluster 4: Open spaces and squares. This group identifies census blocks that have no buildings. Thus there are no inhabitants resident there and no residential consumption. However, consumption for public lighting, identified by the index of mean annual consumption per area unit, is much higher than the average for the whole neighborhood.
- Cluster 5: Areas of low building density. These are very large census blocks, but with few scattered buildings. They have a high density of green areas and very high energy consumption on average.

From the depiction of the distribution of clusters in figure 11, the study area of Rione Gemito can be identified, divided into four distinct census blocks. Against the homogeneity of constructional and settlement characteristics of the complex of buildings, cluster analysis yielded some seemingly inconsistent results: 2 of 4 census blocks fall in cluster 1 and the other 2 in cluster 2 (tab. 6).

BLOCK	CLUSTER
1	1
2	2
3	1
4	2

Tab 6 Distribution of census blocks by cluster

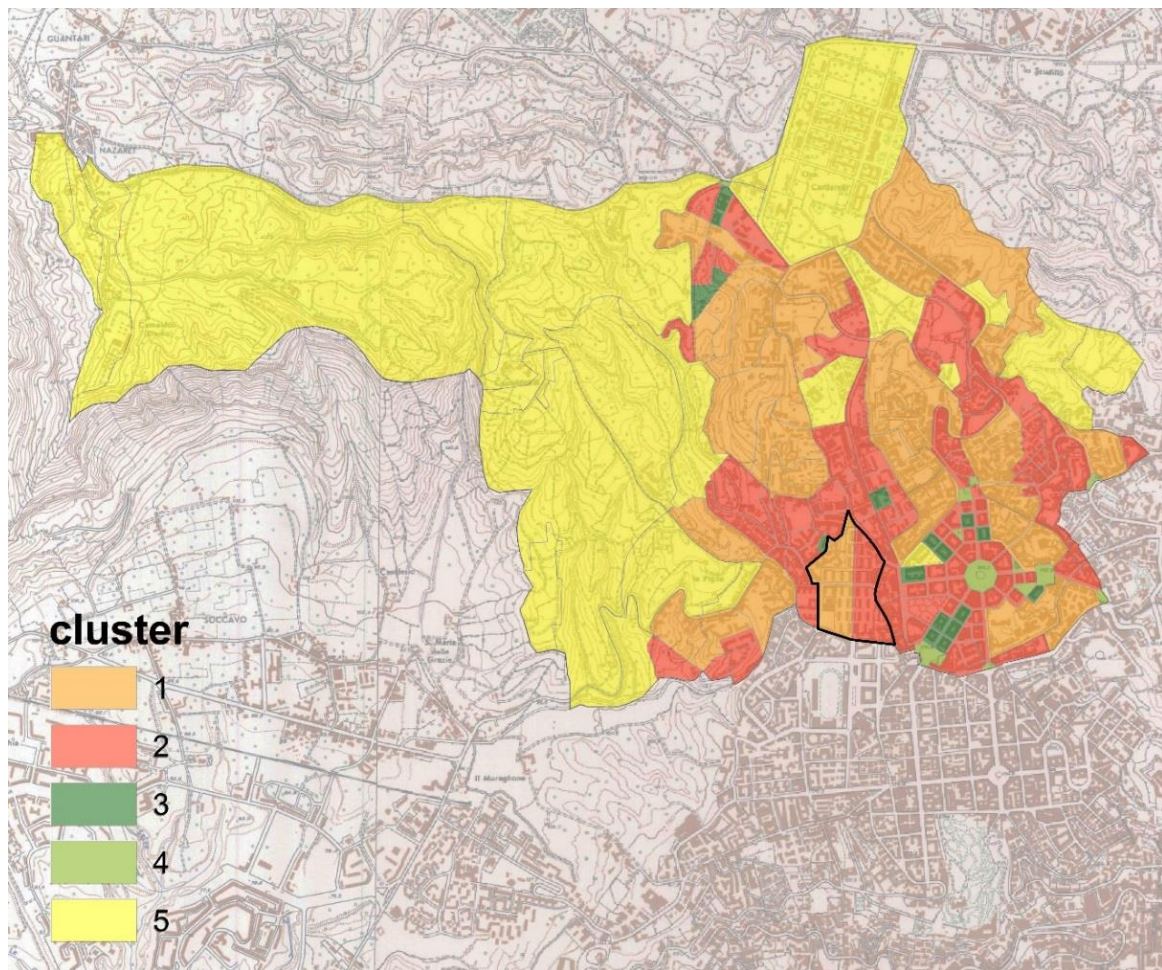


Fig. 11 Representation of cluster analysis in the Arenella neighborhood, Naples

3.3 NEW AREA BOUNDARIES AND DATA REPROCESSING

The values emerging from cluster analysis show dishomogeneity of data for the four census blocks in which Rione Gemito falls. This result highlighted a fundamental aspect: the four census blocks not only comprise the buildings of the Gemito complex, but also a non-negligible number of other buildings differing in shape, number of stories and construction characteristics. This was why we chose to subdivide each of the four census blocks, distinguishing the part of the area containing the complex in question from that occupied by other buildings, thereby obtaining eight new census blocks. These blocks were numbered progressively (fig. 12) which allowed two groups to be distinguished:

- group of "Rione Gemito": 2,3,6,7;
- group of "buildings outside Rione Gemito": 1,4,5,8.

PCA and cluster analysis were then performed once again, this time referring to the eight new census sub-blocks obtained by the subdivision of the original blocks, so as to be able to determine energy consumption values in a context characterized by functional, spatial and territorial homogeneity.

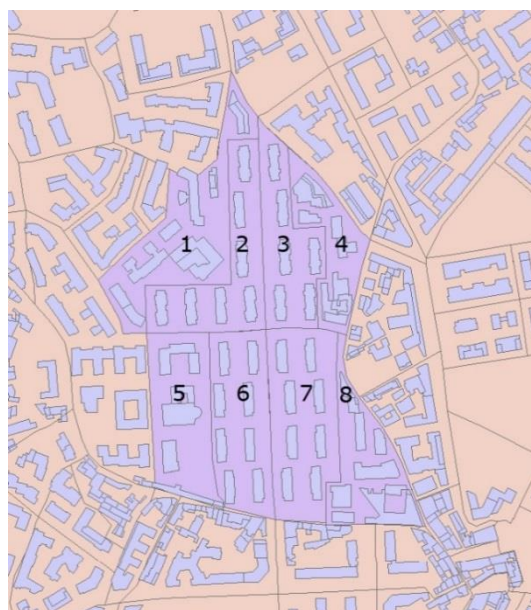


Fig. 12 The 8 subsections of Rione Gemito

3.4 TESTING AND COMPARISON OF RESULTS

Calculations carried out on eight census blocks showed, as hypothesized, a homogeneity of values regarding the individuals of Rione Gemito which all belong to cluster 3. By contrast, the sub-blocks outside Rione Gemito partly fall in cluster 3 and partly in cluster 5 (tab. 7).

In order to understand the results of the analyses carried out, we sought to interpret the distribution by identifying some variables deemed significant for the location of each sub-block in a given cluster.

It should be stressed that the main factors in determining clusters, thanks to which it was possible to envision specific intervention measures, were defined through synthetic interpretation of the results obtained by PCA and cluster analysis for the whole sample of individuals comprising the census blocks of Rione Gemito. In this context, so as to limit the field of interpretation some additional statistical analysis would be necessary, developing the work phases and examining the parameters more rigorously.

BLOCK	CLUSTER	CONTEXT
1	3	External
2	3	Rione Gemito
3	3	Rione Gemito
4	3	External
5	5	External
6	3	Rione Gemito
7	3	Rione Gemito
8	5	External

Tab 7 Distribution of census sub-blocks by cluster

Considering primarily the variables which have most weight in defining cluster 3 (that containing Rione Gemito), highlighted in table 8, it is noted a high area use index of occupied residences (*Ind_util_res_occp*= relationship between the area of occupied dwellings and the area of the block), a high density of residential

buildings (*Dens_N_EdfRes*= number of residential buildings per surface area), high buildings (*Alt_med_edf_res*= Mean height of residential buildings) and high presence of glass surfaces (*Somma_Sup_vetrata*= Sum of glass surfaces in residential buildings) (tab. 7, data highlighted in red). Moreover, the cluster is distinguished by low energy consumption by domestic residential and non-residential unit (highlighted in blue).

CLASSE 3 / 5 (Poids = 18.00 Effectif = 18)						
Variables caractéristiques	Moyenne dans la classe	Moyenne générale	Ecart-type dans la classe	Ecart-type général	Valeur-Test	Probabilité
Ind util res occp	1,179	0,239	0,339	0,365	11,48	0,000
Dens Vol tot edf res	67712,900	14144,500	21577,900	21132,700	11,31	0,000
Dens N EdfRes	4,682	1,086	2,464	1,619	9,91	0,000
Dens N EdfTot	4,682	1,102	2,464	1,616	9,88	0,000
Somma_Sup vetrata	752,877	290,987	229,331	236,780	8,70	0,000
Dens N EdfResCalS	2,922	0,692	2,406	1,212	8,21	0,000
Dens N EdfResMurP	1,600	0,280	2,091	0,871	6,76	0,000
Alt med edf res	26,345	17,672	4,948	9,203	4,20	0,000
Media N Piani	8,778	5,947	1,635	3,050	4,14	0,000
h media tot	24,678	17,582	5,943	7,946	3,98	0,000
Dens	9,056	6,477	2,168	3,756	3,06	0,001
VAL IMM	4727,780	3776,270	341,249	1452,710	2,92	0,002
D Pop	434,616	298,754	200,300	238,941	2,54	0,006
Somma di Consumo UDR	14839,100	40701,100	7374,720	46662,500	-2,47	0,007
Vol tot edf res	31093,200	80927,100	12031,200	89106,900	-2,49	0,006
Somma di Consumo UDNR1	7229,830	24352,800	5442,200	29213,100	-2,61	0,004

Tab 8 Determinant variables in cluster 3

Representation of the results of the analyses using a Cartesian system in which the x axes and y axes are respectively axes 1 and 2 helps appreciate the distribution of the eight sub-blocks of Rione Gemito along a common axis (fig. 13).

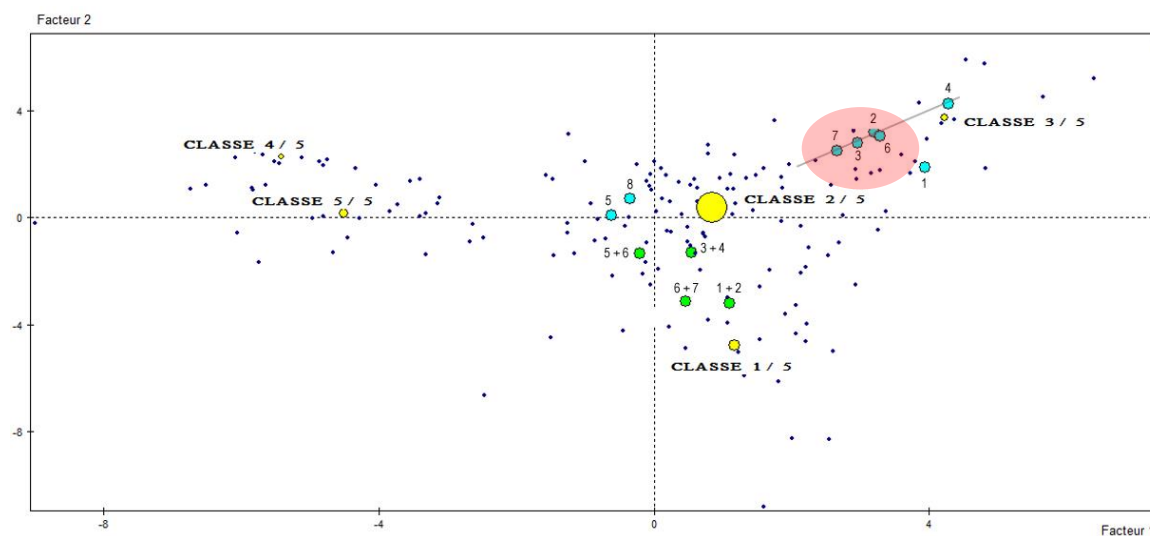


Fig. 13 Distribution of the blocks and sub-blocks relative to Axes 1 and 2

In figure 13 the green circles represent the blocks comprising Rione Gemito and several external buildings, the blue circles represent the sub-blocks obtained following the division, while the group highlighted in red represents the census sub-blocks which comprises only Rione Gemito. What appears evident from the figure is an almost overlap of sub-blocks 2 and 6 and an alignment of sub-blocks 2,3,6, 4 and 7. Further, points 2, 3, 6 and 7, which include Rione Gemito (highlighted in red) are very close to one another. This result may be explained by examining the variables which best characterize cluster 3 (tab. 8 highlighted in red): for the single sub-blocks belonging to Rione Gemito, there emerge very close values as regards the mean height of the buildings (residential and non-residential), total glass surface areas and property density. The values confirm the hypothesis of a close relationship between homogeneity of "physical" parameters and energy consumption, in which height, glass surface areas and building density represent significant aspects.

	Sup_SEZ_ha	Vol_tot_edf_res	Dens_Vol_tot_edf_res	Alt_med_edf_res	Media_N_Piani	N_abitz	N_stanz	SupAbtSez	SupOccRes	Ind_util_res_occ
1	1,527743	120198,848	78677,40058	22,968462	7,615385	222	875	1,7613	1,722671566	1,127592511
2	1,19497	63663,93038	53276,59303	21,374286	7	168	840	1,6128	1,577428434	1,320056934
3	1,018886	54964,42592	53945,60914	21,766667	7	144	720	1,3824	1,351895494	1,326836853
4	0,79225	67458,92354	85148,53081	21,031818	7	126	361	0,7702	0,753204506	0,950715691
5	1,157666	39664,97064	34262,87949	13,135556	4,555556	202	885	1,7641	1,683604654	1,454309494
6	1,22411	62032,50429	50675,59638	21,115	7	192	960	1,8432	1,759095346	1,437040254
7	1,464064	63775,73122	43560,75364	21,385	7	192	960	1,8432	1,790727478	1,223121037
8	1,009956	56099,12522	55546,10817	12,946429	4,214286	79	125	0,1766	0,171572522	0,169881185

Dens_N_EdfTot	Dens_N_EdfRes	Dens_N_EdfNRes	Dens_N_EdfResMurP	Dens_N_EdfResCalS	Somma_Sup_vetrata	MediaDiComptz	GnPR_ok	Dens
5,236482838	5,236482838	0	0,65456035	4,581922483	155,598834	0,292312042	0,057225	7,867740058
5,857887646	5,857887646	0	5,85788765	0	204,54	0,293683997	0	5,327659303
5,888784417	5,888784417	0	0,98146407	4,907320348	175,32	0,29873286	0	5,394560914
7,573366993	7,573366993	0	0,00000000	7,573366993	131,896817	0,363558101	0	8,514853081
2,591421014	1,72761401	0,863807005	0,00000000	2,591421014	42,44197	0,254161683	0,174467	3,426287949
6,535360384	6,535360384	0	1,63384010	4,901520288	226,8	0,29959786	0	5,067559638
5,464242	5,464242	0	4,09818150	1,3660605	200,8	0,296283361	0	4,356075364
8,911279303	5,940852869	2,970426434	0,00000000	8,911279303	19,290917	0,337757979	0	5,554610817

h_media_tot	Ind_copert	raggio di inf# sup# verde	GnR	Asp_ratio	P2011	D_Pop [ab/ha]	Lumen_sup [lm/ha]	cons_sup [Mwh/Kmq]	VAL_IMM	d_Pop_1
22,968462	0,316362828	6011,60419	0,39350	2,259665	673	440,7809429	36655,37986	202,91371	4300	146
21,374286	0,249264413	2008,549299	0,16808	1,089884	510	426,4542206	130547,2104	736,4201612	4300	111
21,766667	0,247887156	0	0	1,590446	292	286,8492321	160960,1074	745,9126929	4300	147
21,031818	0,383831973	0	0	1,818532	256	322,7937309	111580,9404	570,5269801	4300	129
13,135556	0,159784558	6872,391727	0,59364	0,848828	396	341,8921816	69622,84459	472,675193	4300	147
21,115	0,239983337	1872,104695	0,15294	0,896366	376	307,3278102	132014,2798	741,7634036	4300	140
21,385	0,20385362	0	0	0,86172	431	294,2222113	94804,59871	501,3442035	4300	213
12,946429	0,426675687	0	0	0,862306	177	175,4926476	24951,58205	124,7579102	4300	88

Tab9Table summarizing values calculated for the eight reference sub-blocks

Another consideration concerns the overlap of points 2 and 6: in this case it is the parameter relative to the radius of influence of the green area which supplies a possible interpretation: from the values of this indicator (highlighted in blue in tab. 8) and the area representation obtained thanks to GIS calculations (fig. 14), the presence of two green areas behind sub-blocks 1-2 and 5-6 appears significant.

In light of the results obtained, it emerges that the presence of greenery affects the behavior of blocks 2 and 6, with reference to "physical" and "energy" parameters, so much as to cause an almost complete overlap of the points in the graph.

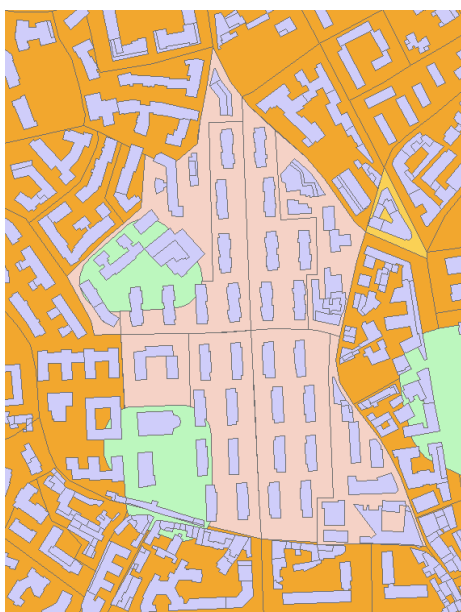



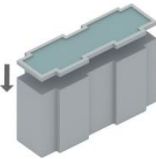

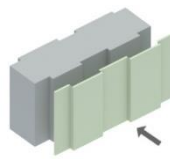
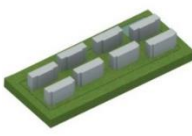
Fig 14 Radius of influence of green areas in Rione Gemito

3.5 INTERVENTION PROPOSALS

Following what emerged from the statistical analysis carried out, it may be suggest that there are some construction, settlement and area characteristics in Rione Gemito which may affect, more than others, determination (hence containment) of consumption. They may be briefly grouped as follows:

- index of land use;
- mean height of residential buildings;
- glass surfaces;
- construction type;
- radius of influence of green areas.

The intervention proposals designed to reduce energy consumption should thus have to take these factors into account so as to improve the overall performance of the area. Moreover, in relation to the points made in the previous sections regarding urban vulnerability, the interventions to be proposed should have to target adaptability to climate change and the reduction in seismic and volcanic risk. The possible interventions which might be hypothesized for Rione Gemito are shown in Table 10. For each of the factors listed measures to adopt were identified and some considerations on their feasibility were formulated. As regards the index of area use, an increase in area occupied by buildings might be hypothesized which, besides having benefits on the reduction of consumption, would also allow value to be created following the realization of extra rooms. However, despite the possible benefits, this intervention was considered inappropriate for Rione Gemito by virtue of the high index of current area use and the complexity of intervening in an urban fabric strongly characterized by strongly marked-out axes. By contrast, interventions on building roofs could be taken into consideration, envisioning operations on raising vertical structures or on foundations, to increase the capacity of the whole system. Depending on the case, various interventions could therefore be envisioned: from insulation of the roofing, to construction of a roof garden or an area of water, to building an additional floor. These interventions are deemed particularly strategic for the potential beneficial effects in various respects: reduction in energy consumption, containment of the effects of climate change, reduction in vulnerability to volcanic and seismic risk, improvement in the perceived quality of the context and creation of economic value.

FACTORS	INTERVENTION TYPE	OBJECTIVE	APPLICATION	INTERVENTION FEASIBILITY
Index of area use	Increase in building area	Reduction in energy consumption per m ² , economic benefits		NO
Mean height of residential buildings	Creation of an extra story/cover rebuilding	Reduction in energy consumption per m ² , improvement in cover resistance in the event of ashfall, mitigation of climate change effects		YES
Glass surfaces	Building of solar greenhouses /suitably screened winter gardens, with or without an increase in volume	Reduction in energy consumption per m ² , mitigation of climate change effects, economic benefits		YES
Construction type	Interventions on building shell: insulation/ventilation of facades; creation of outer support structures to increase the building's resistance	Reduction in energy consumption per m ² , mitigation of climate change effects, increase in structural resistance in an earthquake		YES
Radius of influence of green areas	Increase in green areas in the roofing, in the facade and in public urban areas, creating of water collection sites	Reduction in energy consumption per m ² , mitigation of climate change effects, increase in urban quality and appreciation of property value		YES

Tab. 10 – Summary of possible interventions for Rione Gemito

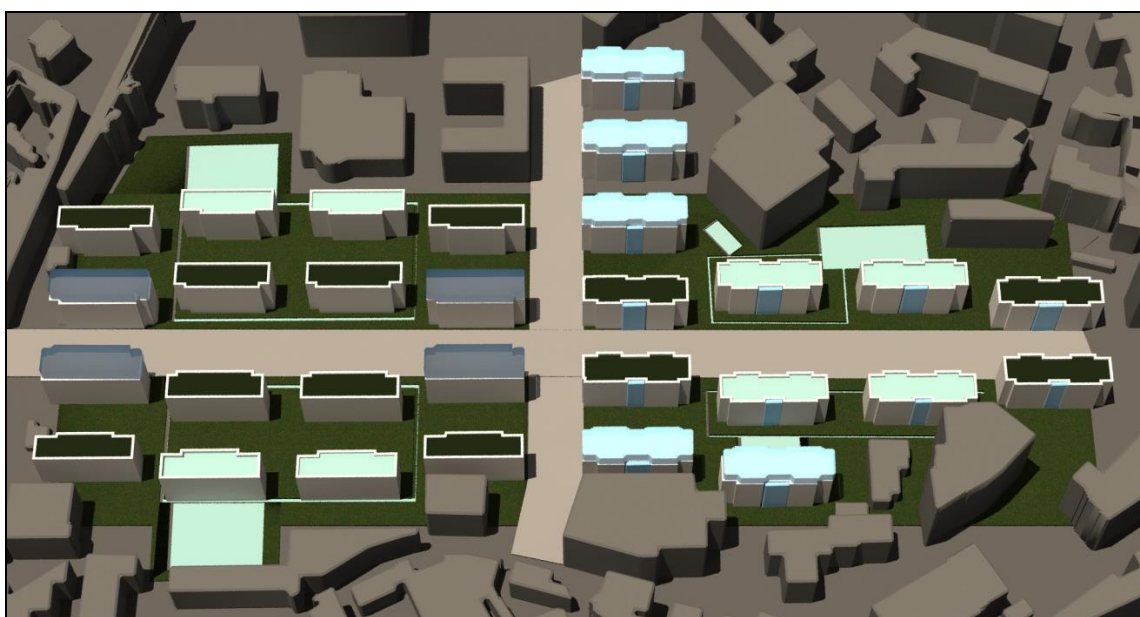


Fig 15 Schematic representation of the combination of interventions proposed in Rione Gemito

As regards the presence of glass surfaces on the facade, a possible intervention comprises south-facing solar greenhouses/winter gardens which, if properly designed, could confer many benefits both in terms of a reduction in consumption and attenuation of sharp changes in temperature. However, it should be borne in mind that in climatic contexts like those in Naples, such interventions may not be necessary, or they may even create negative temperature effects, which is why one needs to evaluate carefully when and in what way measures should be implemented. With reference to the construction type of the buildings, interventions are proposed on vertical closures, given the levels of the transmittance of the building shell and the possible presence of thermal bridges. Such operations may be combined with interventions on elevation structures so as to obtain at the same time interior temperature benefits and improvements in the seismic response of the whole building.

Finally, it is felt that increasing the presence of green areas is the intervention which would confer greater benefits in terms of the environmental quality of the urban contest and an increase in property value in the whole study area. The results obtained by the present study demonstrated the importance of creating larger green areas than the small flower beds to confer microclimatic benefits and reduce energy consumption in the whole area. In addition, we propose the creation small pools and water courses, whose movement may be fed by photovoltaic panels integrated within the urban furniture, so as to mitigate and prevent the heat island effect, function as storage sites on the occasion of abundant rainfall and, at the same time, improve the urban quality of public spaces.

5. FUTURE RESEARCH DEVELOPMENTS

This paper sought to highlight the possibility of identifying integrated strategies to optimize the ever-diminishing supply of resources at the disposal of municipal authorities in order to maximize benefits in terms of reducing energy consumption, reducing urban vulnerability, and improving the quality of the building stock whilst enhancing its value. The intervention proposals were formulated to be grafted onto a theoretical context consisting of the set of recent scientific research developments in very disparate disciplines. This contribution may thus constitute a speculative support to set up a *masterplan* of concrete interventions, within which the times, costs and suitable technologies are established. The attention paid in this article to the importance of tackling the complexity of the issues within a holistic framework underlines the original, disseminating nature of the contribution and opens the way to future testing in greater depth. In this sense, although the calculations yielded some significant results, further statistical exploration would be desirable, setting up a more rigorous methodology, which could make the analytical procedure more scientific. Indeed, the research procedure was carried out through two kinds of analysis: the ACP and Clustering, which provide such valid results in terms of correlations between physical parameters and energy consumption. These two analysis were repeated twice: while the first calculations produced no particularly relevant findings, their reiteration provided some significant results. The interesting datum emerging from the comparison of the two elaborations is that the homogeneity of constructive characteristics of buildings plays a determinant role in the correlations of variables and consumptions: actually, it emerged that the more the buildings are similar in terms of physical parameters, the more the correlations are evident. In this context, it would be worth applying the analytical procedure to a less homogeneous area in terms of construction, settlement type and land area than the neighborhood in question. Such an extension would help validate the proposed methodology. In this context, selecting a sampling area characterized by dishomogeneous buildings, preferably threatened by different risks or of different intensity than those identified in Rione Gemito, may provide interesting insights for a different selection of measures to combine each other.

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IMAGE SOURCES

Fig. 1: Rotterdam Adaptation Plan.

Fig. 2 and 3: Chelseacreack (London). Photo taken by Chiara Lombardi and masterplan.

Fig. 4 and 5: Sergio Stenti, Napoli moderna, città e case popolari 1868-1980, CLEAN edizioni, 1993.

Fig. 6: DICEA archive of the University of Naples Federico II.

Fig. 7 and 8: Sergio Stenti, Napoli moderna, città e case popolari 1868-1980, CLEAN edizioni, 1993.

Fig. 9: Centro Studi PLINIUS, University of Naples Federico II.

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A RANDOM WALK DOWN MAIN STREET

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ABSTRACT

US suburbs have often been characterized by their relatively low walk accessibility compared to more urban environments, and US urban environments have been characterized by low walk accessibility compared to cities in other countries. Lower overall density in the suburbs implies that activities, if spread out, would have a greater distance between them. But why should activities be spread out instead of developed contiguously? This brief research note builds a positive model for the emergence of contiguous development along "Main Street" to illustrate the trade-offs that result in the built environment we observe. It then suggests some policy interventions to place a "thumb on the scale" to choose which parcels will develop in which sequence to achieve socially preferred outcomes.

KEYWORDS:

Keywords: Accessibility; Land Use; Pedestrian Environment; Sprawl; Development.

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沿主干道漫步

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摘要

美国郊区的特点通常是步行便利性不如更加城市化的环境，而美国城市环境的特点是步行便利性不如其它国家的城市。郊区较低的整体密度意味着，如果要分散进行开发活动的话，活动之间的距离将变得更大。但是，为什么要分散开发而不是进行相邻开发呢？这份简要研究笔记建立了一个针对“主干道”沿线出现的相邻开发的积极模型，从而阐明了造成我们观察到的建成环境的取舍。随后本文将建议进行一些政策干预，从而能“施加影响力”，选择将按照何种方式开发哪些地块，从而实现社会优先的结果。

关键词：

便利性、土地利用、步行环境、无计划扩张、开发。

1 INTRODUCTION

There are many definitions of “sprawl”; one common feature is the description of “leapfrog” development (Ewing et al., 2003, Galster et al., 2001, Gillham, 2002, Sutton, 2003, Whyte, 1958). Leapfrog development, named after the children’s game, consists of pockets of development separated by green fields of undeveloped land. This occurs for a variety of reasons, some random, some to do with preferences for developers or future landowners for land which is adjacent to undeveloped parcels, giving the feeling of more space. In the case of commercial structures, Leapfrog and low density developments provide space for surface parking.

Leapfrog patterns are a temporary phase in process of land development, as the parcels that are leapt over are likely to be developed later as their value increases. But as a temporary phase, it may last a long time, depending on the pace of development and depending on the desire of developers (and their prospective customers) to maximize spaces between subdivisions.

One of the major costs associated with leapfrog development are the added costs of infrastructure provision. More infrastructure is required to connect the same number of people than in a compact arrangement. This has long been identified as a “cost of sprawl” (Harvey and Clark, 1965). Another major disadvantage that leapfrog developments poses is a reduction walk accessibility. Leapfrog development runs against preferences for more walk accessibility to destinations (shops, jobs, schools). Local accessibility is naturally hindered by leapfrog development patterns which increase the space (and thus distance) between development.

The past decade there has seen a resurgence in both the use and the study of alternative forms of transportation, including walking (as well as cycling, car sharing, and public transit, which have similar issues). Though walking is generally regarded as a distinct mode, it also forms an important component of trips made using other modes. This is most apparent in the case of public transit: before boarding and after alighting from a bus, streetcar, or train, every passenger is a pedestrian. For this reason, a deeper understanding of the spatial patterns of walk accessibility can also contribute to planning and research of public transit. Similarly, bike and car-sharing systems generally require walking trips to and from vehicle storage locations, and extended distances pose a disadvantage to bicycling compared to motorized transportation.

Imagine, for instance, trying to walk from Uptown (as shown in the southwest corner of 1) to Downtown (in the northeast corner of the Figure) in Minneapolis. While Uptown and Downtown are locally very walkable, one cannot easily or pleasantly travel between them on foot. In this case, the Lyndale/Hennepin/I-94 junction presents both a physical and a psychological barrier to walking trips due to the discontinuity of pedestrian infrastructure and the low quality of the environment for non-motorized travel. Even without that, however, once developed, now undeveloped surface parking lots create an unpleasant contiguous path on the south end of Downtown.

Even more than cities, suburbs have significant walk accessibility issues. As shown in Figure 2, the Arbor Lakes area of Maple Grove Minnesota has short areas of pleasant walking environment surrounded by surface parking lots. Barriers such as this are, in general, readily apparent when encountered by pedestrians. But because they are difficult to identify systematically and because no standards exist for evaluating their impacts, planning for pedestrian infrastructure is often difficult to justify in comparison to auto infrastructure, for which exists nearly a century of technical methodology and guidance.

Based on casual empiricism (anecdotal evidence), it seems that many US cities could be described as comprising islands of walk accessibility. 3 shows this for the Minneapolis-St. Paul region. While there are pleasant neighborhoods and districts to walk in, there are significant gaps of low walk accessibility that discourage walking between them. This would be even more apparent at the 5 minute or 2 minute level.

As part of a larger research project looking at the influence of site design in encouraging walking using pedestrian volume data from twelve neighborhoods around commercial centers in central Puget Sound region (Hess et al., 1999, Moudon et al., 1997), Hess (1997) used measures of street network connectivity to explain

the differences in pedestrian flows between neighborhoods in the Seattle area. In addition to typical measures, such as the amount of land devoted to right-of-way and walking environments, the length of the sidewalk systems and the amount of land devoted to automobiles, three measures were estimated to understand the street network characteristics. The first measure, called the pedestrian route directness, estimates the ratio of the pedestrian network distance to the straight line distance between the origin and destination. The walking shed or the walking distance contour used to identify the half-mile buffer around a place reachable by walk, is defined as the second measure. The final measure, named effective density, estimates the ratio of number of housing units within the walking shed divided by the area of the buffer.

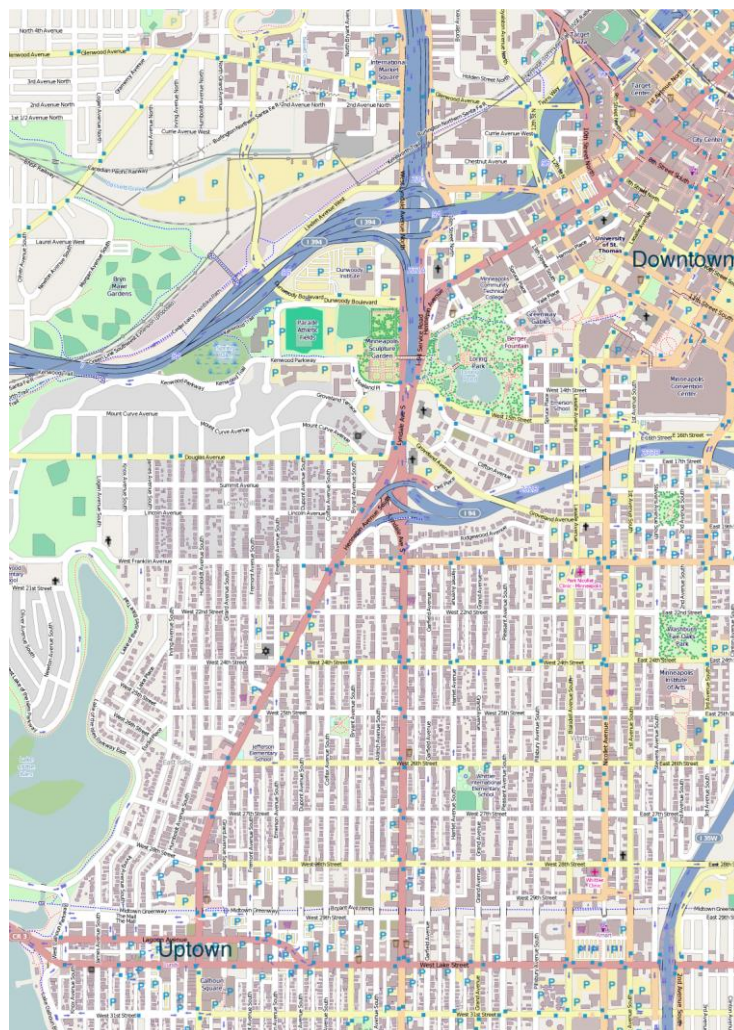


Fig. 1 Street and Building Map of Downtown to Uptown Minneapolis

Dill (2004) presented results from a research project evaluating various measures of network connectivity for the purposes of increasing walking and biking. The research objective was to identify connectivity measures used in various fields such as transportation, urban planning, landscape ecology and geography and evaluate these measures for their potential in promoting walking and biking.

Clearly connectivity is an important aspect of walk accessibility, but adjacent activity is also important, not just for generating demand, but for creating visual interest for those walking past. For instance, we might hypothesize that, all else equal, walkers prefer walking past something interesting than something barren, and thus, all else equal, interesting places will generate more pedestrians.

Though it is frequently discussed, specific definitions of “walkability” vary. There is general agreement, however, that walkability is fundamentally determined by two factors: the availability and quality of pedestrian infrastructure, and the qualities of the environment in which that infrastructure exists. It is intuitive that in isolation, neither of these factors is sufficient to create a fully walkable environment. Candidate variables include:

- Type of infrastructure (sidewalk, unpaved sidewalk, paved trail, unpaved trail, etc.)
- Condition of infrastructure
- Width, traffic volume, and speed of adjacent street, if any
- On-street and off-street parking
- Crash rates
- Roadway intersection geometry and signage
- Presence and type of traffic buffering (boulevard, parking lane, bike lane, etc)
- Tree canopy coverage
- Adjacency to water features
- Characteristics and condition of adjacent landscaping
- Qualities of and distance to adjacent building facade (setback)
- Type and variety of adjacent land uses (walk accessibility to destinations)

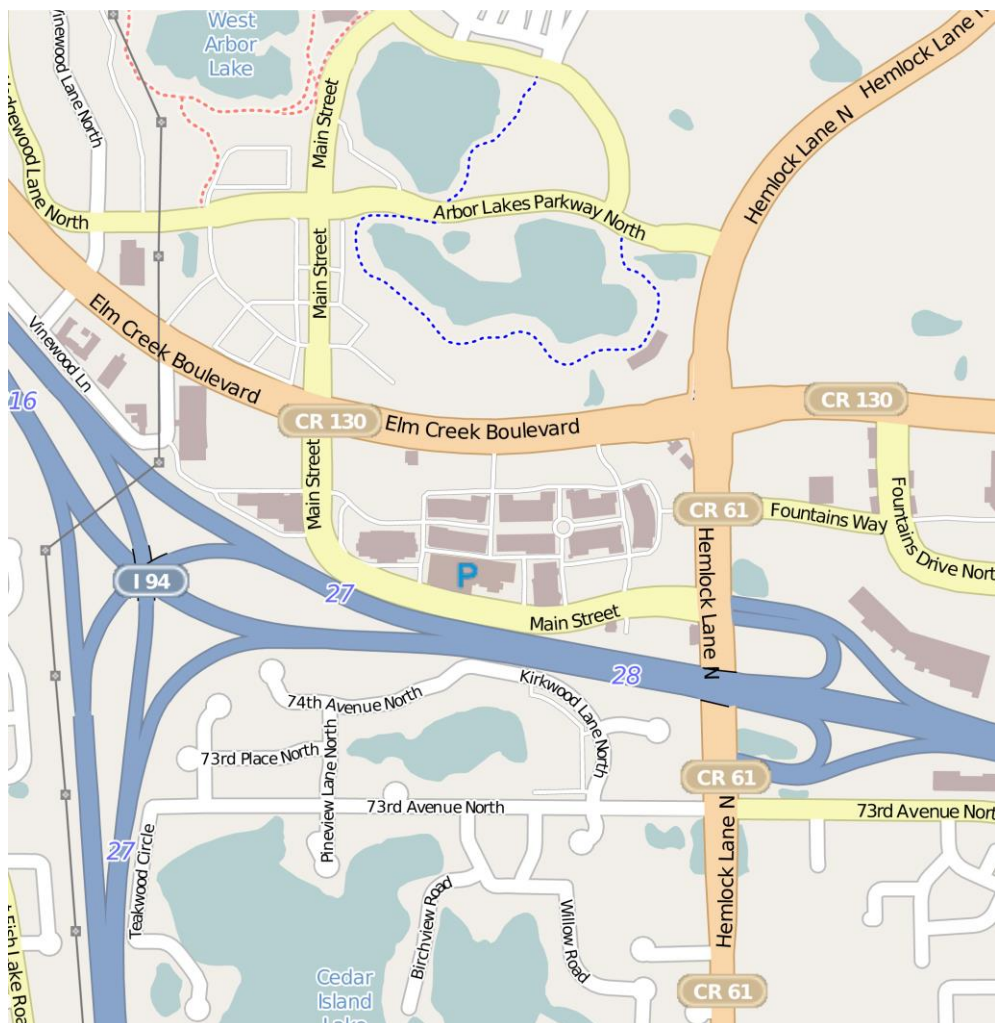


Fig. 2 Street and Building Map of Maple Grove

Considering all of these is the job of an empirical model. The conceptual model presented herein focuses on the last, can destinations be easily reached by walking? To be clear, walk accessibility is just one important aspect of what the literature refers to as walkability. There are many things that are close together, but unpleasant US suburbs have often been characterized by their relatively low walk accessibility compared to more urban environments, and US urban environments have been characterized by low walk accessibility compared to cities in other countries. Lower overall density in the suburbs implies that activities, if spread out, would have a greater distance between them. But why should activities be spread out instead of developed contiguously? This brief research note builds a quite simple model of Main Street to illustrate the trade-offs that result in the built environment we observe, and suggests some policy interventions to place “a thumb on the scale” of the decision about which parcels will develop in which sequence to achieve socially preferred outcomes.

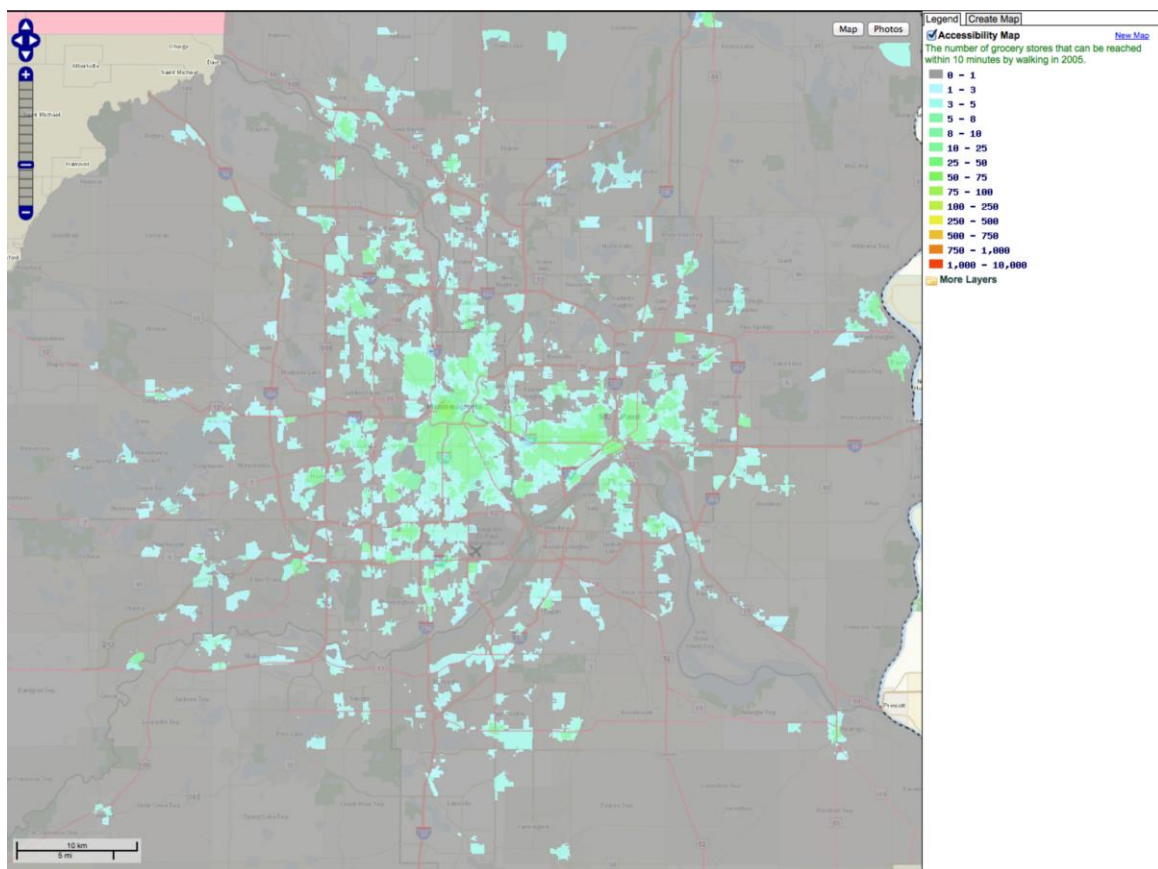


Fig. 3 10 minute Walk Accessibility to Grocery Stores in 2005. (Number of stores that can be reached in 10 minutes by Census Block)

2 MODEL OF MAIN STREET

We start with a linear model (Main Street). We have a community with 9 blocks strung out on a road (north to south). The center block has some exogenous regional accessibility advantage (it is a port, or has more direct access to a regional highway, or some other feature). Accessibility to the rest of the region (R) declines with distance from the center. Initially all blocks are undeveloped. Then blocks are developed in sequence. The model runs through the event where eventually all blocks are developed (the model is indifferent to the actual time this takes, only the sequence). In practice there may be long durations between developments (and though we will never see the end of time, there is no guarantee every block will eventually be developed). With long timespans between developments, determining contiguity over the sequence of development is that

much more important to understand the cumulative accessibility over long time spans. If adjacent blocks are developed, then they form a walkable cluster. If non-adjacent blocks are developed, pedestrians must walk at past at least 1 undeveloped block to reach the next development. A walk accessibility score is used which is based on the number of developed adjacent blocks. Simply put, when the market values walk accessibility (L_i) relatively highly compared to space (S_i), then developments will cluster immediately and all development will be in a walkable neighborhood. However when the market does not value walk accessibility, development will be haphazard, and high levels of walk accessibility will not emerge until a large fraction of blocks are developed. If costs of infrastructure (C_i) are relatively high, developers will similarly build contiguously, while if they are low (or borne by others), developers have less incentive to create continuous wholes. This model illustrates the kind of early stage suburban development in many outer ring suburbs. While many have walkable blocks, those blocks remain unconnected, separated either by undeveloped parcels or giant parking lots as an interim land use. The utility (U_i) of developing on a particular parcel is given by its benefits and costs:

$$U_i = \alpha R_i + \beta S_i + \gamma L_i - C_i + \epsilon$$

α is the value of regional accessibility (R_i), and is highest in the center and lowest at the edges.

β is the value of adjacency to empty space (S_i)

γ is the value of adjacency to neighbors (L_i), and is a measure of local accessibility

ϵ is an error term to account for misperception on the part of developers.

The market finances development in the block with the highest perceived utility $Max(U_i)$.

If infrastructure costs are borne by the developer, building adjacent to existing development minimizes the additional costs of infrastructure. In contrast, if infrastructure is built by the community in advance, this constraint on development is relaxed. If the developer's customers (future landowners) value being near their neighbors (either because they like other people, or because they like the amenities that are associated with other customers, e.g. shops, schools), that positively affects contiguity. In contrast, if future landowners prefer being away from neighbors, because they prefer to be near green space, or because they are simply anti-social, that negatively affects contiguity. While people certainly want to be near jobs and amenities (otherwise why would cities exist), there is evidence that people prefer space to being near neighbors. If people wanted to be near both people and jobs, cities would look like points, with no undeveloped space. This tension is what gives cities an interesting spatial configuration. The simulation applies a logit model of the Utility to each of the remaining available parcels (a Parcel Choice model), and uses a Monte Carlo process to randomly draw one parcel for that iteration. That parcel is developed, and the iteration is incremented. The process is repeated until all parcels are developed. Because in this simulation, $L_i = S_i$, without loss of generality, let $\beta = 0$. In the simulation, we set $\alpha = 1$. To simulate pre-provisioning of infrastructure, $C_i = 0$. Since regional accessibility varies only a little bit over the 4 block distance from the center of the region, the importance of R_i appears most significantly when breaking ties between which parcel to develop when local accessibility and adjacent space are otherwise near equal. In implementation, the error term is simply coded as a random number [0,1]. The error term breaks ties in an otherwise deterministic simulation (should the development occur north or south of Main Street, e.g.). The performance measure is walk accessibility which is defined as

Local accessibility for cell i is given by:

$$L_i = \sum_j O_j D_{ij}$$

where:

$O_j = 1$ if cell j is developed, 0 otherwise $D_{ij} = 1$ if cell j is within 2 cells of cell i in either direction, 0 otherwise. The resulting overall time and person-weighted accessibility.

$$A = \sum_t \sum_i (L_i * O_i)$$

where:

t indicates the iteration round.

3 RESULTS

The results present 3 scenarios $\gamma > 0$, $\gamma = -1$, $\gamma = -5$ in Figure 4. The vertical-axis of the graph is space, with the center (highest regional accessibility point) denoted by 0, and other blocks denoted by number of streets north or south of the center of the town. The horizontal-axis of the graph is time. Each iteration is a round of development. One block is developed each round. Developed blocks are colored red (and have a 1 in them). Undeveloped blocks are colored white (and have a 0 in them).

0	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7	Iteration 8	Iteration 9	Iteration 10
4	0	0	0	0	0	0	0	0	1	1
3	0	0	0	0	0	0	1	1	1	1
2	0	0	0	1	1	1	1	1	1	1
1	0	1	1	1	1	1	1	1	1	1
0	1	1	1	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1	1	1	1
2	0	0	0	0	1	1	1	1	1	1
3	0	0	0	0	0	1	1	1	1	1
4	0	0	0	0	0	0	0	1	1	1

-1	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7	Iteration 8	Iteration 9	Iteration 10
4	0	0	0	0	0	0	0	0	1	1
3	0	0	0	0	0	0	0	1	1	1
2	0	1	1	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1	1	1	1
0	1	1	1	1	1	1	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1
2	0	0	1	1	1	1	1	1	1	1
3	0	0	0	0	0	0	1	1	1	1
4	0	0	0	0	0	1	1	1	1	1

-5	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7	Iteration 8	Iteration 9	Iteration 10
4	0	0	0	0	1	1	1	1	1	1
3	0	0	0	0	0	0	0	0	1	1
2	0	1	1	1	1	1	1	1	1	1
1	0	0	0	0	0	1	1	1	1	1
0	1	1	1	1	1	1	1	1	1	1
1	0	0	0	0	0	0	1	1	1	1
2	0	0	1	1	1	1	1	1	1	1
3	0	0	0	0	0	0	0	1	1	1
4	0	0	0	1	1	1	1	1	1	1

Fig. 4 (a) Time-space diagram of Main Street, $\gamma > 0$. Minimally dispersed development path on Main Street. (b) Time-space diagram of Main Street, $\gamma = -1$. Mixed development path on Main Street. (c) Time-space diagram of Main Street, $\gamma = -5$. Maximally dispersed development path on Main Street

By iteration 9, all 9 blocks are developed in all 3 scenarios, and the communities are identical. However in the preceding years the development takes a different path to get there, meaning in the interim years, there are different levels of walk accessibility. For instance if one could walk 2 blocks in 5 minutes, how many of the blocks that you are on, and plus and minus 2 are developed (the operation definition of L_i). From the center block, scenario (a) minimally dispersed in the first iteration you can get to 1 block, the second iteration you can reach 2 blocks, and so on, until the fifth iteration when you can reach a maximum of 5 developed blocks. This is obviously lower at the edges of the developed area.

In contrast, for the maximally dispersed scenario (c), the first iteration still has accessibility of 1, the second iteration has an accessibility of 2, the third has an accessibility of 3, but the fourth still has an accessibility of

3, as does the fifth iteration. Finally in the sixth iteration the accessibility increases to 4 and the seventh it increases to 5. If we employ the idea of person and time-weighted accessibility summed for all developed cells (A), scenario (a) scores 212 while scenario (b) (mixed) scores 206 and scenario (c) scores 188. This 12 percent loss in accessibility may seem small. Clearly it varies by definitions and the spatial extent of the model, but it illustrates how non-contiguous development loses accessibility. When γ is strongly positive, local accessibility matters, and development is contiguous. When γ is strongly negative, local accessibility is a negative, people do not want to be near neighbors, and development follows a leapfrog pattern until contiguous development is required by land availability considerations. This begins to occur around the middle of the development pattern, as infill nearest to the center takes place first after the checkerboard pattern is played out. This transition from non-walkable to walkable is a phase shift, and takes several iterations to occur in this geometric configuration. When γ is near zero, a mixed pattern occurs.

4 DISCUSSION

We observe discontinuity in our urban environment. The model suggests that is a temporary (though perhaps long-lasting) stage of development which will be filled-in as demand for development increases (exogenously) while space remains finite. However, it also suggests that by increasing the costs of development (by charging development more for infrastructure), by increasing the value of local walk accessibility, or decreasing the preferences for space or parking, we will get a more contiguous built form from the outset.

There are several key points:

1. Pockets of development in places like Maple Grove indicate that individual developers are capable of creating pleasant small walkable places with fine grained streets. The resultant pattern indicates current rules and market preferences don't demand integrating these pockets to create larger walkable districts.
2. Contiguity is an important consideration. If everyone were driving, leapfrog development would not be a problem since there is a small fixed cost of getting in the car and a variable cost of driving. If you want people to walk, it is a problem, since the variable cost increases significantly with distance.
3. Pre-provisioning of infrastructure enables development to occur with more or less equal probability anywhere within the town in the absence of a preference for walk accessibility over space. Were road construction the responsibility of developers, to ensure connectivity, developers would build in a more contiguous fashion.
4. Depending on the rate of development (until all blocks are developed), the town may remain far less walkable if walk access is not valued by the market, or required by the town, until it nears completion.
5. How to ensure walk accessibility in a decentralized piecemeal development process (so it does not take 30 years to complete) is not obvious, but is important. This is where some type of planning is important, either on the part of the master developers who control everything, or the government, or a negotiated compact between the individual property owners. Suppose the individual developers pooled their land and the profits in a joint venture, would the planning outcome have been better?
6. To help avoid discontinuous development, communities can either put the cost of infrastructure back on the developers of parcels, or attempt to regulate not only final densities but also interim sequencing or staging of development. This is particularly relevant when the city-building process is slow, and a lot of land has been devoted to potential future development.

We can think of the transformation from unworkable leapfrog style development to contiguous development as a phase shift. If leapfrog development is preferred early on, (due to preferences for space outweighing preferences for walk accessibility), development is disconnected. But as developments are added, the parcels congeal into an interconnected urban fabric.

There are many directions to extend this model. Thus far, walk accessibility is only considered for adjacent parcels, but one could certainly consider walking to farther parcels, which might enable consideration of a positive feedback system where walk accessibility begets more walk accessibility. (This would especially be valuable on a longer Main Street. We could extend it to a second dimension (east-west as well as north-south) which would enable a richer consideration of neighborhoods. We could consider not simply binary coverage of a block (developed/undeveloped), but consider percentages of development, or allow for varying densities. We could develop trade-off curves between cost, contiguity, and space. But every complication makes the model harder to comprehend, and needs to be justified for some gain in understanding.

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IMAGE SOURCES

Fig. 1, 2: Open- StreetMap.

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THE SPATIAL DIMENSION OF CYCLE LOGISTIC

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ABSTRACT

US Cycle logistics is emerging as a promising alternative in urban freight transport. Compared to fossil fuelled vans, the use of cycles for delivering goods within urban areas offers advantages in terms of environmental friendliness, economic efficiency, flexibility, and liveability of urban neighbourhood. At the same time, cycle logistics has to face limits in terms of weight and volume of goods that can be delivered, distances that can be covered, and spatial urban structures that can be served. This latter issue has till now received less attention in the scientific literature: it is generally recognized that cycle logistics performs at its best in inner urban areas, but no systematic study has been realized to identify specific spatial requisites for the effectiveness of cycle logistics. This paper provides a brief review of the main issues that emerge from the literature over cycle logistics, and contributes to stimulate the debate over the spatial dimension of cycle logistics: it presents a classification of cycle logistics schemes, on the basis of their integration with other urban logistic facilities and of the spatial structure of delivery operations. A three-level classification is proposed, depending on the type of goods consolidation: only distribution without consolidation, consolidation in a fixed urban consolidation centre, or consolidation in a mobile depot; for each level, operational examples and case studies are provided. This systematizing typology could support both public and private operators in decisions about the organization of cycle logistics facilities, such as the location of urban consolidation centres or the composition of cycle fleets.

KEYWORDS:

Cycle Logistics; City Logistics; Urban Freight Transport; Cycles; Urban Spatial Structure; Goods Consolidation.

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自行车物流的空间维度

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摘要

自行车物流正在兴起成为城市货物运输的一种前景光明的替代选项。与使用化石燃料的货车相比，在城市地区使用自行车进行送货具备环保、经济效益、灵活性以及城市街区宜居性等方面的优势。与此同时，自行车物流必须面临所能运输的商品重量和数量、覆盖距离以及所服务的城市空间结构等方面的限制。其中后一个问题现在尚未引起学术界的关注：人们通常认为自行车物流在内城区域能实现最佳表现，但尚不存在系统性的研究，从而识别针对自行车物流实效性的具体空间要件。本文简要回顾了自行车物流文献所出现的主要问题，并推动激发围绕自行车物流空间维度的争论：本文根据自行车物流方案与其他城市物流设施的融合以及送货操作的空间结构，提出了针对自行车物流方案的分类。本文根据商品并货的类型，提出了一个三级分类：只有配送，没有并货；在固定的城市合并中心进行合并；或者在移动式仓库进行合并。本文针对每个层面都提供了操作示例和案例分析。这个系统化的分类可以支持公共和私人运营者做出关于自行车物流设施组织的决策，如城市合并中心的位置或者自行车队的构成。

关键词：

自行车物流、城市物流、城市货物运输、自行车、城市空间结构、并货

1 INTRODUCTION

Among the challenges that cities are facing and will face in the forthcoming decades, there is urban mobility, which accounts for 40% of all CO₂ emissions of road transport and up to 70% of other pollutants (Commission of the European Communities, 2007). Urban freight transport plays an important part within urban mobility, in terms of energy use, CO₂ and other pollutants emissions¹, and congestion (Jorna & Mallens, 2013). This sector itself is facing challenges related to the increasing demand for delivery of goods, fuelled by the growing trend of e-commerce.

Since urban freight transport is mainly done by vehicles that rely on fossil fuels at the moment², it causes impacts in cities such as pollution, noise, congestion and traffic accidents, decreasing the quality of life in urban areas (McKinnon, Cullinane, Browne & Whiteing, 2010). These social, environmental and economic impacts imply the need for more sustainable alternatives to the use of vans, cars and trucks.

One possible solution in order to contribute to more effective and environmentally friendly city logistics is “cycle logistics”, or the use of cycles for delivering goods and services for personal and third part purposes within urban areas, concurring to reduce fossil fuelled trips and congestion, and to increase the quality of life in cities. Among the main advantages of cycle logistics there is undoubtedly its environmental friendliness: limiting CO₂ emissions and other emissions that are harmful to health (such as NO_x, PM₁₀, PM_{2.5}, PM₁) over the whole life cycle, deliveries by cycle reduce the environmental impact of urban logistics (Allen, Browne, Woodburn & Leonardi, 2012; Maes & Vanelander, 2012). The reduction of emissions can be related to the use of cycles instead of cars both for personal purposes, and for commercial purposes (Koning & Conway, 2014; Wrighton, 2014). As well as the environmental advantages, other success factors of cycle logistics are linked to other aspects, such as economic efficiency, flexibility, liveability of the urban environment. These aspects will be discussed in more detail in paragraph 2.

The debate over cycle logistics is quite recent and it has been quickly growing during the last decade, especially outside the scientific literature, through articles on newspapers, dedicated conferences and fairs to which mostly firms and consulting companies take part. Furthermore, envisaging the importance of this issue and its strategic relevance in order to meet the EU development targets – CO₂-free urban freight deliveries by 2030 (Commission of the European Communities, 2011) –, several research projects have been financed by EU programs in order to study and promote the development of cycle logistics³. Likewise, even if it is less rich than the general debate, the scientific literature on this topic is young and growing. Especially during the last five years, articles and papers are increasing. The wideness of perspectives from which this issue is considered and the variety of definitions and terms that are used to describe the use of cycles for delivering goods and services playing its part, the literature let emerge that the scientific debate is still in its embryonic stage. To date, a lack of structured research on cycle logistics can be noticed (Gruber, Kihm &

¹ 30% of urban transport CO₂ emissions, over 50% of the NO_x emissions and about 40% of the particulate matter emissions are due to urban freight transport (Wrighton & Reiter 2016). These impacts are resulting in urban areas in problems that include premature mortality, disability, aggravation of respiratory and cardiovascular disease, and sleep disturbance (Browne, Allen, Nemoto, Patier & Visser, 2012).

² Albeit some studies have evidenced the importance of light, electric or hybrid vehicles in order to reduce environmental impacts (Browne et al., 2012; Faccio & Gamberi, 2015; van Duin, Tavasszy & Quak, 2013, Wygonik & Goodchild, 2011), it is currently difficult to quantify their benefits, chiefly because of the lack of interest by local authorities (so that they have been mainly promoted as spot initiatives), and because of the shortage of data (Russo & Comi, 2016). Fossil fuels are still the premier sources of energy adopted for freight transport.

³ E.g: Cyclelogistics, Cyclelogistics Ahead and Pro-e-bike, all co-funded by the Intelligent Energy Europe Programme of the European Union; SMILE, co-funded by the MED Programme, under the European Regional Development Fund; CITYLOG, co-funded by the European Commission DG-TREN in the 7th Framework Programme. These projects consider cycle logistics with different aims and points of view, and some of them are still ongoing (Cyclelogistics Ahead and Pro-e-bike). Considering that cycle logistics is a quite recent issue and that probably other EU projects on this issue are forthcoming, a compared analysis of their contribution and outcomes, that nowadays would be untimely, will be of interest in order to foster and support the debate.

Lenz, 2014; Lenz & Riehle, 2013; Schliwa, Armitage, Aziz, Evans & Rhoades, 2015; Zacharias & Zhang, 2015) and most of the literature is focused on specific case studies, with few comparisons and integrated reflections. Albeit a general idea on cycle logistics can emerge from the literature and from conference presentations, it is more complex to get shared and detailed information on specific aspects, mainly because of the variety and poor homogeneity of topics that are analysed. Furthermore, some issues are still underexplored or handled quite superficially. Among these issues there is the spatial dimension of cycle logistics, i.e. how it can be integrated in different urban logistic systems and in different urban systems. Even if some studies exist on this aspect (Leonardi, Browne & Allen, 2012, Gruber, Ehrler & Lenz, 2013; Gruber et al., 2014), in our point of view this is a crucial aspect that should be duly taken into account in order to assess the effectiveness of cycle logistics schemes and operations.

In order to contribute to the development of the debate over cycle logistics, and to stimulate reflections over the spatial dimension of cycle logistics, this paper is structured as follows: in paragraph 2 we briefly present the main topics and issues that emerge from the literature over cycle logistics; paragraph 3 is devoted to systematise and illustrate a typology of cycle logistics schemes, with a focus on their spatial implications; in paragraph 4 we propose some issues for the discussion over the development of cycle logistics, fostering more attention on its spatial dimension and on its integration in the logistic chain.

1 CYCLE LOGISTICS: KEY ISSUES IN THE DEBATE

As the debate let emerge, cycle logistics is establishing as a promising solution for last mile and inner urban deliveries and a realistic alternative to motorised transportation in urban areas, mainly because of factors such as the rising awareness on environmental issues and concerns related to urban freight transport. Deliveries by trucks and vans have a severe negative impact on urban local environment and citizens' health, interfere with traffic flows, may cause congestion and overcharge urban infrastructures (Menge & Hebes, 2015). To date, trucks and vans are the dominant mode of freight transport in urban areas, and most of these vehicles are transporting light weight goods that could be easily carried by cycle (Jorna & Mallens, 2013). Even if a precise percentage of the substitution potential of deliveries do not emerge from the literature – since it depends on several factors such as the distance travelled, the urban structure, etc. –, some authors suggest that more than 25% of all goods and 50% of light goods could be dispatched by cycle in European cities (Gruber et al., 2013; Lenz & Riehle, 2013; Wrighton & Reiter, 2016), while less optimistic ones consider that the penetration rate will not exceed the threshold of 10% (Melo, Baptista & Costa, 2014). As some authors suggest, the largest obstacle to the diffusion of deliveries by cycle is still the general lack of acknowledgement of their advantages amongst users, customers and policy makers (Gruber et al., 2014; Lenz & Riehle, 2013; Schliwa et al. 2015). According to Menge and Hebes (2015), the main stakeholders involved with this innovation in urban logistics are:

- Senders, that can be private or public;
- Receivers, private or public;
- Logistics service providers, that can be large companies diversifying their offer, start ups or a combination of them;
- Drivers, employees of a company or self-employed;
- Society, that plays a role especially with regard to the balance between the need of as cheap and quick as possible deliveries and the request for safe and “green” deliveries;
- Public authorities, that should balance interests between different needs and requests and can introduce push-and-pull measures.
- Banks and insurance companies, financing or insuring innovative solutions and startups in this field.

Albeit cycle logistics is receiving a rapidly growing interest⁴, especially during the last decade, and it is widely acknowledged in the debate as an innovative solution for facing the main criticalities of urban logistics, it must be noticed that delivering by cycle is not properly a new activity and in no way a new idea (Goldman & Gorham, 2006, Lia, Nocerino, Bresciani, Colorni & Luè, 2014). At the beginning of the last century, cycles were the most common and accepted means of urban freight transport, until the rapid spread of automobiles during the '50s and '60s. And during the '70s and '80s, a renaissance of bike messengers began, especially for companies' internal transport. The digital revolution challenged again the sector at the beginning of this century, since many small-sized goods such as documents, photographs or tickets no longer needed to be delivered physically, as they could be sent by email (Gruber et al. 2013).

Therefore, cycle logistics should not be considered as a new nor by itself a particularly innovative phenomenon. However, considering more widely the evolution of urban logistics and the needs of a more and more wide range of actors, a distinction must be made: the return to the use of cycles for urban logistics should not be considered as a jump back into the past, but as a rebirth in a contemporary and innovative way of lifestyles and business models that stem from the acknowledgement of the potentialities and advantages of the two wheels.

Furthermore, the main companies that are active in this sector combine tradition and innovation using cycles designed ad hoc and software specifically developed in order to manage the service and to monitor routes and emissions. This is why cycle logistics is considered as an innovative response to the criticalities related to urban logistics (Gevaers, Van de Voorde & Vanelslander, 2014; Menge & Hebes, 2015). Besides the unquestioned environmental advantages of cycle logistics, the other main success factors for cycle logistics can be related to the following aspects:

- Economic efficiency: purchase and maintenance costs are lower than those of a commercial van, cycles have no fuel costs and also for e-bikes energy consumption is very low. Also insurance is much cheaper. As a cost modelling simulation of last-mile deliveries attests (Gevaers et al., 2014), the cost for last mile deliveries by cycle in densely populated areas is almost a half of that of deliveries by motorised vehicles. Therefore combining delivering savings with much lower purchasing price and running costs, cycles can be in all respects considered as a cost-saving solution for urban delivery (Wrighton & Reiter, 2016).
- Flexibility: cycles can easily work around congestion and are unlikely to get stuck in traffic, have access to some dedicated lanes and to areas with restrictions due to environmental or congestion issues (Leonardi et al., 2012; Schliwa et al., 2015). Furthermore, they have no parking restrictions and access to bike paths and pedestrian areas.
- Liveability of the urban environment: cycle logistics also improve the quality and liveability of the urban environment, since it reduces noise emissions, it generates less soil consumption on the road and for parking vehicles, it decreases congestion. Cycles are
- generally viewed as less intimidating and safer than vans, pose less dangers to vulnerable road users and are generally well accepted among the population (Leonardi et al., 2012).

Furthermore, delivering by bike do not requires a driving licence, therefore it can provide employment opportunities for disadvantaged people.

It is necessary to clarify that in the debate, when talking about cycle logistics different purposes are being considered, such as commercial transport of passengers and goods, personal transport, provision of services, etc.

⁴ At the same time, companies active in this field throughout Europe are growing (see e.g. the number of companies registered as members of the European Cycle Logistics Federation) and consolidating their business.

Some authors suggest to classify cycle logistics into three main categories: passenger transport, freight transport, and provision of services (Jorna & Mallens, 2013). According to this classification, passenger transport includes the use of cycles as a taxi, for transporting children to childcare centres, or as a special service for elderly/disabled people; freight transport includes parcel delivery, last mile logistics, home delivery (meals, grocery, etc.), internal transport in factories; provision of services includes services such as gardening, home care, craftsmen, etc. Other authors (Reiter & Wrighton, 2014) make a distinction between:

- private transport, that refers to commuter travel, shopping trips and leisure trips;
- personal transport, that includes all the purposes mentioned above for private transport but also business trips;
- freight and service transport, that refers to both commercial deliveries and service trips made for the execution of professional services;
- commercial transport, that includes freight and service transport and add business trips.

In this paper, we propose a different classification, identifying two main sets (fig. 1):

1. transport for own use purpose, that can be further divided into:
 - a) personal transport of passengers and goods, such as carrying children, carrying groceries or other shopping;
 - b) delivering services for commercial purposes. This set includes services such as gardening, home care, craftsmen (painters, plumbers, etc.), internal transport in companies and factories, home delivery of groceries, meals etc. (when made by the company itself, such as a supermarket, a restaurant, etc.);
2. transport for supply to a third part, that can be divided into:
 - a) passenger transport, e.g. with taxi-bikes, rickshaws, etc.;
 - b) freight transport, including last mile logistics and parcel delivery in urban areas, home delivery of groceries, meals etc. (when made by a delivery company).

This classification proposal, stemming from a reflection on strengths and weaknesses of previous analyses and classifications and on the purposes of this paper, focuses on the distinction between transport for own purpose from transport for supply to a third part, which in our point of view is an important aspect in order to develop considerations on the cycle logistics *market* and on the integration of cycle logistics in the logistic chain.

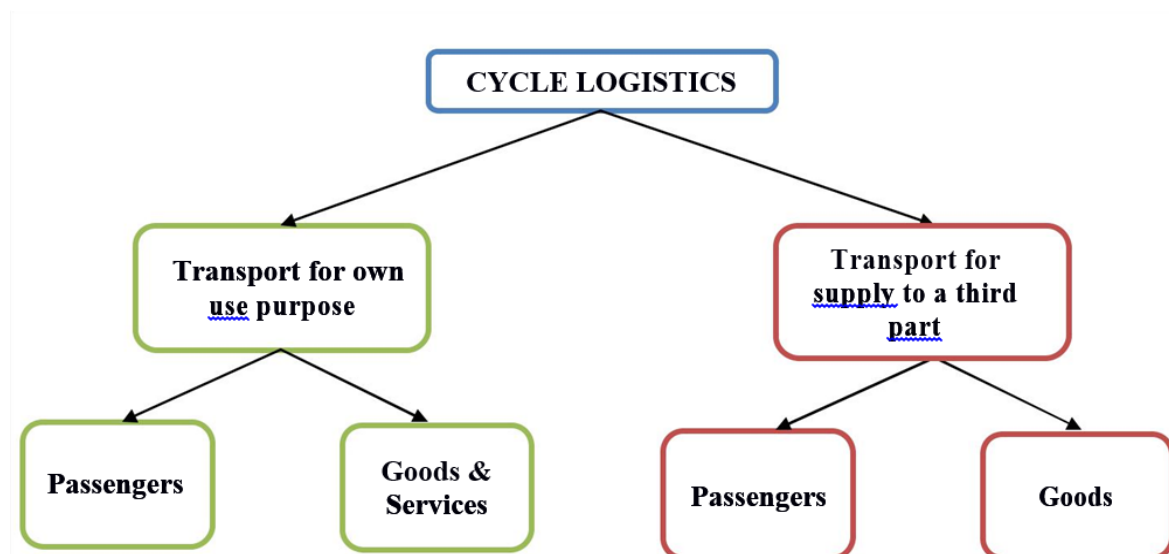


Fig. 1 Classification of cycle logistics categories

As well as the purposes, also the variety of cycles that can be used for cycle logistics, and that the scientific literature takes into consideration, is very wide, including standard bicycles with shoulder bag or panniers, standard bicycles with trailer, cargo bikes, cargo trike/quad (Wrighton, 2014). All these cycles can be also used in their electric or pedelec version. More than 240 cargo bikes products designed specifically for freight transport are available on the market worldwide (Chiffi & Galli, 2015). Another element that can be attributed to the fact that this is a very recent and fast developing field of study is the wide variety of definitions and terms that are used to describe cycle logistics, with little coherence in how they are used. Schilwa et al. (2015) try to systematise at least cycle types, dividing them into bicycles, cargo bikes and cargo tricycles, and reporting some terms that are used in the literature when referring to them.

Within this article, we adopt the definition of cycle logistics proposed by Schliwa et al. (2015): cycle logistics describes the use of human-powered or electrically-assisted standard bicycles, cargo bikes and cargo tricycles for the transport of goods between an origin and a destination, primarily in urban areas.

Even if in the literature and in the debate the expression cycle logistics is used in order to describe a wider set of purposes and uses, in this paper we want to focus on last mile logistics and on commercial freight and documents transport within urban areas for supply to a third part. In effect, we are expressly interested in how cycle logistics integrates with the rest of the logistic chain, since in our point of view this is the aspect on which the configuration and organization of the spatial structure of urban areas can play a more significant role.

2.1 CYCLE LOGISTICS MARKET AND COMPANIES

The market of delivering by cycle includes different services, that can be broadly subdivided into two main categories:

- courier service: generally provided by young and rapidly developing companies that provide alternatives to the use of cars for the delivery of parcels and documents, usually within an urban area; this category includes also door-to-door delivery of goods, meals, etc. for third parties;
- last-mile service: generally provided by big companies themselves or through third parties that provide last-mile delivery by cycle integrating the service within the whole logistic chain.

As it will be reported in more detail in paragraph 3, while the first service is usually concentrated within an urban area, the latter implies one or more steps through consolidation/micro-distribution centres.

The organisation of the companies operating in the field of cycle logistics is directly related to the kinds of services that are offered. While in the past most cycle logistics business operated on a small scale and were rather isolated from other operators in the logistic chain, more recently large logistics companies are increasingly considering cycle logistics solutions, often cooperating with local companies in order to increase the efficiency of the last mile (Jorna & Mallens, 2014; Schliwa et al., 2015). Therefore the business model of companies operating in this field is more and more shifting towards the diversification of services offered, including courier service, door-to-door deliveries and last mile logistics. Since the choice of the cycle depends upon the kind of goods that have to be delivered, cycle logistics companies often dispose of several different types of cycle.

The main limitations for cycle logistics can be referred to three aspects, that are strictly interrelated:

- the weight and volume of the goods that have to be delivered: the limits in terms of weight depends upon several factors, such as the type of cycle and the route slope. A range between 80 and 200 kg, that in exceptional cases may raise up to 400 kg, is suggested by Reiter and Wrighton (2014). As regards the volume, it strongly depends on the design type of the cycle, varying between 400 and 800 litres;
- the distance that can be travelled: it is difficult to identify a precise distance, since it strongly depends on the different patterns of cities and on the differences among the vehicles that are used. The

Cyclelogistics and Cyclelogistics Ahead EU projects set 7 km as an acceptable maximum distance per trip, and 2,5-3,5 km as the average distance per delivery (Reiter & Wrighton, 2014);

- the spatial structure and infrastructure provision of cities: to date the literature does not provide very extensive or detailed information and considerations, generally indicating dense inner urban areas as the most suitable ones for cycle logistics. Any specific or detailed consideration on spatial parameters nor thresholds in terms of density or configuration that could be necessary for effective and efficient cycle logistics operations currently emerge from the literature.

3 A TYPOLOGY OF CYCLE LOGISTICS SCHEMES

As it was anticipated, most scientific literature on cycle logistics is still anecdotal, mainly based on the analysis of single case studies in terms of environmental benefits, models of cycles used, company organization, etc. Less attention has been directed till now to the spatial dimension of cycle logistics, i.e. how deliveries by cycle can be integrated in different urban logistic systems and in different urban systems. Below, we propose a systematisation of cycle logistics schemes, classifying them on the basis of their integration with other urban logistic facilities and of the spatial structure of delivery operations. We will refer to the systemic approach to city logistics (Bektaş, Crainic & von Woensel, 2015; Crainic & Montreuil, 2015; Ducret & Delaître, 2013), that identifies in city logistic systems one or more tiers of consolidation-distribution. We propose a four-level classification, depending on the type of depot/consolidation facilities from which goods are delivered by cycle:

1. only distribution, without consolidation;
2. urban consolidation centres;
3. micro distribution centres;
4. mobile depots.

3.1 ONLY DISTRIBUTION, WITHOUT CONSOLIDATION

This is the case of courier services, i.e. same day deliveries of mails and parcels, which are picked-up from point A and directly delivered to point B, without possibility of consolidation (fig. 2). This scheme favours smaller vehicles and more deliveries being carried out in parallel, as in the case of cycle logistics (Transport for London, 2009). Requests are generally collected in real-time; when time-pressure is not so high, trips can be organized according to the round trip model: the cycle courier proceeds towards the first pick-up point to load and continues to the first delivery point; then he checks his schedule and goes on to the next pick-up point, till the last delivery of the day (Lia et al., 2014).

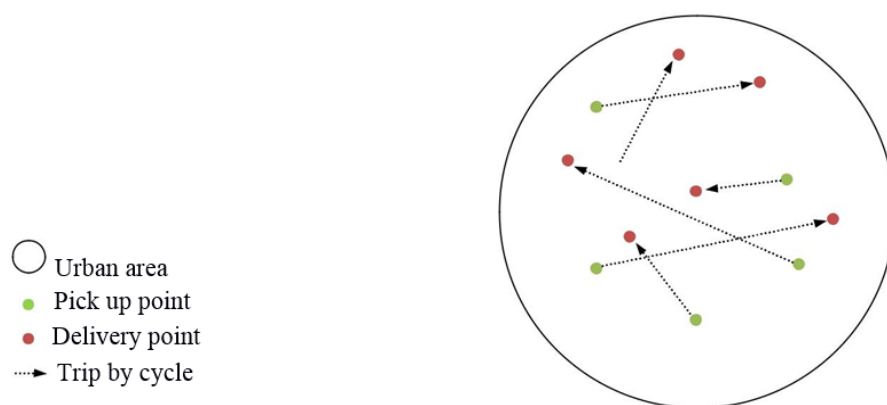


Fig. 2 A cycle logistics scheme for distribution without consolidation

The employment structure of the courier company influences the spatial organization of the service: if cycle messengers work as freelance subcontractors for the company, they generally own their cycle, ride from home in the morning and park their vehicle close to home after duty; otherwise, if messengers are employees, the company operates its own fleet of cycles, and messengers ride directly from the depot (Gruber & Kihm, 2015). Cycle messengers tend to cover each a particular “home area”, and they often pass consignments to each other across their home boundaries; studying eight German cities, Gruber et al. (2013) found that each cycle messenger covers in average 5 km².

In inner urban areas, a great part of courier deliveries could be managed by electrically-assisted cycles, as Gruber et al. (2014) demonstrate in the case of Berlin: two thirds of the courier shipment relations are inside the inner city (the low emission zone surrounded by the circular railway, having a surface of 88 km² and a density of 112 inhabitants per hectare); 56% of the shipments are shorter than 10 km; 42% of the trip chains are below 50 km. Assuming as limiting factors a load rate of up to 100 kg (with no parcel more than 25 kg), a volume of 176 litres and a battery autonomy of 60-100 km, Gruber et al. (2013) estimate that the substitution potential for electrically-assisted cycles is equivalent to 42% of the deliveries and 19% of the generated trip distances, for a maximum shipment distance of 10 km. If this distance is increased to 20 km, the percentages grow to 68% and 48%, respectively.

Courier services have been extended also to interurban deliveries by a train-bike combination. In 2011, SPL Ltd., a British logistic company, formed a partnership with railway passenger train operator East Midlands Trains, to utilize otherwise wasted space on the hourly Nottingham to London passenger services for the movement of small volume freight (in 2014, the service has been extended to the Leicester-London service). First mile in Nottingham and Leicester and last mile in London are entrusted to SPL's partners WeGo Carbon Neutral Couriers and Courier Systems, which mainly use cycles. The transshipment operations between train and bicycle require less than the nominal train dwell time of two minutes. The high frequency of trains to London makes this system particularly fit for bringing regional food produce from different parts of the country into the capital; refrigerated vehicles are not necessary, as packaging for chilled and frozen food is sufficient for longer times than those required for the journey. In 2015, a new InterCity RailFreight (ICRF) service has been launched on the Great Western Railway, to deliver fresh seafood by train from Cornwall to the centre of London: fish, live lobsters and crab are loaded at Penzance station on the 10:00 high speed train, which in 5 and a half hours arrives at London's Paddington station. WeGo couriers then deliver the fresh seafood to top London restaurants using cycles (Eltis, n.d.). Combinations of train and cycles for interurban courier services have also been performed in Italy by Pony Zero between Turin and Milan, and by ImagineCargo in Switzerland.

3.2 URBAN CONSOLIDATION CENTRES

The basic element of these schemes is the Urban Consolidation Centre (UCC), i.e. a logistic facility situated in relatively close proximity to the urban area, be that a city centre or an entire town (fig. 3). Goods are generally transported by trucks and vans to the UCC, where they can be consolidated and transhipped to environmentally friendly vehicles (such as electric and gas-powered vans, cycles etc.) for last mile deliveries. UCCs (also defined in the literature as “urban transshipment centres”, “freight consolidation centres”, “urban distribution centres”; Allen et al., 2012) offer important advantages to cycle logistics: first, bringing goods near the densest part of the city, they reduce the total distance that cycles have to cover, and concentrate it in the urban centre, where cycles are more competitive when compared to vans in terms of average speed; moreover, cycles can go back to the UCC more times in a day to be reloaded, so mitigating their limited payload capacity (Browne, Allen & Leonardi, 2011). Choubassi (2015) highlights that last mile cycle logistics

operations are more efficient if the UCC is located within the delivery area, and the higher is this area's density.

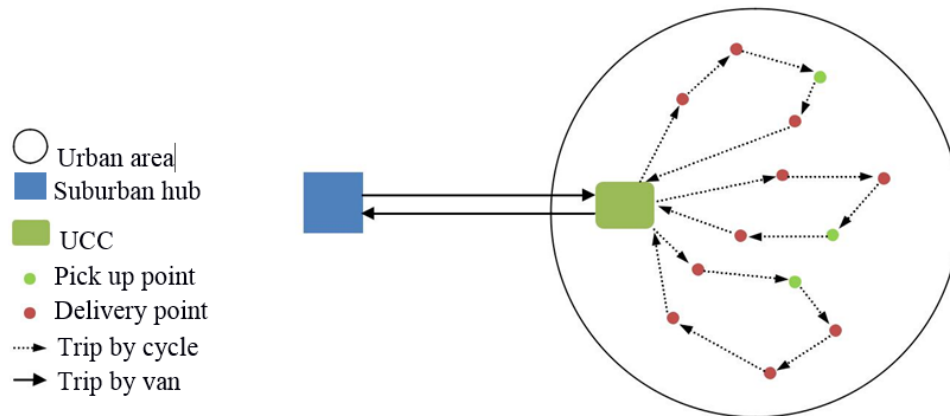


Fig. 3 A cycle logistics scheme for distribution after consolidation in a fixed urban consolidation centre

In the case of cycle logistics, UCCs generally correspond to the premises of the cycle logistics company⁵. A well-known example is La Petite Reine, a French logistic company founded in 2001 in Paris and later expanded to Bordeaux, Rouen, Dijon, Geneva and Lyon.

In Paris, it operates from two own logistic warehouses in the city centre: one in the underground parking Saint Germain l'Auxerrois close to the Louvre museum since 2003, and another in the underground parking Saint Germain des Pres on the left bank since 2010. Before the morning peak hour, La Petite Reine receives in these depots parcels from different companies (DHL, ColiPoste, Monoprix, Dannon, etc.) and consolidates them by routes and destinations; final deliveries are performed by its 50 cycles, each of them consigning about 70 parcels per day, at the average speed of 12 km/h. About 3,000 locations are served every day (Dablanç, 2011).

Similar schemes are used in other European cities: in the United Kingdom, Gnewt Cargo operates from two depots in central London to serve the Congestion charging zone, Outspoken Delivery has an edge-of-city-centre depot in Cambridge, Last Mile Leeds performs deliveries for DHL in Leeds from its city centre premises within a radius of 1-2 miles (Schliwa et al., 2015); in France, this logistic organization is utilized by Becycle in the centre of Lyon (Ducret & Delaître, 2013), in Germany by GO! Express & Logistics in the centre of Berlin (Sacher, 2015), in Belgium by Ecopostale in Brussels (Maes & Vanelslander, 2012), in Italy by PonyZero in Turin, Milan and Bologna.

The environmental advantages of this cycle logistics schemes are shown by Browne et al. (2011): when Office Depot replaced in 2010 its diesel vans making deliveries directly from the suburban depot to customers in the City of London with Gnewt Cargo electric vans and tricycles operating from a micro-consolidation centre in the City of London, the total distance travelled and the CO₂ emissions per parcel delivered fell by 20% and 54% respectively.

⁵ As highlighted by Schliwa et al. (2015), a major barrier to expanding cycle logistics market share is that big companies such as DHL, TNT etc, do not want parcels from different courier companies to be mixed in the same delivery vehicle, significantly reducing the opportunities to create economies of scale and efficient consolidation. As a consequence, each cycle logistics company tend to operate its own UCC, rather than relying on a unique urban UCC managed by a third public or private operator.

3.3 MICRO DISTRIBUTION CENTRES

In large cities, one or two UCCs can turn out to be not sufficient for supporting cycle logistics schemes, as the distances bikes should cover are too large. In this case, UCCs can be integrated (or even replaced) by a set of micro-distribution centres, i.e. storage facilities in which parcels can be stocked from the main UCC or directly from the suburban depot; cycles can then pick up the parcels from the containers and deliver them to the final customers. Each container focuses not on the whole city but only on a particular district. Janjevic and Ndiaye (2014) classify micro-distribution centres in six typologies, and identify a set of attributes (accessibility to the area, loading and unloading infrastructures, access restriction, dedicated infrastructures) to be taken into consideration when choosing their urban location.

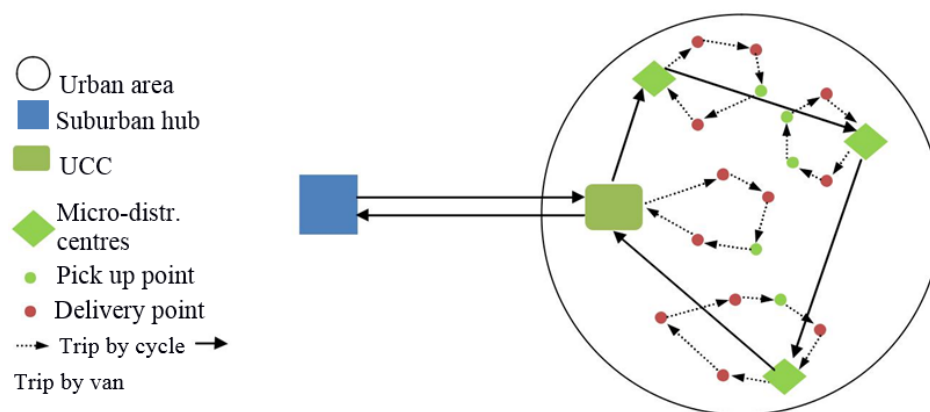


Fig. 4 A cycle logistics scheme based on a UCC and micro-distribution centres

Micro-distribution centres are often containers like BentoBoxes that can be placed near bus shelters, railway or underground stations, car parks, shopping malls etc. Brüning, Abdolrahimi and Schönewolf (2014) illustrate a test field in Berlin: a BentoBox was placed to support cycle logistics operations in the neighbourhood of Steglitz-Friedenau, allowing to replace by cycle 85% of parcel deliveries previously carried out by car. According to the results of the test, the authors conclude that ten BentoBoxes should be necessary to support last miles deliveries by cycle in the whole "environmental zone" of Berlin (88 km²), not because of storage volumes (that on the contrary would not be completely used) but to avoid excessive distances between the containers.

Parcels are usually carried to micro-consolidation centres by vans, but other means can be used. For example, in the city of Porto Sładkowski, Dantas, Micu, Sekar, Arena and Singhania (2014) hypothesize to locate the UCC next to Verdes metro station, which connects two metro lines and has a strategic position: beside the airport, not far from the Port of Leixões and well served by the motorway network. In the UCC, goods are stacked in BentoBoxes, which are then trolleyed to the adjacent metro station; here, they are loaded on old regular passenger metro coaches that have been transformed in hollow units (without seats and grab poles, so to allow fast and easy manoeuvring of BentoBoxes).

These freight metros are planned to run during off-peak hours or other times of the day, when they can be accommodated without significantly altering the existing passenger timetable. Three destination stations are identified: Bolhão, Sete Bicas and Espaço Natureza, which are beside the most important commercial and industrial areas or the city region; here BentoBox are transferred to a "council warehouse" set up in the station, and then delivered to the final customers by cycle (for distances less than 4 km) or electric vehicles (for greater distances or big volume goods). According to the authors' estimation, this system would allow to reduce CO₂ and NO_x emissions by about 50%.

3.4 MOBILE DEPOTS

Further advanced multi-tiers logistic systems are emerging to handle the complexity of large cities, where a single UCC can turn out to be not sufficient. They multiply and diversify the types of logistic facilities and transportation modes used, to adapt to the specific characteristics of each distinctive city. In particular, different private and public transport modes are utilized as mobile depots (and sometimes as mobile consolidation centres), allowing cycles to cover a wider urban area (fig. 4). Two different schemes can be identified, depending on the interface between the cycles and the mobile depot:

1. the cycles are transported on the mobile depot, together with the parcels to be delivered;
2. the cycles meet the mobile depot in one or more “rendez-vous” points of the city, where freights are transhipped from the depot to the bikes for final delivery;

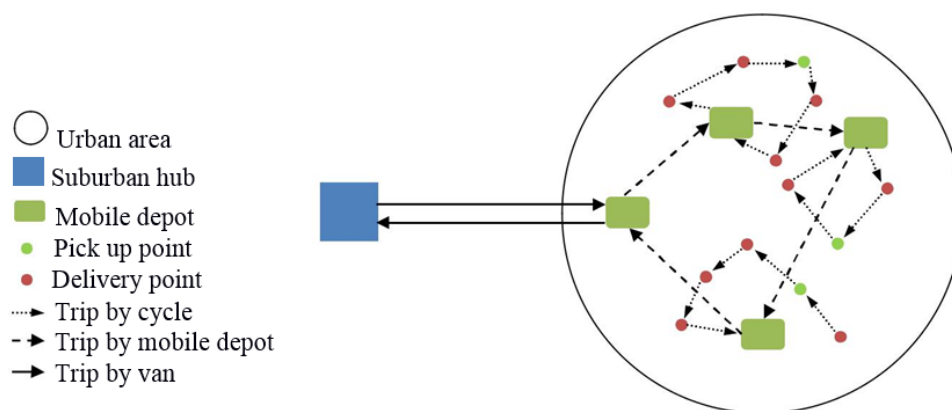


Fig. 5 A cycle logistics scheme for distribution using a mobile depot

Below, examples of cycle logistics schemes will be classified according to the type of transportation mode used as a mobile depot.

BARGE

In 1997 DHL Worldwide Express launched a floating express distribution centre, which combines cycle and river transport. A “grachten boot”, i.e. a 17 meter-long canal boat previously used to ferry tourists around Amsterdam, was converted in a parcel delivery vessel, having a net capacity of 30 m³. In the morning, mails and parcels are loaded on the boat, which then sails over the canals of central Amsterdam on a fixed route. It makes several stops at existing landing stages, to meet up with twenty cycle couriers that pick up the parcels and deliver them in the city to their final destination; these cycle couriers keep in touch with the boat using mobile phones, and also collect return mails that the boat passes to DHL’s classical express network in the evening. In this way, DHL has been able to cut down ten of its delivery vans, which means an annual reduction of 150,000 km and 12,000 litres of diesel per year. The main problem in this system can emerge in winter, if the city canals freeze over (Geroliminis & Daganzo, 2005; Maes, Sys & Vanelslender, 2015; Stevenson, 2009). Vert chez vous, a French goods delivery company, has launched a similar service in Paris in 2012. It operates a “warehouse barge” called Vokoli (a Freycinet model, built in 1953 and fully reorganized) on the Seine river, with a fleet of 18 electrically-assisted cargo tricycles on board. The company has a warehouse in Pantin, along Paris inner ring road, 6.4 km from the centre of the city. Parcels are carried by trucks to the port of Tolbiac (Paris 13th arrondissement), where at 7:00 a.m. are loaded on the barge to be consolidated on the tricycles. From 9:30 to 17:00, the boat makes a round trip on the Seine, stopping at ten platforms along the river; at each stop, a team of tricycles leaves to make deliveries in the

adjacent area in 1 and a half hours, then re-joins the Vokoli two stops further on. Each team performs four delivery rounds during the day; about 4,000 parcels are consigned (Diziain, Taniguchi & Dablang, 2013; Heitz, 2015; Janjevic & Ndiaye, 2014).

TRAM

Well known examples of freight tram services in city logistics are the CarGo Tram in Dresden, which every day transports the equivalent of 60 trucks to the Volkswagen factory located in the city centre, and the Cargo Tram in Zurich, which collects bulky waste from households along the city's outskirts (Arvidsson & Browne, 2013); however, in these cases an interface with cycle logistics operators is not envisaged.

A combination of cargo trams and electric distribution vehicles was tested in Amsterdam in 2007. The project (that was expected to reach full scale operations in 2012) aimed at using cargo trams to transport goods from warehouses located in western suburbs near Schiphol airport to inner city UCCs; electric vans or cycles would have then delivered the goods to their final destination. The cargo trams run on the lines which had enough capacity to avoid conflicts with passenger trams, within the time frame 07:00-23:00 to prevent noise disturbances during the night; dead tracks were used as loading and unloading bays. The cargo tram took fifteen minutes extra compared to trucks, but allowed to cut the costs by 15%. Notwithstanding, at the end of 2008 the project failed, due to inability to acquire adequate finance for investment, and the refuse by the city to build extra tracks that were going to be needed (Arvidsson & Browne, 2013).

In Japan, in 2011 Yamato Transport Co. has begun to use trams to transport parcels from the center of Kyoto to Arashiyama, a congested touristic area located 10 km to the west. The service uses the Keifuku Electric Railroad, an existing line opened in 1910 and previously used only for passenger transport; it runs once a day in the morning before the busy hours for passengers. A parcel-only carriage is linked to a regular tram carriage, and is loaded with container dollies bearing parcels; at Arashiyama station, one or two persons from Yamato unload the dollies, reload them onto carriers pulled by electric bicycles, and finally parcels are delivered to customers (Archdeacon, 2011; Diziain et al., 2013).

SUBWAY

Dampier and Marinov (2015) realized a feasibility study of a metro-based freight transportation system between Killingworth and Newcastle upon Tyne, in the United Kingdom. In the proposed scheme, small and medium size parcels are taken by each business to a micro-consolidation centre at Palmersville, the nearest metro station to Killingworth; parcels are condensed in standardized BentoBoxes, that are loaded onto a modified metro train dedicated to freight transportation. This train departs from Palmersville Metro station and in 16 minutes (in an interval between two passenger trains) reaches a dead track between Jesmond and Manors Metro stations, used only late at night to transport trains back to the maintenance depot and located a short distance from the city centre. Goods are then sorted and taken the last mile to businesses by cycle couriers.

A slightly different logistic scheme was tested in Sapporo, Japan. A pilot project was conducted on the Tozai Line of the city metro network, between the Yamato Transport Sapporo Base beside Shin-Sapporo station and the Home Delivery Centre at Odori station, near the city centre. In this case, goods are loaded (three times during off-peak hours from 10:30 to 14:00) not on metro coaches specifically dedicated to goods, but on ordinary passenger metro coaches using a hand cart (0,5x0,9x0,7m) on a wheelchair floor. At Odori station, the cart is unloaded, lifted from the platform to the ticket gate and taken above ground; parcels can then be delivered to final destination using cycles or other small electric vehicles (Kikuta, Itoa, Tomiyamab, Yamamotoc & Yamada, 2012).

BUS

The feasibility of using a bus line to transport goods to the city centre was analyzed by Masson, Trentini, Lehuédé, Malhéné, Péton and Tlahig (2015) for the city of La Rochelle in France, using a mathematical model. Parcels are condensed in containers at the UCC, which is located near a stop of the Illico bus line (74 buses per day). Buses have been modified, so to guarantee an easy and simultaneous access to both freight containers and passengers (Trentini & Malhéné, 2010). The containers are loaded on buses at times of low passenger capacity utilization, carried to one of the six bus stops in the city centre and finally transhipped (without storage facility) to a fleet of city freighters, like electrically-assisted tricycles, to be delivered to final customers. The quantitative assessment in the paper shows the feasibility of this logistic scheme; an efficient transhipment of containers from buses to city freighters turns out to be the key factor in the system performance.

TRAILER

In 2013, TNT Express tested in Brussels for three months a combination of electrically-assisted cycles and a mobile depot, consisting of a trailer fitted with a loading dock, warehousing facilities and an office. The test concerned parcel deliveries and pick-ups in three municipalities (Schaarbeek, Etterbeek and Sint-Joost-ten-Node) in the inner part of the city: an area of just over 12 km², densely populated and highly urbanized. In the morning, all parcels to be delivered in the three municipalities were loaded on the trailer at the TNT hub (located near Brussels freight airport Brucargo). The trailer was driven to a parking location in the Parc du Cinquanteenaire, which is near the selected demonstration area and the depot of the subcontractor doing the cycle deliveries. From there, deliveries and pick-ups were made by four cycles. During the three weeks of the test, 1,292 pick-ups and 5,286 deliveries were done; 4,534 cyclocargo km were driven. Compared to the regular TNT delivery system based only on vans, the new scheme allowed to replace 1,291 van km to 141 truck km per week; CO₂ and PM₁₀ emissions were reduced by 20-25%. At the same time, operations cost nearly doubled (Verlinde, Macharis, Milan & Kin, 2014). Notwithstanding, TNT has launched in March 2016 a new test in Turin, Italy, with a difference: in this case, at TNT hub located in Settimo Torinese (a municipality adjacent to the city, 15 kilometres from the centre of Turin) five cycles are directly loaded on the trailer, together with the parcels to be delivered. The trailer is then parked in Piazza Statuto, at the very centre of the city.

3 DISCUSSION

Cycle logistics has a significant potential for improving the sustainability of small and medium size goods deliveries in urban areas. The typology of cycle logistics schemes we have proposed illustrates how many spatial structures delivery operations by cycle can assume. The efficiency of these schemes depends on how deliveries by cycle are integrated in the whole urban logistic chain, exploit the existing logistic facilities and adapt to the urban system they have to serve. In general, if we recall the three main limitations for cycle logistics quoted in paragraph 2, we can conclude that, moving from the first cycle logistics scheme presented (only distribution without consolidation) to the last one (based on a mobile depot):

- the weight and volume of delivered parcels increase, because cycles can be reloaded more often and easily;
- distances that cycles have to cover decrease, as their departure point is nearest the delivery destinations;
- the urban area that can be served is wider;
- on the other hand, a bigger set of transport means and logistics facilities is required and transhipment costs increase.

Therefore, there is a trade off between the benefits (on environmental emissions, congestion, etc.) of more complex cycle logistics schemes, and their increasing costs; but the research of its balance point, which is strictly linked to the spatial dimension of the schemes, has till now received poor attention, both in theory and in practice. The scientific literature on city logistic network design is quite huge, although rather sparse; many models have been proposed for the location and dimensioning of logistic facilities such as UCCs, micro-distribution centres, etc., as well as for determining the last mile vehicle fleets composition and size (for a review, see for example Bektaş et al., 2015). But these models have almost never been applied for planning cycle logistics schemes, or for assessing the pertinence of their spatial structure to different types of urban systems. It is generally recognised that cycle logistics performs at its best in urban areas that have high density, narrow streets, limited access (Schliwa et al. 2015); but no systematic study has been realised to identify specific spatial requisites for the effectiveness of cycle logistics schemes, in terms for example of minimum density (inhabitants per hectare), maximum radius that can be served by cycle from a UCC, extension of delivery services also to polycentric metropolitan areas (and not only to central portions of the city) using mobile depots etc.

As regards practice, a deeper knowledge of these spatial issues could support cycle logistics companies in their decisions about the location of their depots or the composition of their cycle fleets. On the contrary – confirming widespread doubts concerning the professionalisation level of most of these companies (Maes & Vanelander, 2012) –, till now these decisions in many cases have been the result of what was available at the moment, and not based on a real “geographical” assessment (van Duin, Quak & Muñuzuri, 2010).

At the same time, also public policies could take advantage of this kind of scientific research. Cycle logistics can be promoted through a push-and-pull approach: it requires both policies for penalising fossil fuel motorised delivery vehicles (like limited traffic zones, congestion charging mechanisms, restricted delivery time windows) and policies for benefitting alternative vehicles like cycles (reserved lanes or loading/unloading areas etc.) (Russo & Comi, 2010). The realisation of UCCs is often a public initiative of municipalities (for example, in Paris La Petite Reine opened its first depots near the Louvre museum winning a bid for tender organized by the city for allocating the logistic space): an unsuitable location could compromise the success of cycle logistics business.

More scientific research on the spatial dimension of cycle deliveries is also needed to assess if cycle logistics is bound to remain a niche of market, or to replace a relevant share of conventional deliveries (not only in central urban areas but also in wider metropolitan contexts), even in competition with innovative delivery solutions like small electric vehicles, drones and crowdsourcing services.

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EVALUATION OF URBAN SPACES FROM THE PERSPECTIVE OF UNIVERSAL DESIGN PRINCIPLES THE CASE OF KONYA/TURKEY

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ABSTRACT

During the process of accessing services provided within urban interior and outer spaces the elderly and disabled individuals encounter with a myriad of problems due to the limitations posed by structured environments. This limitation hinders elderly and disabled individuals from mobility without assistance, which in turn negatively affects their full participation to urban and social life. Rearrangement of urban spaces to meet the needs of elderly and disabled individuals would correspondingly bolster life quality of the entire range of users. Within the scope of present research, as mandated by universal design principles to stick to plans and designs approaches inclusive for all users, it is aimed to conduct evaluations on the use of urban outer spaces situated within Konya City Center. In the hypothetical and theoretical part of this paper, the perception of disability throughout historical process has been examined from a sociological perspective. In addition, concept of universal design, its principles and gravity have also been elaborated. In the part dealing with the case study, outer spaces within Konya City Center have been analyzed with respect to universal design principles and a range of suggestions have been developed.

KEYWORDS:

Universal design; accessibility; disabled people; urban spaces.



EVALUATION OF URBAN SPACES FROM THE PERSPECTIVE OF UNIVERSAL DESIGN PRINCIPLES

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摘要

由于结构性环境所造成的限制，老年人和残疾人在获取内外城市空间所供服务的过程中会遇到大量问题。这些限制会妨碍老年人和残疾人在无协助情况下自主行动，反过来会对他们全面参与城市和社会生活带来消极影响。重组城市空间以满足老年人和残疾人的需求，会相应地提升所有使用者的生活质量。通用设计原则要求遵守包容所有使用者的规划和设计方法，因此本研究的目的即为对孔亚市中心的外部城市空间进行使用评估。本论文的假设和理论部分，将从社会学角度对整个历史进程中的残疾感知进行研究。此外，本文还将详细阐述通用设计的概念、原则及重要性。案例研究部分将从通用设计视角对孔亚的外部城空间进行分析，并提出一系列建议。

关键词：

城市及区域规划、通用设计、可用性、残疾

1 INTRODUCTION

The reports issued by the World Health Organization (WHO) demonstrated that circa 500 million people equating to 10% of global population are disabled. Turkish Statistical Institute reports manifested that approximately 12,29% of the entire population is disabled in Turkey. These data point that there are currently 8,5 millions of disabled people in Turkey (Turkish Statistical Institute, 2010). Aside from these data, there is an evident climb in the expected life span of human beings thanks to the recent advancements in medical practices. Aging brings with itself certain physical disabilities. Accordingly, in our country, it is one social responsibility to enable the access of elderly and disabled individuals to social and urban life. Irrespective of this responsibility however, it is a known fact that disabled and elderly individuals face a long list of challenges in the access to the services provided within urban interior and outer spaces due to the limitations posed by inadequate plan and architectural design. Such group of people is deprived of the basic rights to independently move and access the offered activities without any external assistance. Elderly and disabled individuals, due to the inadequate planning in cities, are marginalized from social life and imprisoned to their house in a sense; driven to forced-loneliness and their life quality is negatively affected. In that scenario a handicapped individual is thus transformed into a disabled one by the community.

Another point to accentuate hereby is that in the process of constructing disabled-friendly arrangements within urban spaces, it would be rather a discriminatory act to construct disabled-only designs. It would also be another discriminatory policy to establish the kind of institutions that were specifically catered to the use of disabled individuals alone. Disabled individuals themselves vehemently oppose such types of practices and demand to live under equal terms with the rest of citizens. In lieu of such approaches, it would be smarter to arrange the kind of settings and spaces in which all members of the community were comfortable to live collectively. The truth is that rearrangement of physical environment to suit to the easy-use of elderly and disabled individuals would translate to the structuring of physical spaces favorable for all users. In an attempt to generate solutions to the problems met in urban life by elderly and disabled individuals, it would be a reasonable practice to conduct all-inclusive arrangements to reunite urban spaces with the entire community rather than discriminate such individuals. Accordingly, during the stage of planning physical environment spaces, it is advocated to accentuate and employ universal design concept and principles recognized as an all-inclusive design approach integrating the entire community.

2 THEORITICAL BACKGROUND

2.1 THE SOCIOLOGY OF DISABILITY

Elderly and disabled people encounter many problems, these vary according to the types of disability they have, in urban spaces and their social surroundings. In almost every sector of society, people with disabilities, with their physical differences, are to be found. This generates different attitudes in people towards people with disabilities in society, and these diverse attitudes hamper people with disabilities from fulfilling their social needs. The primary reason for this negative situation can be traced through a historical perspective, from the past to the present; disability has been regarded as a disease and even as a disaster.

The focus of the medical model for disability is on the physical and biological condition of people with disabilities. In addition, the medical model regards disability as “reparable” and more importantly, as a condition that demands repair, the creation of a situation in which an individual can get back into circulation, or get as close to it as far as is possible is required. In other words, the medical model approaches a disabled person as if, for example, he/she has caught measles. So, the medical model asks the individual

with a disability or handicap to act as if she/he is sick. The assumption is that people with disabilities must act “the role of a patient”. Acting like a patient leaves disabled individuals bereft of independence; in other words, deprives them of the ability of controlling their own lives, which is the basic feature of human personality. In brief, the problems which people with disabilities encounter are simply medical problems according to the medical perspective. As a matter of course, any person with any medical problems is treated by medical specialists. The medical model regards “knuckling down” to the treatment of specialists as a must, and any disabled person “patient” is regarded as an inactive person, scarcely able to present his/her own personality, and unable to take charge of his/her own life. Ultimately, the disability rights movement views the medical model as a form of torture. The disability rights movement believes that the main reason for the exclusion of people with disabilities from society stems from the problem that so-called “healthy” people regard themselves as rightfully superior (Winter, 2003).

The first presupposition of the social model is that disability is a social structure and a social construction (Oliver, 1990). Disability is created by the views of healthy people both individually and collectively. It is also shaped by hostile social attitudes towards the disabled and their stigmatization in the fundamental social relationships or during encounters in the society. In addition, disability is created by society in secondary relations which characterize that society, the state and its economy; this is the result of laws, policies and institutionalized habits which clearly constrain people with disabilities. In short, the first presupposition is that disability is not a direct result of any deficiency but rather a result of social constraints. These constraints generally become apparent due to the difficulties in building entrances (the absence of ramps or elevator for people with disabilities) for example, or in the misguided perception of disabled people’s intelligence and social skills (the thought that people with disabilities are stupid and so unskilled that they are not self-sufficient), the fact that the general population is not able to use sign language, and in the absence of reading materials for visually handicapped people, or in the general public’s hostile attitude towards people who have invisible disabilities (the mentally handicapped) (Oliver, 1990). In brief, “people with disabilities are disabled by a society which is customized to the needs of people who are intelligent and can walk, see, hear and clearly speak” (Brisenden, 1998). The second presupposition of the social model is disabled people’s need for and ability to control their own lives as far as is possible. First and foremost, disabled people’s independence should be respected and there should be no pressure brought about by pointless constraints. The disabled should make and realize their own decisions. This presupposition is enhanced by the view that the social model recognizes “a series of individualistic mental and physical skills” which any person with or without disability can have (Brisenden, 1998). The social model does not approve of eliminating the humanity and leaving the disabled person alone (Charlton, 1989). As Charlton says, ‘people should not be given labels such as blind, deaf and handicapped; because, when people with disabilities are labeled this way, their personalities are identified solely with their conditions’. Contrary to this, the social model emphasizes the need to respect the independence of everyone, irrespective of the degree or type of their disability (Winter, 2003).

In this context, the descriptions which have risen according to diverse opinions should be discussed. The medical model explains that disability is dependent on biological structure. The assumption that all of the disabled are constricted forms the basis of this model. According to Article 1 of the Convention on the Rights of Persons with Disabilities, a disabled person is described as one who has ‘long-term physical, mental, intellectual or sensory impairment which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others’ (United Nations, 2006).

Functional deficiency is not simply an obstacle. Disability can be regarded as the limitedness of physical functions that hinders participation in social life (Ozarslan, 2010). According to Goldsmith (1976), the description of the disability in terms of architecture is the lack of opportunity to use buildings and their

surroundings which are only designed to meet the needs of individuals with no physical shortcomings. Kaplan (2007) describes disability as follows, obstacles encountered in the urban spaces are spatial factors which create difficulties for all individuals to overcome these obstacles at different degrees and especially prevent or restrict the disabled to use spaces and to take part in the social life in urban environment. Ideal spaces should be designed by taking the common denominator of the needs all individuals, disabled or not, into account, so that these spaces are designed architecturally to fulfill the general needs of all individuals.

2.2 UNIVERSAL DESIGN CONCEPT AND PRINCIPLES

“Universal Design involves designing products and spaces so that they can be used by the widest range of people possible. Universal Design evolved from Accessible Design, a design process that addresses the needs of people with disabilities. Universal Design goes further by recognizing that there is a wide spectrum of human abilities. Everyone, even the most able-bodied person, passes through childhood, periods of temporary illness, injury and old age. By designing for this human diversity, we can create things that will be easier for all people to use” (URL 1). The seven principles of Universal Design were developed by Center for Universal Design in the North Carolina State University (Figure 1 and Table 1).



Fig.1 The images of universal design principles

The underlying belief in universal design is that from a generic perspective all individuals are potentially-disabled people due to the physiological losses introduced with aging. The advocates of this design approach treat the user dimension in designs from a wider perspective and attempt to generate applicable solutions to problems related to use by following an inclusive and integrative attitude (Dostoglu et al., 2009).

UNIVERSAL DESIGN PRINCIPLES	UNIVERSAL DESIGN GUIDELINES
1. Equitable Use: The design is useful and marketable to people with diverse abilities.	1a. Provide the same means of use for all users: identical whenever possible; equivalent when not 1b. Avoid segregating or stigmatizing any users 1c. Make provisions for privacy, security, and safety equally available to all users 1d. Make the design appealing to all users
2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.	2a. Provide choice in methods of use 2b. Accommodate right-or left-handed access and use 2c. Facilitate the user's accuracy and precision 2d. Provide adaptability to the user's pace
3. Simple and Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.	3a. Eliminate unnecessary complexity 3b. Be consistent with user expectations and intuition. 3c. Accommodate a wide range of literacy and language skills 3d. Arrange information consistent with its importance 3e. Provide effective prompting and feedback during and after task completion
4. Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.	4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information 4b. Maximize "legibility" of essential information 4c. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions) 4d. Provide compatibility with a variety of techniques or devices used by people with sensory limitations
5. Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.	5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded. 5b. Provide warnings of hazards and errors. 5c. Provide fail safe features. 5d. Discourage unconscious action in tasks that require vigilance
6. Low Physical Effort: The design can be used efficiently and comfortably and with a minimum of fatigue.	6a. Allow user to maintain a neutral body position. 6b. Use reasonable operating forces. 6c. Minimize repetitive actions. 6d. Minimize sustained physical effort
7. Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.	7a. Provide a clear line of sight to important elements for any seated or standing user. 7b. Make reach to all components comfortable for any seated or standing user. 7c. Accommodate variations in hand and grip size. 7d. Provide adequate space for the use of assistive devices or personal assistance

Tab. 1 Universal design principles and guidelines (URL 2)

The preliminary objective of universal design is to conduct the kind of arrangements that aim not to adapt the individuals to the physical space but rather to adapt the space to the individuals. Accordingly the duty of designers is to build the kind of activity spaces that can meet the differing user needs in the best way possible. Accordingly, based on the objective of universal design as well, designers are required to reflect on the needs of different users and provide comfortable and safe spaces for the individuals. To achieve this objective in the implementation of universal design approach, certain data are transferred about the key criteria to harness within the scope of the accessibility to the design of interior spaces. Specifications to abide by in the design indicate the minimum technical specifications regarding the structured environment. During this process all designers are required to follow applicable standards (URL 3).

3 THE CASE STUDY: EVALUATION OF URBAN SPACES IN KONYA CITY CENTER IN TERMS OF UNIVERSAL DESIGN PRINCIPLES

Konya is one of the first inhabited cities in the history of mankind, and still contains traces of many ancient civilizations which give it the atmosphere of a museum city. Because of its locations in the middle of the barren Anatolian steppe, it used to be one of the most important trading centers on the Silk Road. The fertile land around the city means Konya is also the heart of Turkey's grain industry, with farming a major industry (URL, 4). Figure 2 illustrates the location of Konya in Turkey.

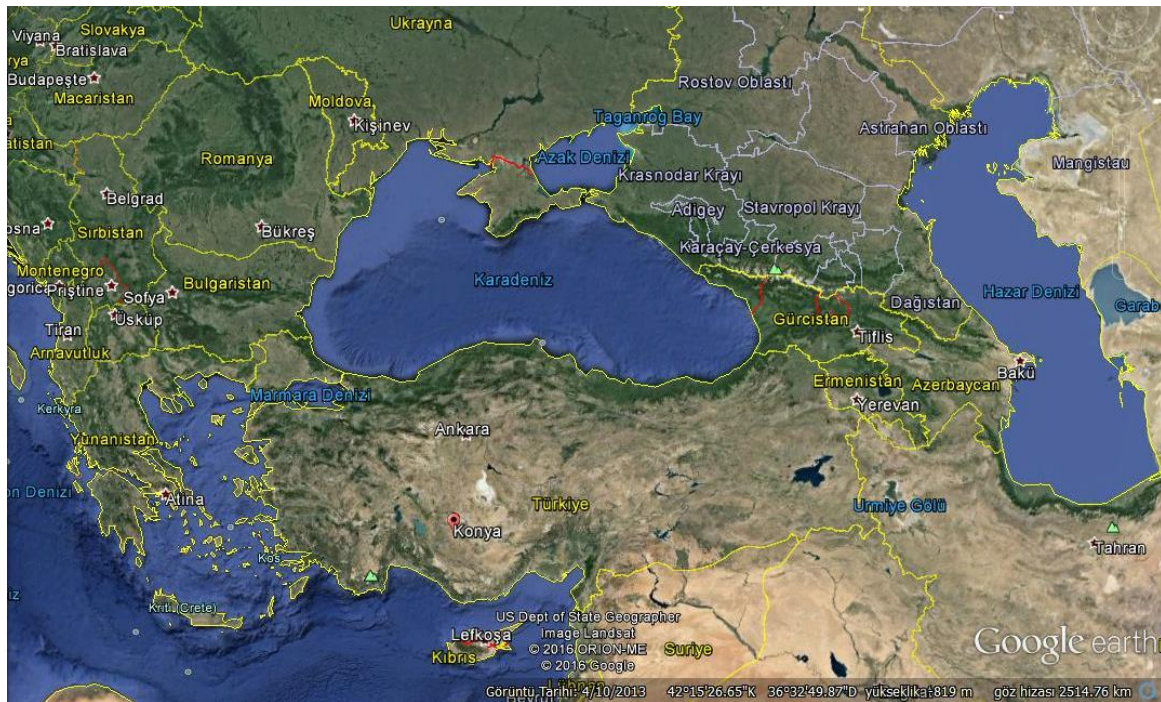


Fig. 2 The location of Konya in Turkey

Zafer Pedestrian Area, Alaeddin Hill and Mevlana Celaleddin Rumi Museum, Ince Minare Historic Mosque, Culture Park and Anıt Square are situated in Konya City Center. Culture Park is an attractive center for the inhabitants of Konya, hence it is easy to access via public transportation means viz. minibus, tramway or autobus. Culture Park project was implemented in 2009 by Konya Metropolitan Municipality in the ex-center of fairs and exhibitions. Nearby Culture Park the existing buildings are Konya Metropolitan Municipality, Haciveyiszade Mosque, Alaeddin Hill, Zafer Square, residences and commercial. Figure 3 illustrates the area of case study.

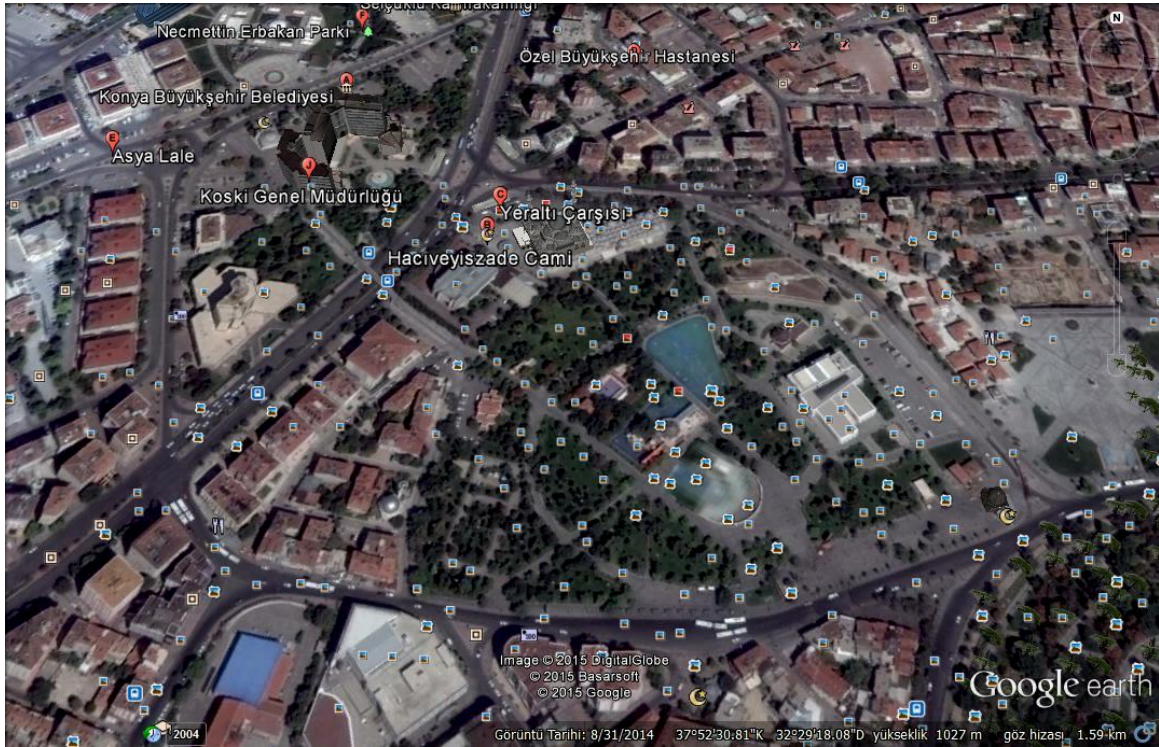


Fig. 3 Aerial photo of case study area

3.1 METHODOLOGY

Outer spaces selected within the case study site, Konya City Center, have been evaluated with respect to universal design approach and by analyzing in terms of individuals with restricted mobility as well as access and use status of all users, situational analysis of urban design components has been conducted. The suitability of public outer spaces to the access and use of individuals with restricted mobility would in effect enable comfortable and ergonomic use of all the other people. In this paper, the case study has been examined in line with globally approved design principles and standards. The case study research was conducted in April 2015. Current conditions, challenges and opportunities have been displayed via employing on-the-map marking, photographing and technical observation methods. In the process of data collection, evaluation and suggestions the assessment of urban design components in terms of universal design approach has been harnessed. Universal design principles and reflections on this paper have been examined with respect to three key headings:

1. Entrances and exits
2. Use of movement and circulation systems (main ways, pedestrian ways, stairs, ramps)
3. Common-use needs (outdoor-green spaces, urban substructure and urban furniture components)

3.2 FINDINGS AND DISCUSSION

3.2.1 ENTRANCES AND EXITS

From the pavement to building entrance, there are no guide track marks for the easy-guidance of visually-disabled individuals. Because there is level and surface failure in the building entrance, it is not feasible for the use of wheel-chaired disabled individuals; hence the entrances of such residences fail to comply with the principle of equitable use in universal design approach (Figure 4-a).



Fig. 4-a Building entrances in the survey area

At the entrance of Municipality Building, the coexistence of swing door and normal door, lack of threshold in entrance door and presence of a ramp are comforts for wheeled chair users. Nonetheless use of slippery material in building entrance is against the tolerance for error principle universal design approach. At the entrance of Finance Ministry building there exist stairs as well as a ramp. In the entrance of this building the unequal leveling, surface material and slope of the ramp are unfavorable for physically disabled individuals with a wheeled chair. The absence of any rails in the ramp is likely to trigger falling hazard which is a violation of tolerance for error principle. In addition this ramp is not applicable for wheeled chair users, thus it is against low physical effort principle of universal design approach. As seen at the building entrance of Chamber of Commerce the ramp and stairs coexist. The surface is made of slippery material which poses danger for the users and violates tolerance for error principle of universal design approach. Ramp slope is not fit for comfortable use and railing materials of slippery composite are nonresistant against heat and cold (Figure 4-b).



Fig. 4-b Building entrances in the survey area

At the entrance of KOSKİ Building absence of swing-door or a user-friendly ramp setting and ramp surface structure are some of the potential problems for wheeled chair using disabled individuals (Figure 4-c).



Fig. 4-c Building entrances in the survey area

At the entrance of library and exhibition halls, stairs-ramps coexist and as mandated by equitable use principle of universal design approach, surface flooring and ramp slope have been arranged (Figure 4-d).



Fig. 4-d Building entrances in the survey area

Entrances of bank buildings are not practical for wheeled chair users. There is only one single ramp for a range of banks ordered in line; hence this arrangement also violates low physical effort need principle of the universal design approach (Figure 4-e).



Fig. 4-e Building entrances in the survey area

In sum as surveyed at the entrances of the entire list of public spaces, it can be detected that the designs are not in full-compliance with the needs of visually and physically disabled individuals. Another detection is that the use of such urban spaces have failed to comply with equitable use principle mandated in universal design approach. Perceptible information criterion was also ignored and no warning systems were installed.

3.2.2 USE OF MOVEMENT AND CIRCULATION SYSTEMS (MAIN WAYS, PEDESTRIAN WAYS, STAIRS, RAMPS, FOOT BRIDGES)

At the entrance points of pedestrian foot bridges there is a stair-lift and lift module for the use of physically disabled individuals with wheeled chairs, for those with baby carriages and for elderly users. Slope of the ramp fails to comply with low physical effort need mandated by universal design principles. In the pedestrian foot bridges the height of the stairs is excessive and stair surface is of non-slippery solid surface (Figure 5-a).

At the entrance points of pedestrian undergrounds there are no ramps, stair-lifts or lift modules for the use of wheeled chairs for physically disabled individuals, for those with baby carriages or for elderly users. Surface flooring in the underground system is composed of slippery material which is another violation of equitable use and tolerance for error principles of universal design approach. The availability of secured non-slippery band at the foot of stairs provides ease of use for the walkers (Figure 5-b).

The frequent planting in the pavements and the excessive placement of decorative flowers restrict the mobility of visually disabled individuals. There are no perceptible surfaces for the easy use of visually-disabled individuals. Nearby the trees there exist no textures and levels uneven from ground surface. Pavement width is inadequate and ground floorings are not favorable for the comfortable use of visually-disabled individuals using assistance sticks (Figure 6-a).

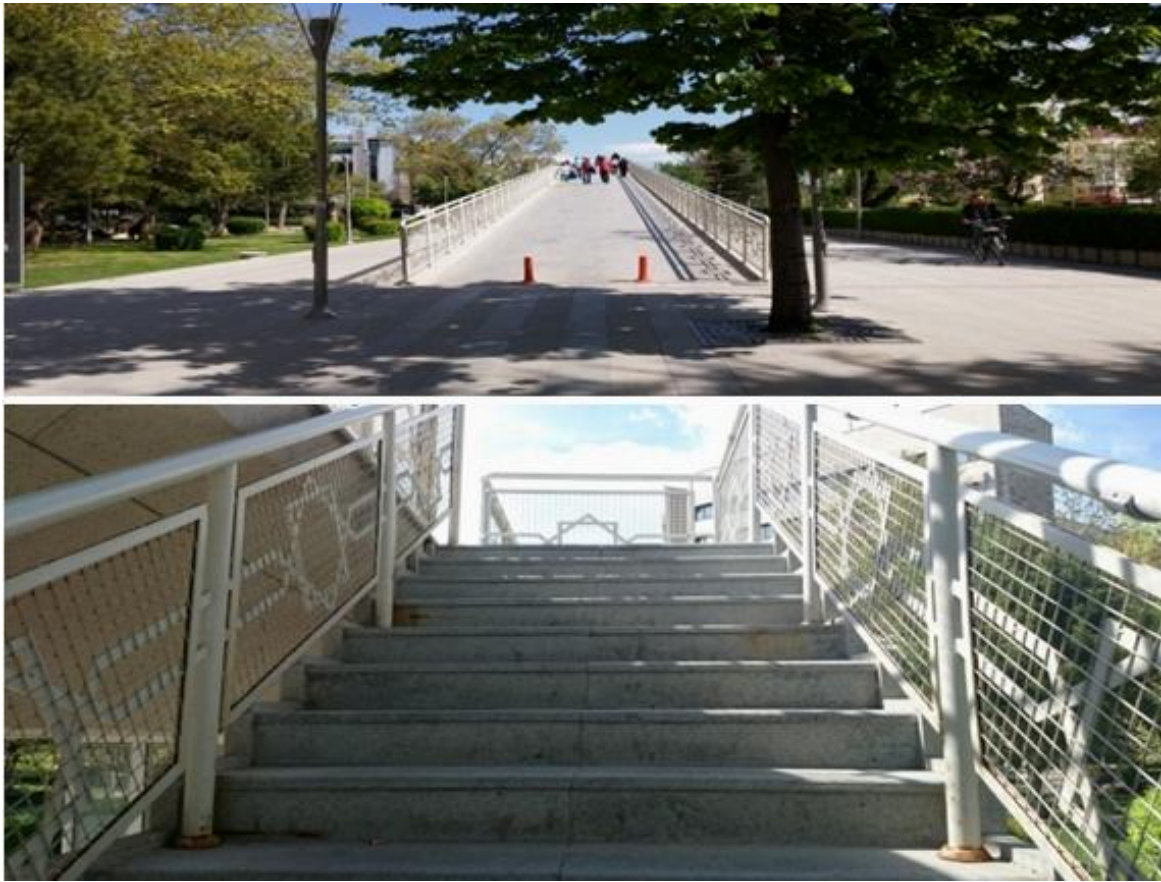


Fig. 5-a Pedestrian footbridges in the survey area



Fig. 5-b Pedestrian footbridges in the survey area



Fig. 6-a Pedestrian pavements in the survey area



Fig. 6-b Pedestrian pavements in the survey area

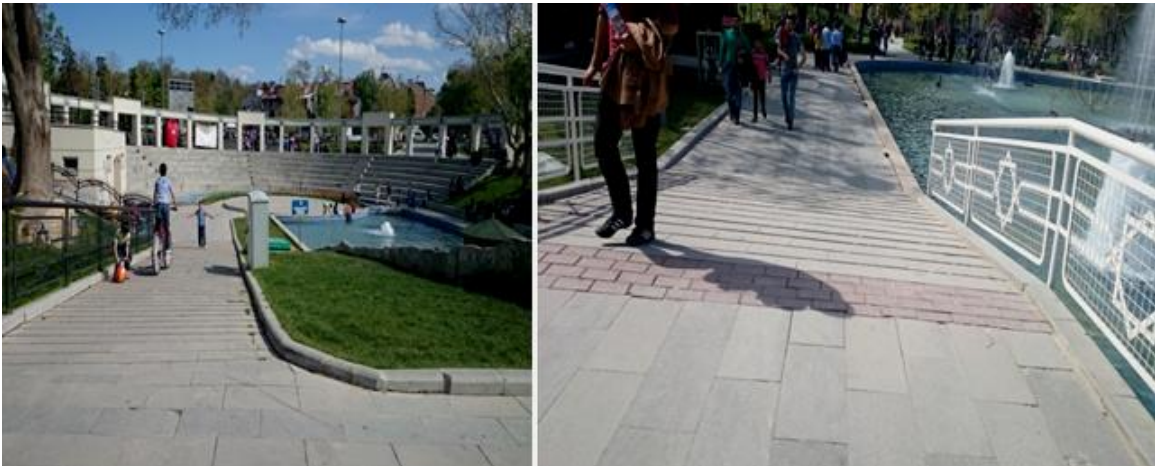


Fig. 7-a Ramps in the survey area

Pavements are discontinuous. There are no protective barriers in the border line to stop car parking; thus cars are parked on the pavement. Iron bars mounted to stop car passages on the pedestrian areas block the pedestrian traffic. There are no guide track colors and widths for the partially-blind or completely blind disabled people. In pedestrian footbridge there is a guide track for the visually disabled ones; however it is discontinuous (Figure 6-b).

As also seen in Figure 7-a, since uneven material was used in the surface texture of ramp it is against the low physical effort need principle of universal design approach and in this ramp there are no perceptible surfaces that can aid the visually disabled people to locate their direction.

Since there are no railings on the ramp borders in building entrances, it is challenging for wheeled chair users to move on the ramp which is against low physical effort principle of universal design approach. These ramps were not specifically catered for wheeled-chair users (Figure 7-b).

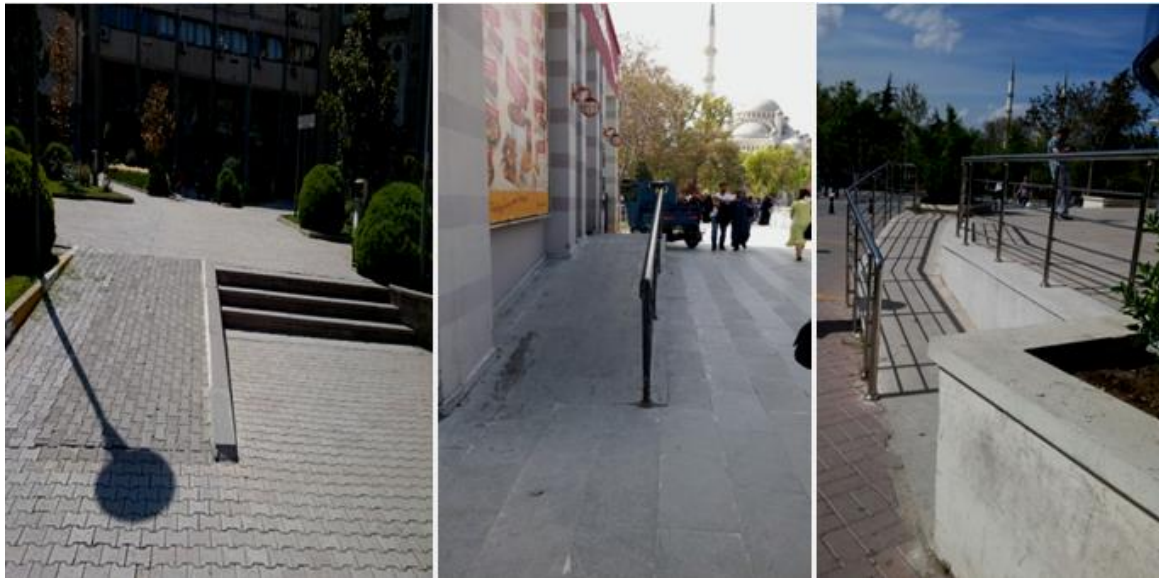


Fig. 7-b Ramps in the survey area

3.2.3 COMMON-USE NEEDS (OUTDOOR-GREEN SPACES, URBAN SUBSTRUCTURE AND URBAN FURNITURE COMPONENTS)

The failed structuring of the road and faulty location of substructure component render difficulty for all users to access the spaces. There are wide gaps in the grids used in pedestrian walkways and pavements are stationed perpendicular to the main traffic route which is a violation of equitable use principle and renders particular handicaps for the users of wheeled chairs, baby carriages, sticks or heeled-shoes wearing women. Likewise its design is incompatible with tolerance for error principle. Additionally, connection details of different materials are also unfit for the relevant principles of universal design approach and such incompatible components deviate the easy access and utility of the space. In this substructure application, absence of any perceptible surface is impairment for the comfortable and safe movement of visually disabled individuals. Technical substructure component installed on the pavement is a limitation for unassisted mobility of the users (Figure 7-c).

The installment of technical substructure component atop pavement impairs easy passage. This situation is a violation of tolerance for error and simple and intuitive use principles in design; thus based on the significance of the space it adversely affects the perceptibility of space (Figure 8).

The position of Automatic Teller Machines is not favorable for wheeled chair using disabled individuals. The height and location of telephone kiosks were not designed for the comfort of wheeled chair users. Since it was designed quite high, the model is not compatible with the size and space for approach and use principle of universal design approach. There is no Braille letter or digit telephone apparatus for visually disabled individuals or any frequency amplifier sound control tabs for the hearing disabled individuals (Figure 9-a).



Fig. 7-c Technical substructure in the survey area



Fig. 8 Urban infrastructure elements in the survey area



Fig. 9-a Urban furniture in the survey area



Fig. 9-b Street furniture in the survey area

The urban space catered for the easy passage of wheeled chair users is not wide enough. Absence of any warning signals for visually disabled individuals poses dangers for the users. In the pedestrian footbridges marked within the park area, there are no perceptible surfaces for the use of visually disabled individuals (Figure 9-b).

Another application that hinders pavement continuity and negates visual comfort is related to landscape design. As mandated to provide spaces and dimensions compatible with the universal approach and use principles of simple and intuitive use, tolerance for error in design, equitable use; it is equally vital to select appropriate trees in proper heights and sizes and locating suitably on the pavements (Figure 9-c).



Fig. 9-c Street furniture and recreation areas in the survey area

3.3 RECOMMENDATIONS: DESIGN FOR PEOPLE WITH DISABILITIES IN URBAN SPACES

The main pedestrian circulation, pedestrian walkways in open and green areas, should be arranged in order to ensure the accessibility for all users in accordance with universal and disabled-friendly design principles. These recommendations have been developed taking into account the 'Accessibility for the Disabled a Design Manual for a Barrier Free Environment' was prepared by United Nations (United Nations, 2004).

Entrance to Buildings

- At least one entrance in all buildings will be disabled-friendly. All accessible routes will be at minimum a 90 cm width. The ramp slopes will be not more than 8%. Signs will be placed on accessible routes with signboards for alternative entrances. There will be no lamps or pending signboards on entrances to be used especially by visually disabled or partially sighted people. Ramp width will be at least 90 cm.
- The access from the walkway to the main building entrance was preferred. All entrances were designed for easy access for the disabled.

Pedestrian Ways

- The width of pedestrian walkways/sidewalks were arranged to allow those using walkers or wheel chairs to pass easily.
- The width of the pedestrian pavement will be 200 cm, which is regarded as the ideal width. Pedestrian pavement curbstone levels will be maximum 15 cm higher than roadway coating. Non-slip material will be used for the coating of pedestrian pavement. Specific attention will be made to ensure that the pavement is steady and level. Also, there will be guiding tracks consisting of surfaces that can be perceived by visually impaired people using walking sticks. The guiding track with 60 cm width will be

placed parallel to the main pedestrian walkway and away from manholes and drainage channels. In addition, the color of the guiding tracks will be different from pedestrian pavement.

- Billboards, streetlights and trees, and other objects, in pedestrian walkways will be placed on a platform with 10 cm height to allow, especially visually impaired people, to recognize them.
- Instead of steps, platforms will be used for those using wheelchair to help negotiate the level differences.
- Texture changes will be made for visually impaired people on pavement landings.
- Texture changes will be made on slopes on sidewalk corners.
- In order to indicate pedestrian crossroads, returns, surface and usage changes, the tissue and coating material will be changed around these areas.
- The sidewalks and ramps will be built with an appropriate slope and with stable, uniform, non-slip, hard surface and matte material and color.
- Loose material such as sand, pebbles, stones etc. that may causes difficulty in moving and requires a lot more energy to navigate, will not be used. In surface coating, the ranges of junctures will be arranged in order to prevent obstacles for those using wheelchairs or walking sticks.
- The distances of vertical ranges for pedestrian walkways were formed so as to not make obstacles for visually impaired people.
- Parallels on drainage grills will be arranged to prevent obstacles for those using wheelchairs and walking sticks.
- Place identifiers, restrictive architecture and natural factors were taken into consideration for visually impaired people.

Street Furniture and Recreation Sites

- In order to ensure the easy use of all street furniture for everyone along pedestrian walkways, the necessary arrangements were made. The height of lamps will be minimum 220 cm. In order to ensure that people easily recognize street furniture, their colors will be different from the surrounding areas.
- Seats were placed along pedestrian walkways. Spaces were allocated around seats to let those using wheelchairs have proximity. Seat surroundings were planted. Recreation areas will be placed out of the main pedestrian walkway. Sitting benches will be placed with a 100 cm-200 cm range. A 120 cm area will be allocated around sitting benches for wheel chairs. Benches will be at 45 cm height and back recliner will be at 70 cm height.
- The height of tables in the recreation areas will be between 75 cm and 90 cm. The minimum depth below the tables will be 60 cm to allow wheel chair access in every direction.
- Project areas will be sufficiently illuminated to ensure access and personal safety. At this point, light levels should be increased in dangerous areas and matte material should be used to prevent flashing or reflection.
- To light the main pavement walkway, a lighting platform will be at minimum 150 cm width and 230 m height. Along the main walkway, a sitting bench will be placed every 100 m. The main pedestrian walkway and paths in green areas will be coated with non-slip material. For sidewalks within the park, light fixtures will be at minimum 90 cm width and 230 cm height. Ground types in open areas should be passed by wheel chairs easily and smoothly. Moreover, the ground should be used without any danger in all climate conditions. Surface coating will have a guiding function.
- Rubbish bins will be mounted at minimum 90 cm and maximum 120 cm height and at least 40 cm away from the curbstone on the edge of pedestrian walkways in order not to prevent pedestrian

circulation. Rubbish bins will be mounted in the opposite direction from lamps and pedestrian circulation so as not to cause any obstacle for pedestrians. Rubbish bins will also be painted with a different color than lamps to enable partially sighted people to recognize them.

- Traffic, information and guide signs should be basic and visible. Their height, position, color, size and graphical order are important. Signs should be illuminated, Braille should be used and they should be at suitable height to be touched easily. Signs should use international symbols.

Planting

- Thorny plants and trees, and plants that produce seeds and fruits that may cause slippery surfaces, were not used on pedestrian walkways since they are potentially dangerous.
- Branches extending over pedestrian walkways are dangerous obstacles, especially for visually impaired people. These branches should be prevented from extending over pedestrian walkways. Such trees will be planted away from pedestrian walkways so that they do not prevent passage.
- Bushes, shrubs and flowers with different colors, forms and scents were used for planting.
- Trees, electricity, traffic signs, ornamental plants, flower beds and pots to be placed on the edge of roadways and walkways will be appropriately placed within a border with minimum 75 cm and maximum 120 cm width. Perceivable warning surface elements will be placed around trees, pavement stone bulges, shrubs etc.

4 CONCLUSION

Physical spaces used by the disabled and elderly individuals are the kind of areas that are comfortably used by healthy individuals as well. Therefore arrangements to conduct in urban interior and outer spaces must be performed to prioritize the needs of all society members. Applied plans and designs must be comprehensive, integrative and inclusive for all disability groups. However under no circumstances should it restrict the easy-use of others or create any discriminatory arrangement policies. Certain spaces should be arranged in cities to allow the independent and unaided movement of disabled individuals. In urban areas, right of way should be allocated to pedestrian-focused designs rather than vehicles. Instead of traffic-speeding foot bridges, lighted roads with uni-surface pedestrian ways should be opted for. In public transportation it is advised to implement integrative and all-inclusive arrangements rather than specific solutions catered for disabled and elderly individuals.

It is the main duty to achieve the participation of all mobility-restricted disadvantageous groups into social and urban life and to ensure that it is required that states, local administrations, relevant professional groups, nongovernmental organizations and university boards duly perform their respective duties. Other imperatives are forging social awareness and shifting the biased perspective towards disabled and elderly individuals. Rendering egalitarian rights and opportunities to disabled individuals is one rule for modern and social state approach. Local administrations, nongovernmental organizations and design-focusing departments of universities are advised to take action in coordination.

The arrangements to implement in Konya City Center on the basis of universal and accessible design principles would contribute to the strengthened life-bonds between elderly and disabled individuals and the city itself. Parallel to their risen participation to social and economic life they would attain a boosted level of productivity. In effect any disabled and elderly individual having managed to partake in urban and social life would sustain his/her life in a further productive and healthier manner.

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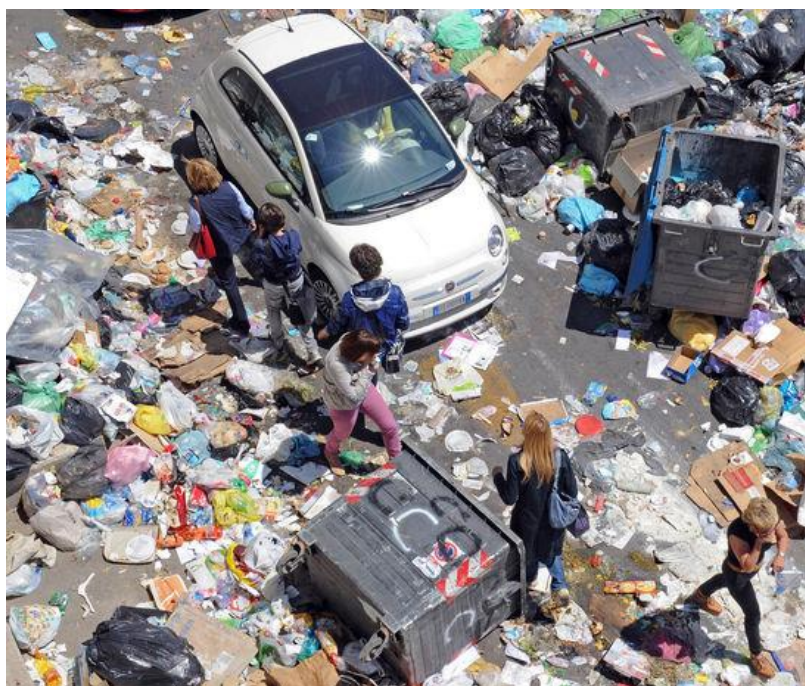
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MSW FROM POLLUTION/DEGRADATION SOURCE TO RESOURCE

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ABSTRACT

Municipal Solid Waste is one of the biggest challenges that cities are facing: MSW is considered of the main sources of energy consumption, urban degradation and pollution. This paper defines the major negative effects of MSW on cities and proposes new solutions to guide waste policies. Most contemporary waste management efforts are focused at regional government level and based on high tech waste disposal by methods such as landfill and incineration. However, these methods are becoming increasingly expensive, energy inefficient and pollutant: waste disposal is not sustainable and will have negative implications for future generations. In this paper are proposed all the principle solutions that could be undertaken. New policy instruments are presented updating and adapting policies and encouraging innovation for less wasteful systems. Waste management plans are fundamental to increase the ability of urban areas effectively to adapt to waste challenges. These plans have to give an outline of waste streams and treatment options and provide a scenario for the following years that significantly reduce landfills and incinerators in favor of prevention, reuse and recycling. The key aim of an urban waste management plan is to set out the work towards a zero waste economy as part of the transition to a sustainable economy. Other questions remain still opened: How to change people's behavior? What is the role of environmental education and risk perception? It is sure that the involvement of the various stakeholders and the wider public in the planning process should aim at ensuring acceptance of the waste policy.

KEYWORDS:

Urban waste management; Waste governance; Urban degradation.

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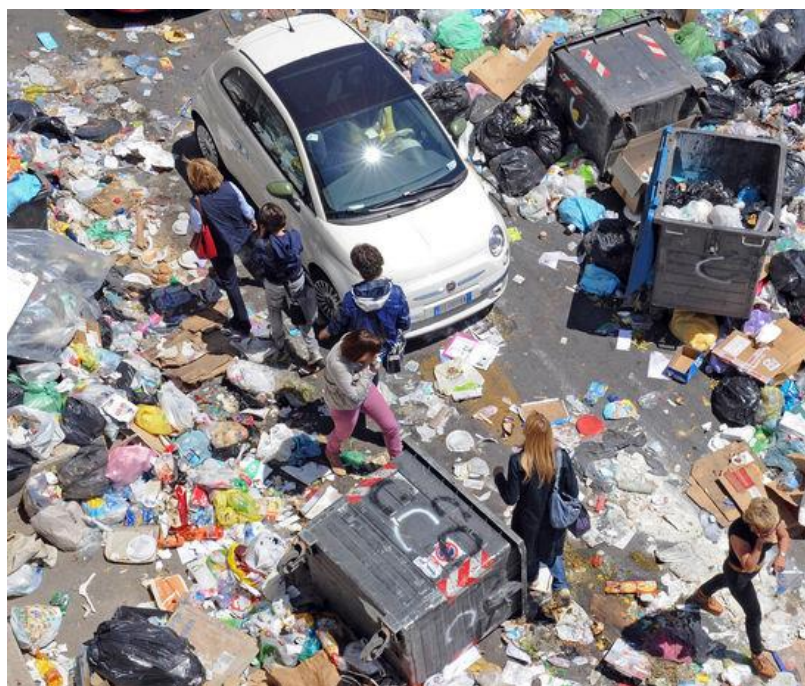
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城市生活垃圾

从污染源/退化源到资源

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摘要

城市生活垃圾（MSW）是当今各个城市面临的巨大挑战之一：城市生活垃圾被认为是能源消耗、城市退化和污染的主要来源。本文定义了城市生活垃圾的主要负面影响，并提出了指导废弃物政策的全新解决方案。当今的大多数垃圾管理工作都集中在地方政府层面，以高科技废弃物处理方式为主，如垃圾填埋和焚烧等。然而，这些方法的成本越来越高，能源效率低下和易污染：废弃物处置不具可持续性，会为后世带来负面影响。本文提出了能采取的所有原则性解决方案。提出了全新的政策工具，更新和调整政策、鼓励减少系统产生废弃物的创新。废弃物管理计划对于增强城市地区有效应对废弃物问题的能力有着决定性的作用。这些计划中必须包括废弃物流和处理方案的草案，提出接下来数年内能极大减少堆填和焚化以利于预防、重复使用和回收的方案。城市垃圾管理计划的主要目的，是启动以零废弃物经济为目标的工作，将其作为向可持续经济体系过渡的一部分。其他问题仍然亟待解决：如何改变人们的行为？环境教育和风险感知的作用是什么？可以确定的是，各利益相关方和广大公众在规划过程中的参与，应以保证对废弃物政策的接受度为目的。

关键词：

城市的废弃物管理；废弃物治理；城市退化

1 THE CITIES' BIGGEST CHALLENGE: MANAGING WASTE GENERATION

One of the biggest challenges that cities will face, in the next years, is connected to waste production. Municipal Solid Waste - MSW¹ - generation levels are expected to double by 2025 according to the World Bank: 1.3 billion tonnes per year are estimated to increase to approximately 2.2 billion tonnes per year². This might represent a significant change in people lifestyle and it will force local, regional and national authorities to find new solutions and policy instruments. Per capita waste generation rates will increase from 1.2 to 1.42 kg per person per day in the next fifteen years². New life styles and best practices have to be promoted to stop solid waste generation rates. Waste management is more critical in urban areas. Urban residents produce about twice as much waste as people living in the countryside. Considering that all over the world there will be 1.4 more people living in cities it is clear that MSW will be one of the biggest problems that cities will have to deal with. Waste management has already been the main source of expenditure for local authorities in the last 20 years. The increasing urban population made the environmentalists think about the scientific waste management with topmost priority in urban planning (Ahmed 2011). Another factor that influences urban waste production is the income level of a country: high-income countries generate the most waste per capita, while developing countries produce the least solid waste per capita. So it is reasonable to say that for many cities above all in Asia and Africa, but also in South America, the total quantities of waste will increase significantly in the next years. According to the World Bank's report "What a Waste. A Global Review of Solid Waste Management", the amount of urban waste being produced is growing faster than the rate of urbanization (Hoornweg, Bhada-Tata, 2012).

This paper wants to analyze MSW issue from an innovative point of view. The authors³ show in the first three subsections how much municipal solid waste are affecting urban areas both as a source of pollution, degradation and in terms of energy consumption. MSW generates methane that is a greenhouse gas particularly dangerous in short-term. Solid waste, if not managed correctly, could be responsible for air pollution, flooding and public health impacts such as respiratory ailments. A city that reduces, reuses and recycles its waste is more livable, attractive and sustainable.

In the second paragraph are analyzed the main measures for sustainable waste management. The paper proposes new policy instruments for urban waste management. Waste management plans, at a local level, are identified as the best policy instrument to reduce energy consumptions, urban pollution and degradation. A possible structure for these plans it is here proposed to guide urban technicians. Solid waste management is the one thing just about every city government provides for its residents. While service levels, environmental impacts and costs vary dramatically, solid waste management is arguably the most important municipal service and serves as a prerequisite for other municipal action (Kyte 2012). The authors give also some instructions to choose the most suitable best practices depending on city's characteristics (population, geography, morphology...). Different factors have been considered such as pilot area features, people/institution involvement, sustainability aspects... Waste management plans have to fix high objectives: zero waste policy it is the final goal. Some questions remain unsolved: How to change people's behavior? What is the role of environmental education and risk perception? The final paragraph identifies all the aspects that need to be consider and more deeply analyzed in future researches to really define an efficient and sustainable waste management plan. Cities have been the hub of innovation for humanity; such human ingenuity will be needed to address the ongoing and emerging major challenges facing cities: waste management remains one of them (Wilson, Velis 2014).

1 The World Bank defines municipal solid waste as 'non-hazardous waste generated in households, commercial and business establishments, institutions, and non-hazardous industrial process wastes, agricultural wastes and sewage sludge. In practice, specific definitions vary across jurisdictions.'

2 Data reported in What a waste: A Global Review of Solid Waste Management, n°15 Urban Development & Local Government Unit World Bank, Washington.

3 Selena Candia has done an analysis on MSW as a source of urban pollution, degradation and energy consumption (chapters 1,2,3 and 4). Francesca Pirlone has done an analysis on innovative measures for sustainable waste management (chapter 5,6 and 7).

1.1 MSW AS A SOURCE OF URBAN POLLUTION

MSW collection, treatment and digestion can significantly affect urban environment. In the following subsection are defined the principle types of pollution that are due to MSW management⁴. Human health and environment protection have to be at the heart of every waste policy. There needs to be determinate how and to what extent MSW are contaminating contemporary cities.

Municipal waste could be one of the principle causes of water, air and soil contamination. Air pollution depends mostly on greenhouse gases produced during waste collection and digestion especially in landfills and incinerators. Landfills produce mainly CH₄ (methane) and CO₂, incinerators generate other climate-change gases and particulates such as PM₁₀, SO₂, NO₂. Landfills produce a huge amount of planet-warming methane, a greenhouse gas with 25 times the climate impact of carbon dioxide over a 100-year period (EPA, 2010). Methane is produced from biodegradable waste decomposition. Municipal solid waste landfills are the third-largest source of human-related methane emissions in the United States, accounting for approximately 18.2 percent of these emissions in 2014 (EPA, 2014). On the contrary only the 0,5% of CO₂ emissions are related to waste treatment. For this reason, CH₄ reduction represents a big potential to reduce global warming. Moreover, methane lifetime is very short, it can remain in the atmosphere at least 12 years, but CH₄ is more efficient at trapping radiation than CO₂. To stabilize the actual situation, it is sufficient to reduce methane presence in the atmosphere of 8%. Since inappropriate management of MSW in landfills contributes from 4% to 11% of world greenhouse gases emissions, properly managed food waste by means of separate collection and recycling will have positive impacts on climate change; by transforming food waste into compost, the organic matter is stored in soils by means of a low-cost and immediately available technique and not lost into the atmosphere as CO₂ or methane (ISWA –International Solid Waste Association, 2013).

Emissions to soil can occur from slag, from leaking liners under a landfill, and from the storage site of incinerator fly ash. Municipal solid waste that derives from natural products, rotten fruits or vegetables, normally only contribute to soil fertility. However, in a landfill are buried many other materials full of chemicals that lead to soil pollution. This phenomenon has different negative effects both on health of citizens and on growth of plants decreasing soil fertility and changing soil structure. Plants and crops absorb the pollution from the soil and then people eat harmful toxins. This could lead to the sudden surge of different form of illnesses. It is also difficult for many plants to adapt to a soil that changed radically its chemistry in a short period of time. Soil pollution decreases significantly the number of fungi and bacteria in the ground contributing to soil erosion. Emissions to water arise from certain types of flue gas treatment and from the extraction of leachates under a landfill (Spadaro, 2008). Waste settlement seems to be one of the major sources of water pollution which provide many negative impacts above all to urban communities. Many landfills were settled on unsuitable soils which are often too close to groundwater reserves. This is because landfills placed during the 60s and 70s, when there wasn't a stringent European legislation, are still working. The result is that in many cities groundwater is a chemical cocktail reducing drinking water resources.

Carbon dioxide is warming the planet and changing the climate. Disasters such as violent storms, polar melting, floods etc. are growing over time. A sustainable waste management could reduce significantly the level of many greenhouse gases. Recycle is a best practice in this sense, because one ton of material recycled reduces of 30-90⁵ kg of greenhouse gases compared to landfills and incinerators (Morris J., 1996). Composting and anaerobic digestion are other smart solutions. Composting is optimal to digest organic waste because aerobic conditions eliminate methane production. Anaerobic digesters are modern systems which use organic waste to produce biogas through an anaerobic procedure. It is a biological process that produces a gas principally composed of methane (CH₄) and carbon dioxide (CO₂), this gas is not dispersed into the atmosphere but it is

⁴ The data reported defines globally the main effects of MSW on the environment. Each city has to calculate its level of pollution aggregating the effects here reported (CO₂, CH₄, soil erosion).

⁵ It depends on the material recycled.

used to produce energy. Local authorities have to consider environmental impacts related to each form of waste treatment to choose the most sustainable solutions (Tab.1).

WASTE TREATMENT	ENVIRONMENTAL IMPACTS
Landfill	50 percent methane (the primary component of natural gas), 50 percent carbon dioxide (CO ₂) and a small amount of non-methane organic compounds. Methane is a potent greenhouse gas with a global warming potential that is 25 times greater than CO ₂ .
Incinerator	Incinerator are responsible for: - different emissions harmful to the atmosphere like NO _x , SO ₂ , HCl, particulates, ...; - many dangerous greenhouse gases like CO ₂ (coming from plastic combustion) and NO ₂ that contribute to climate-change. Moreover, only a part of the energy produced is renewable, because generated burning organic waste.
Recycle	Recycle results in a reduction of 30-90 Kg of greenhouse gases for each ton of material. Producing new products using secondary materials can save significant energy (preventing new raw material extraction and manufacturing processes).
Composting	Composting is possible maintaining aerobic conditions eliminating methane production.
Anaerobic digestion	Biological process that produces a gas principally composed of methane (CH ₄) and carbon dioxide (CO ₂). This gas is not dispersed into the atmosphere but it is used to produce energy.

Tab.1 Environmental impacts due to waste treatment

Researchers in the UK and USA⁶ have found how to monetize the social negative effects of CO₂. These studies are very important for local authorities because they give an economic value to support sustainable waste management solutions. The Social Cost of Carbon (SCC) is defined, according to Environment Protection Agency (EPA), as an estimate of the economic damages associated with a small increase in carbon dioxide (CO₂) emissions, conventionally one metric ton, in a given year. In 2015, EPA recommended an illustrative estimate for the SCC of \$68/tonne of carbon (tC), within a range of \$46 to \$138/tC (for year 2025 emissions, see Fig.1).

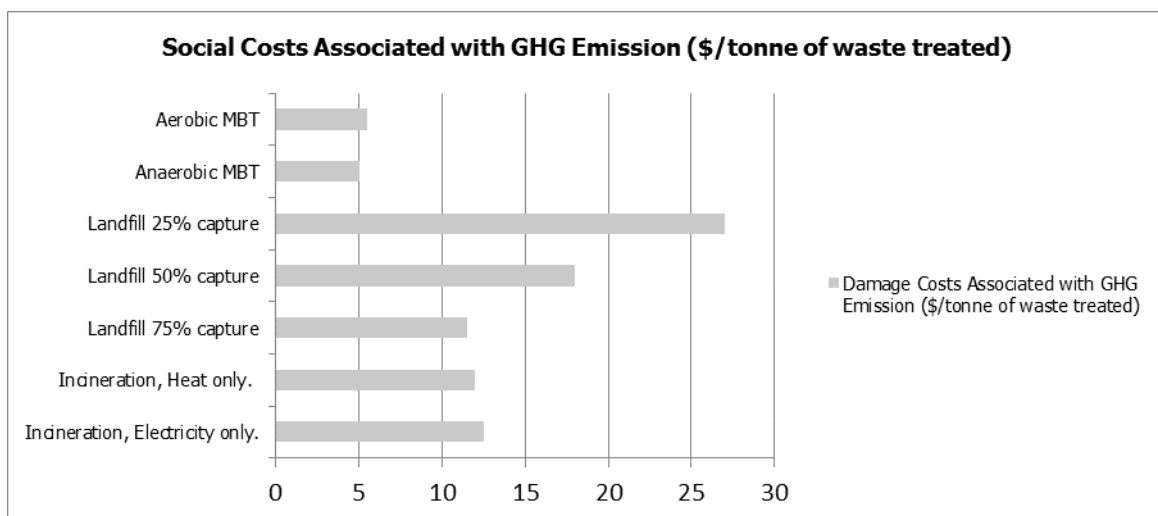


Fig. 1 Social Costs of GHG Emissions from Residual Waste Treatments

⁶ The Government Economic Service (GES) in the United Kingdom and the Environmental Protection Agency (EPA) in the United States of America.

1.2 MSW AS SOURCE OF URBAN DEGRADATION

MSW is one of the main sources of urban degradation. Problems with waste disposal continue to condition the quality of life in modern cities. In the following subsection are defined the bad effects on urban spaces and on the tourism sector that are due to MSW management. Some case studies are reported to show the strong relationship that exists between a good or bad waste management and urban decay. People involvement is essential to prevent litter and to attract people interest in recycling.

A touristic destination can lose visitors if its garbage is not properly managed. This happened in Tunisia in 2011 when a lot of tourists coming back home from Hammamet, Sousse and Djerba reported a negative Word of Mouth. Word-of-mouth advertising is what happens when a tourist talks about his journey with someone else. A negative word of mouth can severely damage or even cancel a touristic destination/city. For this reason, the Tunisian Minister of tourism announced at the World Bank conference (December 2012) that new measures to solve the situation would have been undertaken. Also in Italy some tourists claimed that different destinations are dirty and degraded - according to a research carried out by Alpitour in 2011 -. Despite its huge historical heritage, Italy is only the fifth visited Country in the world. According to Alpitour's questionnaires the cause is due in part to the lack of public transport and urban degradation (dirty streets, inappropriate waste management ...).

Urban decay is more evident considering some examples of bad MSW management such as Beirut. The Lebanon's cosmopolitan capital since September 2015 is a surreal and unhygienic city (Fig. 2). The waste crisis begun last July: local authorities decided to close the main landfill of Beirut, and other structures in the surrounding, without thinking to any alternatives. The city center is relatively clean – to avoid public demonstration against the government –; all the rubbish is pushed in the periphery where it is accumulated along the road and the banks of the Beirut River. A study by the American University of Beirut demonstrated (December 2016) that the air in Beirut suburban areas is 400 times more polluted than in the country's industrial area.

The airborne toxin levels have grown exponentially because many municipalities have started to burn rubbish piles on the street. Beirut's hospitals have registered in the last months more and more cases of respiratory diseases consequence of this illegal solution. There is strong evidence linking uncollected household waste to public health, both directly to higher incidence of diarrhea and acute respiratory infections in children and indirectly to flooding and the spread of water-borne diseases via blocked drains (UN-Habitat, 2008).

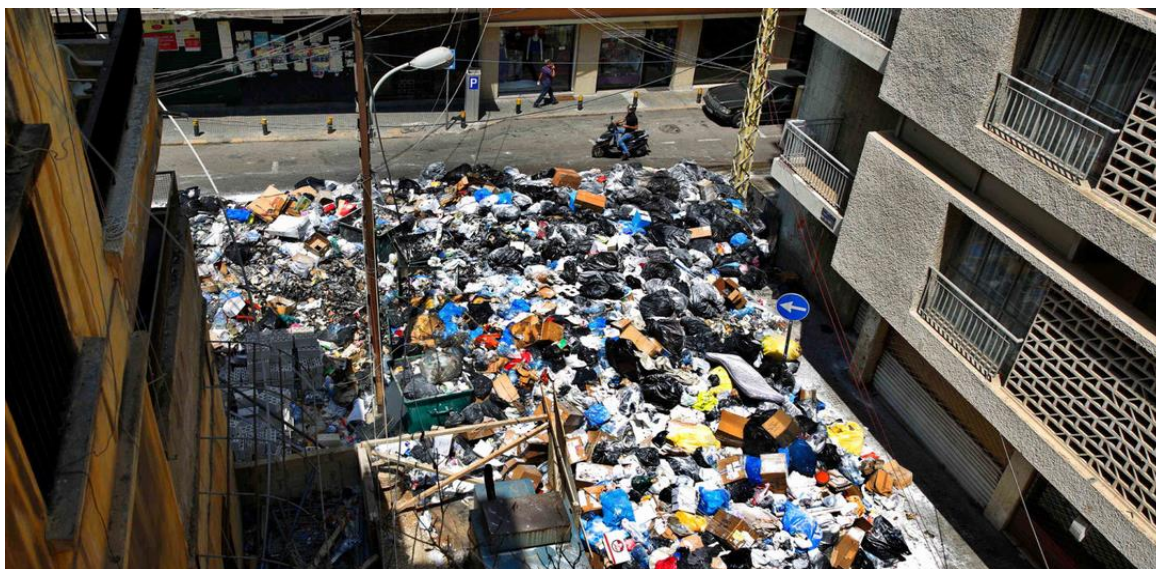


Fig. 2 A motorcycle passes by a large pile of garbage blocking a street in Beirut, July 27, 2015

Inefficient systems of waste management and outdated technologies could degrade significantly urban spaces. Many cities in Europe have found new ways to prevent urban degradation above all in historical areas. Most of them have adopted underground waste bins: this system provides a greener, cleaner and more aesthetic collection solution. Normally underground waste bins can contain larger volumes of waste using less land than common garbage bins. This big volume increases operational efficiency reducing the number of vehicles – that means also a carbon footprint reduction - and of sanitation workers. Underground waste bins are one of the best solution in touristic areas, where it is needed a discrete system of collection that does not affect the historical heritage and the city image. In some cases citizens are primarily responsible for urban degradation: they litter, they do not respect collection time, they prefer to put their trash bag in the closest garbage bin even if it is full and there is another empty within walking distance... Drawing on research from North America, Australasia and Europe, there is a wealth of evidence to suggest that a wide variety of factors influence environmental action; these can be characterized as environmental and social values, situational factors and psychological variables (Barr 2003). For this reason, it is important to do awareness campaign tailored on local situation to make citizens feel part of city waste management. People prefer not to think about garbage and where it will end up. MED-3R project demonstrated that showing to citizens what municipalities do with their waste it is important to improve their confidence in local authorities and their environmental engagement. Awareness campaigns have to reach all kind of target: resident (children, families, shop keepers ...) and fluctuant (students, migrants, tourists ...). Another initiative carried out by two project's partners – the city of Genoa and the metropolis of Nice – trained a group of citizens to become "Recycling Ambassadors". The training program taught to more than 50 volunteers: How to talk to other citizens about changing behavior to become environmentally friendly; What can and cannot be recycled; The common contaminants in recycling bins. The "Recycling Ambassadors", after the training, have participated in different initiatives organized in every neighborhood to attract people interest in recycling. The results of this operation were very positive and also in this case there was a domino effect.

1.3 MSW AND ENERGY CONSUMPTION

Waste management does not affect only water, soil and air quality but it has many impacts on energy consumption. In the following subsection is analyzed the amount of energy used to transport and treat MSW. Some best practices are reported to show new management systems to reduce energy consumption. Reduce, Reuse and Recycle are the three essential components to save energy.

Urban areas consume a lot of energy to transport and to treat MSW. The energy used for treatment regards above all wastewater treatments. Water and wastewater systems are significant energy consumers with an estimated 3%-4% of total U.S. electricity consumption used for the movement and treatment of water and wastewater (Daw, Hallett 2012). The energy used for transport is mainly obtained from fossil fuels and so it is highly polluting. The reduction and modernization of vehicles can significantly cut down energy consumption and curb greenhouse gas emissions. More than 80 garbage trucks in Nice (France) are equipped with a GPS system. This system optimizes waste collection and gives a better service to citizens. Sanitation workers can operate in safer conditions and in a more effective way. Vehicle's progress is monitored in real time (fuel consumption, activities details, level of eco-driving). Thanks to this information each tour is optimized to use less energy. Moreover, the service identifies the amount of waste collected in each city circuit providing data to better define garbage trucks' routes and number. Drivers can now report, in a few clicks, any logistic problem specifying the ongoing trouble. The Metropolis of Nice has also provided 57 000 garbage bins - located in remote areas - with a chip. These chips allow sanitation workers to report, using a portable terminal, all interventions needed: repairing, cleaning, substitution, etc. Another system to optimize waste collection was textured by IBM's researchers in Nairobi. Ten garbage trucks are still equipped with smart devices. Thanks to

these devices city officials can monitor the position and the movement of the fleet in real time. When garbage trucks are driving, they collect both garbage and information to optimize and reroute the vehicles. The device gives real-time information on the amount of fuel used, distance covered and time spent idling or off the job. Other factors that can result in significant energy savings are connected to the three R's of the Environment – Reduce, Reuse and Recycle -. Source reduction is the main contributor to energy reduction because it completely prevents new raw material extraction and manufacturing processes. If we consider the entire cycle of life of a given material, from the cradle to the grave a lot of energy is required. The biggest quantity of energy is normally used during the production phase. Recycling and reusing a product it is possible to save the energy related to material extraction, processing and manufacture. MSW can represent a considerable potential resource. In recent years, the global market for recyclables has increased significantly. The world market for post-consumer scrap metal is estimated at 400 million tonnes annually and around 175 million tonnes annually for paper and cardboard (UN-Habitat, 2009). In global terms this represents a value of at least \$30 billion per year (EPA, 2015). This value does not consider the informal and illegal sector that is very active particularly in low and middle income countries. Producing new products using secondary materials can save significant energy. For example, producing aluminum from recycled aluminum requires 95% less energy than producing it from virgin materials (EPA, 2015). The figure presented here demonstrates how much energy is saved per ton of recycled material (relative to landfilling), for example using 1 ton of recycled plastic it is possible to save almost 103 Million of calories (Fig. 3). Only some materials such as dimensional lumber or medium-density fiberboard require more energy to be recycled rather than the energy they can produced during combustion.

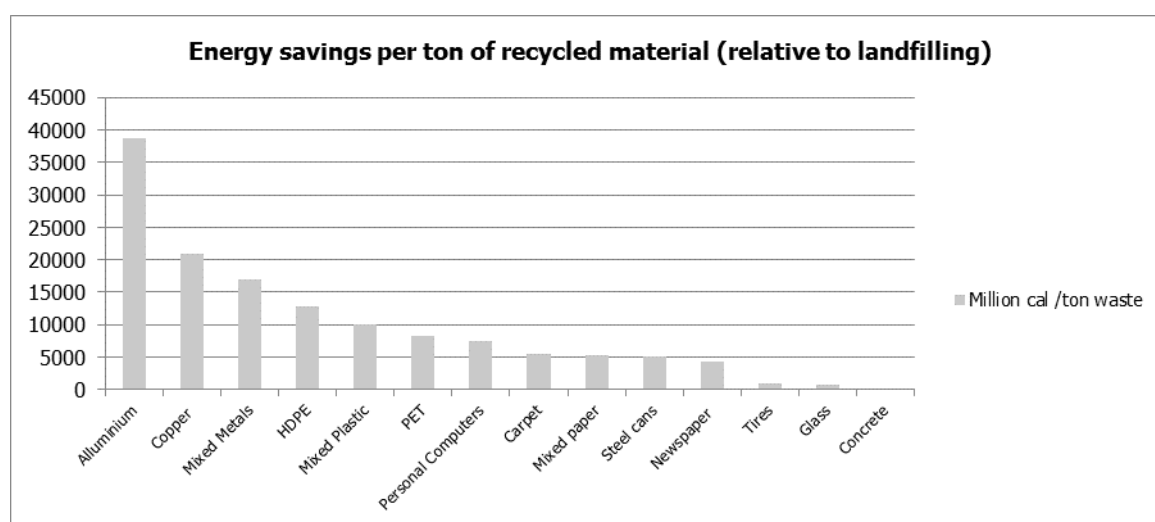


Fig. 3 The table presented shows how much energy is saved per ton of recycled material (relative to landfilling), results are expressed in Million of cal per ton waste

Another way to recover energy from waste is producing heat and electricity with incinerators or anaerobic digesters. According to the UE directive 2008/98 on waste, municipalities have to prefer prevention, reusing and recycling rather than energy recovery from waste. It simply does not make sense to spend so much money destroying resources we should be sharing with the future (Connect, 2013). This directive describes in details the waste management hierarchy that EU Member States shall apply: waste prevention, re-use, recycling, recovery and finally disposal as a last option. According to the waste hierarchy, incinerators in terms of energy should be encouraged over landfills. There are currently 86 waste-to-energy facilities in the United States. According to the Energy Recovery Council, they provide 2,700 MWh of clean electricity on a 24-hour-per-day, 365-day-per-year basis enough to power about 2 million homes (Pyper, 2011). Always in terms of energy

recycle is the best choice, because you can save more energy recycling an object than the energy that you can recover burning it. Incinerating municipal solid waste in an energy-from-waste (EFW) facility recovers a portion of each waste material's heat value as electrical energy. Waste materials recycled conserve energy by replacing virgin raw materials in manufacturing products, thereby reducing acquisition of virgin materials from the natural environment. At the same time, recycling removes materials, some of which have high intrinsic energy content (e.g., paper and plastic), from the stream of MSW available for EFW incineration (Morris, 1996). A research of the Ontario Waste Composition Study demonstrates that for 24 of 25 waste materials, recycling saves more energy than is produced by incinerating MSW in an EFW facility to generate electricity (Morris, 1996). For example, one kilo of newspaper burned produces 18600 KJ but if it is recycled it is possible to save at least 21300 KJ (Choate, Pederson, Scharfenberg, 2005).

2 MEASURES FOR SUSTAINABLE WASTE MANAGEMENT

In this paragraph are proposed new policy instruments to improve the quality of life in modern cities reducing urban pollution and degradation. Innovative solutions are studied to reduce to a minimum product's impacts from cradle to grave. Waste management plans, especially at a local level, have a key role to play in achieving sustainable waste management. The authors define, in the following subsections, the possible structure of an urban waste management plan, examining which best practices, goals and activities should be considered.

Cities can rely on quite new tools for a good waste governance such as waste management plans. The establishment of a plan allows taking stock of the existing situation, defining the objectives that need to be met, formulating appropriate strategies, and identifying the necessary implementation means (EU, 2012). Waste management plans need to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use. These plans are the best way to manage MSW, preventing urban pollution, degradation and reducing energy consumption in cities. As prevention, re-use and recycling have the highest priority in the EU directive 2008/98/CE, waste management plans should be made in order to aim at reducing the quantity of waste generated and treated in landfills or incinerators. Waste management plans are fundamental to improve the ability of urban areas to effectively manage MSW finding a solution to waste negative effects (as outlined in the subsections 1.1, 1.2, 1.3). These plans have to give an outline of waste streams (for each waste stream, understand all regulatory considerations; who is responsible for each internally, how is each handled, what are the policies and procedures, who are the waste haulers) and treatment options and provide a scenario for the following years that significantly reduce landfills and incinerators in favor of prevention, reuse and recycling.

According to European legislation it is compulsory for every state member to have a national waste management plan, however regional and local authorities are recommended to define their strategies to reach national objectives. A national waste management plan is of a strategic nature, whereas regional or local plans are more action-oriented: operational plans with detailed descriptions of current collection systems, treatment plants. National, Regional and local plans are important tools contributing to implementation and achievement of policies and targets set up in the field of waste management at the national and the European Union level (EU, 2012). The key aim of an urban waste management plan is to set out the work towards a zero waste economy as part of the transition to a circular economy. As direct consequence, cities will become more livable preventing urban degradation and pollution. It is important to establish both short- and long-term goals for waste minimization and integrate them into a meaningful and achievable waste management plan. Target setting allows an organization to set reasonable goals that are consistent with a basic, intermediate or advance approach. Finally, the target goals will inform which performance improvement measures to implement to achieve the goals. Even if cities are most of the time primarily responsible for waste management, in Europe

there are no plans at a local level⁷. During the EU project MED-3R the authors have defined the guidelines to write a waste management plan at urban scale. There is no rigid pattern for how to structure a waste management plan. However, it may be expedient to structure the plan with three consecutive phases - Background, Status part and Planning Part – and two transversal parts good for all the other planning phases – Participatory Process and Monitoring – as reported in tab.2.

GUIDELINES TO PREPARE AN URBAN WASTE MANAGEMENT PLAN

CONSECUTIVE PHASES	
1.BACKGROUND	
Overall waste problematic	MSW: increasing per capita waste generation ...
Legislative framework	local, regional, national and European legislation
Specific goals for the analyzed area	Main goals: population welfare, environment defense, economic development, resources exploitation ...
Working groups	It is suggested to create a working group directly responsible of the definition, control and monitoring of the waste management plan.
2. STATUS PART	
Data collection	Information to consider are: territorial framework, general waste data (waste amounts, waste streams and sources) waste management options, waste collection and treatment, ...
SWOT Analysis	With this method it is possible to resume and reorganize all the collected information highlighting the Strengths, Weaknesses, Opportunities and Threats of each analyzed territory
Best practices analysis	There are many best practices on waste management. Local and regional authorities have to identify the most suitable for their territories (see chapter 2.1)
3. PLANNING PART	
Planning condition	Intervention priorities, infrastructure planning and needs, information and training needs, budget, ...
Main goals	Description of the main goals to reach in the next 5, 10, 15 years
Actions, time, actors and budget determination	It is necessary to define a global picture of the situation considering not only foreseen goals but also actions, times, responsibilities and budget
Connections with other in force programs	The waste management plan has to consider the others plans that manage the territory
TRANSVERSAL PHASES	
4. PARTICIPATORY PROCESS	
This phase crosses all the others. It is addressed to all people involved in waste production (citizens, factories, etc.) and treatment (associations, cooperatives, enterprises, etc.). The participation process is based on: information, communication, awareness and training. There are many possible initiatives to inform and make aware people about the waste issue. To reach an efficient participation, it's important to consider: -The main characteristics of each group involved: age, gender, etc.,... -The communicative content of the awareness message: rational, ethic, touching, alarming; -The instrument typology: TV, radio, internet, newspaper...; -The possible budget.	
5. MONITORING	
The plan application has to respect the legislative framework. Moreover, it is important to do: - A pre-project feasibility study; - An environmental impact study. The monitoring phase have to work during the plan definition and realization. It is necessary to identify the indicators able to control each plan actions.	

Tab. 2 Guidelines proposed by the authors for a waste management plan at a local level

⁷ According to a research done within the EU project MED-3R (ENPI-CBCMED): F. Pirlone, I. Spadaro, G. Gandino, G. Ferrando, Lignes guides pour la prédisposition d'un plan de gestion des déchets au niveau urbain, 2013

The structure here proposed stem from the reworking of the following documents: Preparing a Waste Management Plan - A methodological guidance note, European Commission 2012; Sfax municipal Plan on waste management, GIZ 2010 and different questionnaires launched in 8 Mediterranean cities (Nice – France -, Genoa – Italy -; Sousse, Sfax – Tunisia -, Aqaba – Jordan -; Byblos and Blat – Lebanon -). All the information contained inside EU guidelines and GIZ methodology were interpolated in a data sheet with cities' needs to find the most suitable structure for a local waste management plan (see Fig. 4).



Fig. 4 Guidelines methodology

2.1 BEST PRACTICES ON WASTE MANAGEMENT

It is important to look more closely at certain aspects of best practices analysis. To write a waste management Plan it is needed an analysis on actions actually realized that could be considered best practices on sustainable waste management. A best practice is an action, exportable to other realities, which allows a municipality, a community or any local government, to move towards forms of sustainable management at a local level (General Directorate of Environment of the European Union, 1997). An action is considered a best practice only if is compatible with the concept of sustainability, that is a model of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland Report - "Our Common Future" UNCED, 1987). In Italy it is possible to point out seven groups of best practices on waste management⁸. These are about:

- Packaging waste prevention activities: substitution of liquid detergents packaged in single-use containers by those distributed 'loose' through self-dispensing systems and refillable containers; tap water instead of bottled water for household consumption; ...
- Prevention activities: repair centers;
- Waste sorting: door to door collection; recycling containers in public spaces for tourists; eco-parties with eco-friendly green party supplies, eco-tableware; recycling cooking oil; ...
- Reuse initiatives: barter markets for furniture and dresses; creative reuse/upcycling; design to reuse objects and materials; ...
- Economic incentives: computerized recycling centers giving points and prizes in exchange for an empty bottle or can; "Pay as you throw" principle; ...
- Composting:
- Green public procurements policies:
- Environmental education: theoretical and practical workshops on environmental education; recycling ambassadors; awareness campaigns;

⁸ Analysis on waste management best practices done by Francesca Pirlone after Active- Action Vert (EU project: IT-FR Marittimo programme) - <http://www.acti-ve.net/file-cabinet>.

Local and regional authorities are responsible for defining the most suitable practices for their territories. In this sense the collection of best practices should provide a categorization of: types of experiences, scales and area of intervention (local, regional, national or community), target groups, beneficiaries, budgets, cultural background, implementing subjects such as public and private partnership, types of pilot area (residential, touristic, industrial, ...), etc. With regard to cultural background a recent study⁹ done by economists George Halkos and Nickolaos Tzeremes demonstrated the influence of major cultural dimensions on ecologic efficiency in 72 countries. High eco-efficiency levels are linked with societies in which skill, wealth, power and status appear to be linked together, where individual interests prevail over collective interests, laws and rights are the same for everyone, ideologies of individual freedom exist and finally the role of the state is restrained (Halkos, Tzeremes 2013). Considering the favorable cultural effect on a country's eco-efficiency levels, a good practice has to look at target groups' cultural background to obtain significant results. A best practice is a real sustainable tool only when it respects at the same time the three aspects of sustainability: environmental, social and economic. For example, door to door collection is a good practice that satisfies environmental and social aspects but it is more expensive than other collection systems. The municipality of Catania cut the costs using volunteers, members of different environmental associations, for the awareness campaign to explain to citizens how door to door collection works. In other village in Sicily, Solarino, door to door collection is made directly by community service volunteers satisfying at the same time the three aspects of sustainability.

TABLE FACTORS TO BE CONSIDERED IN BEST PRACTICE ANALYSIS

PILOT AREA FEATURES	
Typology	residential, touristic, industrial, ...
Scale	local, regional, national, ...
Population	small, medium, large city, metropolis, ...
Topography	plain, hill, mountain, ...
PEOPLE/INSTITUTION INVOLVED	
Target groups	children, adults, elders, ...
Beneficiaries	private companies, municipalities, associations
Cultural background	target group's environmental attitudes
Implementing subjects	public and private partnership, only public, ...
SUSTAINABILITY ASPECTS	
Environmental	environmental benefits
Social	social benefits
Economical	reasonable budget
INNOVATION	
new solutions	ICT, high tech, georeference, ...
TRANSFERABILITY	
Transferability of results	results have to be transferable to a range of other communities
REPRODUCIBILITY	
Reproducibility of methods/approaches	methods/approaches have to be transferable to a range of other cases
COMMUNITY RESPONSIBILITY/ENGAGEMENT	
Participation features	consultation, involvement, collaboration in decision-making

Tab. 3 Factors to be considered in best practice analysis. There are many best practices on waste management, local and regional authorities have to identify the most suitable for their territories

⁹ 2013, Journal of Environmental Economics and Policy Studies.

Others factors, that have to be considered in best practice analysis, are: innovation, transferability, reproducibility and community responsibility. Best practices are innovative if they produce new solutions or interpret creatively solutions already tested. Transferability and reproducibility are fundamental features that make possible to replicate the proposed model in other contexts or to apply the same solution to other problems. Community responsibility is a very important success factor; the top-down model generally does not produce good results. Best practices are effective if communities are crucial part of the design process and if the practice becomes part of citizens' daily life. Consultation, involvement and collaboration in decision-making are different aspects to be considered to raise community responsibility.

The authors have defined, through a multiple choice frame, the logical relationship that links study case's factors (considered in Tab. 3) and the more common best practices¹⁰. In Tab 4., it is reported an excerpt taken from the frame over mentioned. The relationship comes from an empirical study on more than 200 best practices on waste management in Europe and their positive or negative effects depending on pilot site's characteristics.

	CHARACTERISTICS					BEST PRACTICES			
	Typology	Topography	Tissue	Target	....	Door to door collection	Waste sorting on the street	Community composter	....
< 45.000 hab. Town/village	Old town	Plan	Grid plan	Children	....			
	Residential	hill	Organic	Adults	....	x	x		
	Industrial	mountain	Spread	Elder	....		Only small bins for tourists		....
	Touristic	mix	High density	No residents	....			
				
> 45.000 hab. < 250.000 hab. City	Old town	Plan	Grid plan	Children	....			
	Residential	hill	Organic	Adults	....			
	Industrial	mountain	Spread	Elder	....		x	x	....
	Touristic	mix	High density	No residents	....			
				
> 250.000 hab. Metropolitan area	Old town	Plan	Grid plan	Children	....			
	Residential	hill	Organic	Adults	....			
	Industrial	mountain	Spread	Elder	....		x		....
	Touristic	mix	High density	No residents	....			
				

Tab.4 Relationship between study case's factors and the more common best practices

¹⁰ Analysis on waste management best practices done by Francesca Pirlone after Active- Action Vert (EU project: IT-FR Marittimo programme) - <http://www.acti-ve.net/file-cabinet>.

2.2 GOALS AND ACTIVITIES

Waste management Plans are essential to identify local main goals. It is important to set up mid-term and long term goals (in 5, 10, 15 years). These goals have to be aligned to EU's goals expressed in the Directive 98/2008. In particular, by 2020:

- the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight;
- the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight.

A research carried out by Paul Connett¹¹ has identified the ten steps to zero waste objective (composting, recycling, reusing, non-wasteful product design, etc.). These steps could help municipalities, entrepreneurs and activists responsible for local waste management to set up a strategy to significantly augment their recycled waste. Each step could be considered as an action to reach the main goal: no more mixed waste, landfills and incinerators. In order to better organize and achieve waste management plan's objectives, it is suggested to identify for each action: budget, target groups, beneficiaries, actors, lead-times and references.

TEN STEPS TO ZERO WASTE				
Source of separation	Door to Door Collection	Composting	Reduction	Reuse/Repair Community center
Recycling	Economic incentives	Residual separation	Better industrial design	Temporary landfill

Tab.5 Ten steps to zero waste. Source: *The Zero Waste Solution: Untrashing the Planet One Community at a Time*, Paul Connett 2013

Connett demonstrates how much the situation is changing – in the short term – in many cities that are strongly committed to recycling. The municipality of Salerno achieved 72% waste diversion in only one year, Novara achieved 70% diversion in just 18 months and Villafranco d'Asti has reached 85% diversion. The results obtained so far are encouraging.

3 FINAL REMARKS AND OPEN QUESTIONS

This paper analyses the most effective policy instrument to manage MSW. Waste management plans could significantly reduce urban degradation, pollution and power consumption. Other questions remain still opened: How to change people's behavior and policy makers' attitude? What is the role of environmental education and risk perception? It is sure that the involvement of the various stakeholders and the wider public in the planning process should aim at ensuring acceptance of the waste policy. The authors are developing new researches on these topics to maximize the positive effects of waste management plan at a local level.

Waste policies are essential to increase the amount that a city recycles, developing civic amenity facilities which accept recycling of all types of waste streams from households, and implementing separate collection of residual and mixed dry recyclables. Waste management planning is the cornerstone of any local policy on waste management. There needs to be assurance that Local Authorities have the competency and resources

¹¹ In the book "The Zero Waste Solution: Untrashing the Planet One Community at a Time".

to fully conduct their responsibilities in the area of enforcement for the benefit of the whole waste management system. The key aim of an urban waste management plan is to set out the work towards a zero waste economy as part of the transition to a circular economy. In particular, this means using the waste hierarchy (waste prevention, re-use, recycling, recovery and finally disposal as a last option) as a guide to sustainable waste management. This paper shows how a waste management plan could be structured, to improve urban waste policies. The professional skills of those who deliver governance have to be continuously maintained and strengthened in order to improve their output and impact. This research is a valuable source of information regarding techniques to reduce a city's exposure to risk caused by MSW bad management. The structure for an urban waste management plan, here presented, enhances the efficiency and effectiveness of MSW services and policies. The aim is to prevent all the negative effects that MSW have on the urban environment: to improve the quality of life in cities and human health by reducing the adverse impacts of the generation and management of waste and by preventing overall impacts of resource use and improving the efficiency of such use. Waste management plans make sure that waste is optimally managed, so that the costs to society of dealing with waste, including the environmental costs, are minimized. There is a need for transparent and consistent methodology across the city for calculating statistics and future waste projections. Waste management plans set out the starting point and the policies that are currently in place to help move the city towards a sustainable vision. It is not however an exhaustive strategy and it necessary to continue to monitor the effectiveness of the policies on waste and resource management to protect the environment and human health. It is recommended to establish a multi-stakeholder sustainability or green team with representatives from departments that share responsibility for the purchase, management, monitoring and/or disposal of particular waste streams.

Much remains to be done to prevent and manage waste to support the growth of the economy and to continue to protect the environment. Some questions remain still opened: How to change people's behavior and policy makers' attitude? What is the role of environmental education and risk perception? Environmental education has a key role to play in achieving sustainable waste management. The public should be included in the planning process but before this phase an awareness campaign on waste's risks should be organized. This is because risk perception is a subjective judgment that affects our decisions. Risk perception is the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome (Sjöberg, Moen, Rundmo, 2004). Many sustainable solutions studied by experts on waste management and treatment are not supported by citizens. This is because people is more afraid to have a recycling or composting center close to home – even if centers of this type are safe and do not produce harmful gases – rather than a landfill or an incinerator 10 Km further. People perceive as a risk only what they have under their nose, they do not consider that greenhouse gases even if produce in another country could affect their life. For this reason, is fundamental to teach how to recognize real risks. Marine litter is another global concern, which represents a risk for the ecosystem and for people life. This is because we are eating fishes that in their turn have eaten plastic (Miranda, 2016). Despite this, citizens are more worried about the placement of a new garbage bin on the street. For this reason, according to different studies (Slovic, Weber, 2002) the risk perception links to waste is generally high, but these researches consider only evident risks connected to landfills or incinerators and not the general exposition to polluted air, soil and water. Waste management is not considered as a risk factor, even if it could be one of the first causes of pollution: municipalities that do not recycle or reuse, even if are keeping the city clean, are affecting the environment and their citizens. This is an objective risk that is not perceived. According to a study done by the American Biological Safety Association (ABSA) risk perception is strongly conditioned by the Epictetus theory: People are disturbed, not by things, but by the view they take of them (Hadot, 2006). Consequently, people go on

producing more and more rubbish without wondering where this rubbish end, the only important thing it is that they do not have to see it near home. Environmental education is not only important for citizens, also decision makers, entrepreneurs, associations ... have to be conscious of this topic. Political support and understanding of the need to draw up a waste management plan is crucial. This is to be done according to the various levels of administration concerned, reflecting cultural traditions and political organization (European Commission Directorate-General Environment, 2012).

There needs a common "waste consciousness" (for policy makers, citizens, entrepreneurs ...) underlying sustainable waste management plans. Without the general consensus it is impossible to follow zero waste strategies and to apply best practices: everyone has a role to play to get cities more sustainable and livable.

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IMAGE SOURCES

Cover fig.: Cities and Municipal Solid Waste. Sky 24

Fig. 1: EPA (2015). *Social cost of carbon*. EPA FACT SHEET, Washington DC.

Fig. 2: Photographer: Hassan Ammar/AP Photo

Fig. 3: EPA (2005).

Fig.4: elaborated by the authors

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Smart Energy in the Smart City

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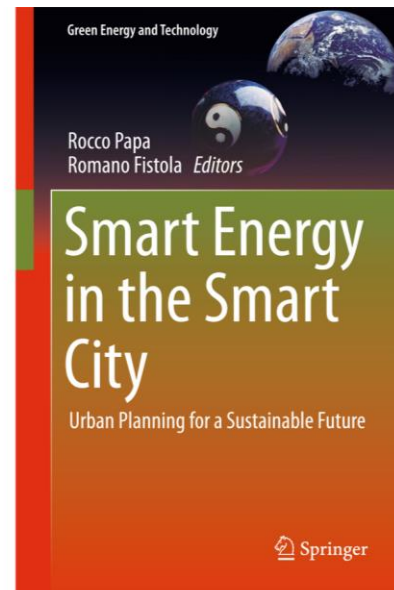
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REVIEW PAGES

ENERGY, POLLUTION AND THE DEGRADATION OF THE URBAN ENVIRONMENT

Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always remaining in the groove of rigorous scientific in-depth analysis. During the last two years a particular attention has been paid on the Smart Cities theme and on the different meanings that come with it. The last section of the journal is formed by the Review Pages. They have different aims: to inform on the problems, trends and evolutionary processes; to investigate on the paths by highlighting the advanced relationships among apparently distant disciplinary fields; to explore the interaction's areas, experiences and potential applications; to underline interactions, disciplinary developments but also, if present, defeats and setbacks.

Inside the journal the Review Pages have the task of stimulating as much as possible the circulation of ideas and the discovery of new points of view. For this reason the section is founded on a series of basic's references, required for the identification of new and more advanced interactions. These references are the research, the planning acts, the actions and the applications, analysed and investigated both for their ability to give a systematic response to questions concerning the urban and territorial planning, and for their attention to aspects such as the environmental sustainability and the innovation in the practices. For this purpose the Review Pages are formed by five sections (Web Resources; Books; Laws; Urban Practices; News and Events), each of which examines a specific aspect of the broader information storage of interest for TeMA.

01_WEB RESOURCES

The web report offers the readers web pages which are directly connected with the issue theme.

author: Chiara Lombardi

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02_BOOKS

The books review suggests brand new publications related with the theme of the journal number.

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03_LAWS

The law section proposes a critical synthesis of the normative aspect of the issue theme.

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04_URBAN PRACTICES

Urban practices describes the most innovative application in practice of the journal theme.

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05_NEWS AND EVENTS

News and events section keeps the readers up-to-date on congresses, events and exhibition related to the journal theme.

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REVIEW PAGES

能源、污染和城市环境的退化

TeMA从城市规划和流动性管理之间的关系入手，将涉及的论题逐步展开，并始终保持科学严谨的态度进行深入分析。在过去两年中，智能城市（Smart Cities）课题和随之而来的不同含义一直受到特别关注。

学报的最后部分是评述页（Review

Pages）。这些评述页具有不同的目的：表明问题、趋势和演进过程；通过突出貌似不相关的学科领域之间的深度关系对途径进行调查；探索交互作用的领域、经验和潜在应用；强调交互作用、学科发展、同时还包括失败和挫折（如果存在的话）。评述页在学报中的任务是，尽可能地促进观点的不断传播并激发新视角。因此，该部分主要是一些基本参考文献，这些是鉴别新的和更加深入的交互作用所必需的。这些参考文献包括研究、规划法规、行动和应用，它们均已经过分析和探讨，能够对与城市和国土规划有关的问题作出有系统的响应，同时还对诸如环境可持续性和在实践中创新等方面有所注重。因此，评述页由五个部分组成（网络资源、书籍、法律、城市实务、新闻和事件），每个部分负责核查TeMA所关心的海量信息存储的一个具体方面。

01_WEB RESOURCES

网站报告为读者提供与主题直接相关的网页。

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那不勒斯菲里德里克第二大学民用建筑与环境工程系

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02_BOOKS

书评推荐与期刊该期主题相关的最新出版著。

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03_LAWS

法律部分提供主题相关标准方面的大量综述。

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04_URBAN PRACTICES

城市的实践描述了期刊主题在实践中最具创新性的应用。

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05_NEWS AND EVENTS

新闻与活动部分让读者了解与期刊主题相关的会议、活动及展览。

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ENERGY, POLLUTION AND THE
DEGRADATION OF THE URBAN ENVIRONMENT

REVIEW PAGES: WEB RESOURCES

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In this number
URBAN FOOTPRINT, RESOURCES
SCARCITY AND POLLUTION

Though cities represent only the 2% of world's surface, more than a half of the total world's population lives in cities, wasting 75% of global resources: that is to say that cities' footprint is much higher than the surface they cover (Hui et al., 2001). At the same time, cities are not only the main cause of resources wasting and pollution, they are also the places where reside the greater opportunities to give a large-scale technological answer to this problem (Hodson, Marvin, 2010; Dixon, Eames, 2013, Papa et al., 2014)

In this context, the building sector in the world represents on average more than a third of the final energy consumption, exceeding transportation and industrial sectors.

In the last decade, in the most advanced European countries with marked programmatic, planning and technical capacities, the "energy question" has already entered in the governments' agendas from years, and policies and large-scale interventions aiming at reducing cities' energy consumption have been issued yet (Leone, 2011). Also in Italy, there has been an increased attention towards the reduction of energy consumption in the latest years. Unfortunately, major efforts have been only dedicated to the building scale, neglecting the size where the results could be more effective: the urban scale. In fact, only few cities have drafted a Municipal Energy Plan (PEC), introduced by Law 10/91; and the copious SEAP issued (Sustainable Energy Action Plan) have produced no significant effects until now.

With the aim of giving insights on the matter, in this volume three websites are presented: C2ES, World Green Building Council, Gov.UK – Innovate UK. The first is the website of the Center for Climate and Energy Solutions, an American independent, nonpartisan, non-profit organization working to advance strong policy and action to address climate and energy challenges. It was launched in 2011 as the successor to the Pew Center on Global Climate Change, long recognized in the United States and abroad as an influential and pragmatic voice on climate issues.

The second is the official website of the Green Building Council, a network of national green building councils in more than one hundred countries. It is the world's largest international organization, which also strongly influences the green building marketplace. The third is the web portal of the UK's innovation agency, an executive non-departmental public body, sponsored by the Department for Business, Innovation & Skills of the UK. It works with people, companies and partner organisations to find and drive the science and technology innovations that will support the grow of British economy.



C 2 ES

<http://www.c2es.org>

The Center for Climate and Energy Solutions is a non-profit organization working to enhance policies and actions to address climate change and energy challenges.

Founded in 1998 with the support of The Pew Charitable Trusts, a non-governmental body widely recognized in the United States and abroad as a credible, independent force for pragmatic climate action. The nonpartisan Center for Climate and Energy Solutions was a valued source of information and analysis, an effective bridge between diverse interests, and an established leader in catalyzing constructive business engagement.

The Center's activities are mainly focused on providing with:

- A Reliable Source – providing timely, impartial information and analysis on the scientific, economic, technological and policy dimensions of climate and energy challenges;
- Working Together – working side by side with business, the environmental community, other stakeholders, and policymakers to achieve common understandings and consensus solutions;
- Concrete Action – Working with members of Business Environmental Leadership Council of the United States and others to take action on the ground;
- Innovative Policy – Working closely with policymakers and stakeholders to promote pragmatic, effective policies at the state, national and international levels. Thanks to a rich web resources help both experts and citizens understand the issues, track government efforts, and contribute to the policy process.

The webpages are divided into seven sections, besides the homepage where there is an overview on the blog, the latest news and analysis and the publications library.

The first section is dedicated to policies, organized in International, Federal, U.S. State and Region and Economics.

The second section is about Energy and Technology, where it is possible to access other sections: energy and technology in general, Climate Techbook, Energy Efficiency Web Portal, Energy Sources, Energy Uses, ICT, Facts and Figures, Events, This Week in Energy News.

The third section is about Science and Impacts. Here you can find information on: Adaptation, Climate Resilience, The Basic, Events, Extreme Weather, Facts and Figures, National Security, National Climate Assessment.

The fourth section is dedicated to Business and its implications on climate change. This section is structured into 8 sub-sections: About Business, Business Environmental Leadership Council, Climate Resilience, Climate Leadership Award, Events, Low Carbon Business Innovation, What Companies say about Climate and Energy, Business Support for the Paris Agreement.

The fifth is about Initiatives: it includes past and present initiatives led by the Center. Here there are 4 sub-sections: Make an Impact, Climate Resilience, National Enhance Oil Recovery Initiative, Towards 2015: An International Climate Dialogue.

The sixth section is the Solution Forum, where there are discussions on the main themes of interests.

The last section is for donations in order to support the Center.



WORLD GREEN BUILDING COUNCIL

<http://www.worldgbc.org>

The World Green Building Council is the network of the Building Councils operating in each country in the World. Its aim is to strengthen green building councils in member countries by championing their leadership and connecting them to a network of knowledge, inspiration and practical support.

All its efforts are directed to the dissemination of sustainability and energy saving, at first only at the building scale and, in the last decade, also at the neighbourhood scale. The first World GBC meeting took place in November 1999 in California, and the countries represented were Australia, Canada, Japan, Spain, Russia, United Arab Emirates, United Kingdom and the United States. This led to the creation of Green Buildings Councils in most of the countries in attendance. The World GBC was formally funded in 2002 with the primary role to formalize international communications, help industry leaders access emerging markets and provide an international voice for green building initiatives. Since its foundation, the Green Building Council model has widespread in the five continents and counts now more than 100 Green Building Councils in the world at various stages of their development. This global network has an extraordinary influence since it has more than one hundred thousand buildings and one billion square metres of green building space registered, operating in all aspects of building sector: both residential and industry, leading towards a sustainable growth. Its main mission is to support GBC in the world from the very first steps, strengthen new and emerging Councils by providing them with tools and strategies to foster their leadership positions in their countries. Born in 2002, the GBC has been working with local councils to promote green building actions and address global challenges such as climate change. It works to guarantee that the green building market be part of a comprehensive strategy to reduce GHG emissions and pollution. One of the most important outcomes of the GBC's work in the world is the development of sustainable assessment tools. The first product was the Leadership in Energy and Environmental Design (LEED) certification, born in the Nineties and now become the most widely used third-party verification for green buildings. From the late 2000's the GBC have started pilot projects to develop a LEED certification for the urban scale, which have then originated LEED for Neighbourhood Development, released in 2009.

This webpage is connected with all the portals of each GBC in the world, so it is possible to have a quick overview of what the Councils are doing in the world. Indeed, the website is structured in four sections:

World GBC refers to the international organization in general. Here you can find information on WGBC, its members, its Board, how to make a career at WGBC, its history, people profile etc;

Regions provides link to African, American, European Asian and Pacific, Middle East and North Africa Councils, giving a overview of their work and key people;

Activities gives insights on news, events, blog, congress, case studies and activities in general lead on by the Councils;

Resources provides links to download documents, videos, newsletter, pictures and all the informative stuff regarding green buildings.

In addition, the web portal provides with a form to contact the staff and, also, an address and mobile phone number to contact directly their marketing and communications manager. Another section is dedicated to members login of each different region.

To conclude, the World Green Building Council webpage is the main portal to know more about GBC activities in the world and to build networks with agencies, companies and people involved in the green building sector in the world.



GOV.UK – INNOVATE UK

<http://www.gov.uk/government/organisations/innovate-uk>

Innovate UK is a non-governmental body powered by the UK's Department for Business, Innovation & Skills. Its main aim is to support companies, associations and people to drive technology in the UK, with a specific focus on business. Indeed, Innovate UK intends to de-risk innovation and provide support, through 5 cardinal actions:

- determine which science and technology developments will drive future economic growth;
- meet UK innovators with great ideas in the fields we're focused on;
- fund the strongest opportunities;
- connect innovators with the right partners they need to succeed.

The body has worked successful so far, committing £1.8 billion to innovation delivered to more than 7,600 organisations, which are expected to return to the UK economy more than £11.5 billion and create 55,000 extra new jobs, through innovative projects. Recently, the UK Government has confirmed the crucial role of innovation in the growing strategy of the country. Actually, in the forthcoming National Innovation Plan 2016-2020, the UK's Innovation agency is going to perform a key role in the development of actions. One of the initiative carried out by Innovate UK is dedicated to energy saving, especially focusing on 3 major challenges: low carbon, security of supply and affordability. This initiative "Energy Catalyst Competition" aims at supporting projects proposed by businesses and research organisations collaborating with a business, thanks to a special fund of £10 million afforded by the UK Department for International Development (DFID) and the UK Engineering and Physical Sciences Research Council (EPSRC). This competition is expected to speed up commercialisation of UK energy innovation that will deliver clean, affordable and resilient energy. Last but not least, the website provide a section through which access latest funding opportunities for innovative projects from the Government but also from the European Union. There are several funding competitions covering different industry sectors:

- emerging and enabling technologies;
- infrastructure systems;
- health and life sciences;
- manufacturing and materials.

To sum up, Innovative UK is a smart, user-friendly and comprehensive web portal for people, companies and researchers to access the main funding opportunities for projects in the field of energy saving and innovation in general.

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 ENERGY, POLLUTION AND THE
DEGRADATION OF THE URBAN ENVIRONMENT

REVIEW PAGES: BOOKS

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 In this number
**REGENERATION OF THE URBAN
AREAS**

The urbanisation is the consequence of the growth in world population and rural-urban migration in the search for improved socio-economic opportunities in urban areas. In the first decade of the 21st century the urban population reached parity with the rural for the first time in the history. In the 2050, the population will increase to 9.5 billion and its urban fraction to three quarters. In the urban areas are located the great part of global economic activity, it follows that urbanisation will impose greater stress on the natural environment and this at a time for which the international organizations on climate change suggest the reduction of greenhouse gas emissions. In the last years, the 75% of Europe's population living in cities and urban areas. In particular, the Europe continent is the world's most urbanised. Urban living has many benefits, including more and better job perspectives, the variety and liveliness of urban life, and other social and economic opportunities. Towns and cities support the regional and national growth. However, the very characteristics that make them desirable places to live and invest cause a great number of challenges to their sustainability. Cities are wonderfully liveliness places for the education, employment and commerce, social encounter and recreation. They are the most important centres of the modern global economy and as such they continue to attract migrants in search of a better quality of life for themselves and their families. This high density of economic and social activity is connected by a similar concentration in the use of energy and resources as well as of technology and infrastructure, with significant consequences for raw materials depletion, greenhouse gas emissions and climate change. Also, the urban areas present a great concentration in societal challenges, as disparity in income and social inequality that can adversely affect social capital and cohesion and in the worst of cases lead to exclusion of access to home ownership, education, welfare and healthcare. The urban and territorial planning can contribute to sustainable development in various ways (Salvati et al., 2013). It should be directly related with the three complementary dimensions of sustainable development: social development and inclusion, sustained economic growth and environmental protection and management. Integration of those three dimensions in a synergetic way requires political commitment and the involvement of all stakeholders, who should participate in urban and territorial planning processes. According to these considerations, this section suggests three books that help to better understand the issue of this number: International Guidelines on Urban and Territorial Planning; Sustainable regeneration in urban areas; Transition towards and the strategic research sustainable and innovation agenda liveable of Joint Programming Initiative urban Europe urban future.



Title: **International Guidelines on Urban and Territorial Planning**

Author/editor: United Nations Human Settlements Programme

Publisher: UN-Habitat

Download: https://www.uclg.org/sites/default/files/international_guidelines_on_urban_and_territorial_planning_un_habitat.pdf.

Publication year: 2015

ISBN code: n.d.

As a follow-up to resolution 24/3, UN-Habitat established a group of experts to advise the secretariat on the structure, content and wording of the Guidelines. The group was geographically balanced to respect experience and practice in every region of the world.

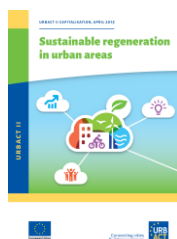
The Guidelines will support the operationalization of two sets of guidelines previously adopted by the Governing Council of UN-Habitat: The international guidelines on decentralization and the strengthening of local authorities (2007) are a catalyst for policy and institutional development and reforms at national level to empower local authorities and improve urban governance. They are policy-oriented and have been used as a reference in a number of countries. The international guidelines on access to basic services for all (2009) provide an enabling framework for improved partnerships in the delivery of basic services at city level. They are process oriented and have been adapted to the national conditions of various countries.

In response to that transformation, the International Guidelines on Urban and Territorial Planning (the Guidelines) are intended to be a framework for improving global policies, plans, designs and implementation processes, which will lead to more compact, socially inclusive, better integrated and connected cities and territories that foster sustainable urban development and are resilient to climate change.

The Guidelines are an instrument to promote sound urban and territorial planning around the world, based on universally agreed principles and national, regional and local experience, as well as a broad framework to guide urban policy reforms, taking into account the specific approaches, visions, models and tools existing in each country.

The goals of the Guidelines are captured hereunder: To develop a universally applicable reference framework to guide urban policy reforms; To capture universal principles from national and local experience that could support the development of diverse planning approaches adapted to different contexts and scales; To complement and link to other international guidelines aimed at fostering sustainable urban development; To raise the urban and territorial dimensions of the development agendas of national, regional and local governments.

The following section contains the Guidelines on urban and territorial planning. The structure is derived from the accepted way of unpacking the sustainable development agenda by United Nations bodies. It is organized into two sections reflecting the interrelated dimensions of that agenda, namely, the governance, social, economic and environmental aspects of urban and territorial planning, followed by two sections on urban and territorial planning components and their monitoring and implementation. Each section starts with key underlying principles, followed by a series of action-oriented recommendations. It should be emphasized that the recommendations are of a general nature and intended to be a source of inspiration when reviewing, developing and implementing urban and territorial planning frameworks. National Governments, local authorities, civil society organizations and their associations, planning professionals and their associations could consider adapting the Guidelines to national and local contexts.



Title: **Sustainable regeneration in urban areas**

Author/editor: Joint Programming Initiative Urban Europe

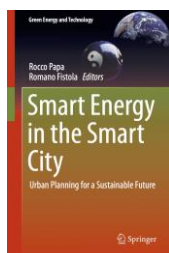
Publisher: n.d.

Download: n.d.

Publication year: 2015

ISBN code: n.d.

This publication is part of a bigger initiative set by the URBACT programme and presents a collection of the evidence, analysis and concrete solutions. In first part, provides an overview of the main challenges and types of approaches applied in Europe. In following part, "Why 'Think Global, Act Local' is no longer enough", the authors discuss about local solutions in the wider context of pressing global challenges by introducing the notion and evidence on environmental limits, calling for a move beyond the well-known "Think Globally, Act Locally" motto of sustainable urban development. Following conceptual framing, the study moves to discussing on to innovative approaches and concrete solutions. It begins by looking at the physical environmental dimension: the first in-depth case study, on the IBA Hamburg (International Building Exhibition), discusses in detail the implementation of the innovative "Cities and Climate Change" strategy and actions towards a climate neutral urban district. Furthermore, the report proposed interview with the co-ordinator of the Power House Europe project tells about the challenges and solutions that housing providers are facing in their quest to retrofit Europe's housing stock, as well as on the importance of linking energy-efficient housing renovation to sustainable urban regeneration. Finally, it proposed an interview with Luís Carvalho from the URBACT workstream "New urban economies", to reflect on connections of the latter with sustainable urban regeneration and the possibilities and limits of current policy trends such as the "smart city" or the "green economy". A second part of publication, the authors investigate on the importance of institutional and social aspects in achieving sustainable urban regeneration. In "Governing the sustainable city", it's offer a reflection on the importance of cross-sector integration in sustainable regeneration projects and propose a set of recommendations for cities to become better at that. The publication proposes residents' perspective on these processes, particularly at what happens next following completion of a given sustainable regeneration project, through an interview with one of the leaders of the residents' movement that gave rise to the IBA Hamburg in Wilhelmsburg. After this, Francois Jégou, co-ordinator of the URBACT workstream "Social innovation in cities", defines his views on the importance of social innovation not only from the grassroots when it comes to sustainable urban regeneration initiatives, but also from local authorities leading these projects. The second case study, the city of Vilnius, looks at the specific problems that post-communist cities face in this field and adopt a process-perspective to understand the root causes of problems and the way forward. In addition, we asked the Head of the Urban Planning Department of Vilnius to give us her view on how to best work with the private sector to achieve win-win solutions in sustainable urban regeneration projects. But none of the above can be achieved and sustained over time without the adoption of new, pro-environmental behaviours by individuals and institutions. The last article explores this issue and sheds light on concrete actions that cities can take to encourage their citizens to change their behaviour in that direction. The publication is concluding with a set of policy recommendations, followed by a word on our working methods to carry out this work and by a list of useful literature and online resources for the curious reader.



Title: Smart Energy in the Smart City. Urban Planning for a Sustainable Future
 Author/editor: Rocco Papa, Romano Fistola
 Publisher: Springer
 Download: n.d.
 Publication year: 2016
 ISBN code: 1865-3537

This book examines the energy dimension of the smart city from the urban planning point of view, through a collection of papers about the energy dimension of a smart city. The papers are written by the main Italian research groups in the field of urban sciences. The aim of the publication is to define a new concept of a smart city that can successfully open a new understanding of urban systems and progress towards a new type of administration of the urban areas. From this debate on the smart city, it is possible to say that the central issues of this new concept regarding the urban areas are the energy and technology. The technological aspect of the smart city is inherent to the city itself and represents the engine that moves the urban systems. But the principal issue for the future development of city is the energy. The cities are the places where this challenge must be played out first, because cities are the main wasters of energy on the earth. The planning of a smart city will be greatly different from the canonic urban planning of our current cities. In particular, many studies have highlighted the relations between activities, urban structure and energy consumption (Papa et al., 2016).

The Italian case study is particularly exposed to energetic problems for three principal causes: The geographic location determines a particular vulnerability to climate change and consequently the need for large amounts of energy; The country has no primary energy resources available; Due to a public referendum, no nuclear plant is available on national territory. This study has an explicit concern about a city's energy. Again, energy has to be considered inside the urban planning process as well as inoculated within the new idea of a future city. From this concept is developed this book, which is structured along three principal issues: the relationship between energy and city (in its different dimensions), a methodological aspect of energy's contribution to the urban system management, with a special focus about ontological issues, a review of case studies which describes some practices, procedures, and tools of urban planning. At the end this essay could be useful to students of urban planning, town planners, and researchers interested in understanding where the city of the future will go and what the energy contribution to this evolution will be.

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ENERGY, POLLUTION AND THE
DEGRADATION OF THE URBAN ENVIRONMENT

REVIEW PAGES: LAWS

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AIR POLLUTION: THE INVISIBLE KILLER

With the rapid growth of cities urban air pollution levels are dramatically rising, putting in danger human health. The OECD (Marchal, 2012), indeed, estimates that the number of premature deaths from exposure to particular air pollutants leading to respiratory failure could double from current levels to 3.6 million every year globally, with most occurring in China and India. In Europe one hundred millions workdays are lost because of air pollution with a direct cost of about fifteen billion euros in productivity, four billion euros are lost in direct health costs and farmers lose three billion euros a year in crop damage due to the Ozone smoke. Air pollution is, therefore, not only unhealthy but also expensive. In addition, air pollution has also environmental impacts affecting the quality of freshwater, soil, and the ecosystem, and some air pollutant also behave as greenhouse gases that cause climate change. For all these reasons not to act is simply not an option.

The focus of this issue of TeMA is therefore air pollution, and three environmental laws on air quality will be described: the U.S. Clean Air Act, the European Air Quality Package, and the China New Air Law. The three regulations are reviewed in chronological order, starting with the oldest – e.g. the American Clean Air Act – concluding with the most recent, e.g. the Chinese Air Law. The goal is to highlight the main regulations they require, the accomplishments achieved under them, and the criticisms they have attracted.

The U.S. law was first adopted in 1970 and more recently revised in 1990. Since then, a great number of air quality improvements have been obtained in the U.S., but despite these positive achievements a lot more has to be done, especially for limiting climate change. On the other hand, much more recent is the European Air Quality Package, approved in 2013. It includes a revised National Emission Ceilings Directive with severer national ceilings for six main pollutants, aiming at bringing EU on the right pathway towards achieving better air quality. Lastly, the Chinese New Air Law adopted less than a year ago – in summer 2015 – and that became effective at the beginning of this year. This law can be considered a first attempt by the Chinese government to reduce air pollution, which represents one of the main challenges of China's growing cities, but there have been also some critics because probably something more concrete could have been done.

Despite all the critics, the three environmental laws represent a necessary tool to make sure that all citizens around the world can access better air quality and, thus, better health, cleaner environment and a more productive economy. They confirm the commitment of policy makers to put in place strategies and actions to protect human health and ecosystems from pollution.



THE U.S. CLEAN AIR ACT (1970-1977-1990)

Considered one of the most comprehensive air quality regulation worldwide, the Clean Air Act was first introduced in the United States in 1970 to control air pollution at national level and to protect public health and welfare. Then, in 1977 and 1990, two major revisions were established in order to improve the original structure and to address newly recognized air pollution issues such as acid rain, urban air pollution, and toxic air emissions. The Act requires States to adopt plans to meet the National Ambient Air Quality Standards (NAAQS) set by the Environmental Protection Agency (EPA) for six common air pollutants, which are scientifically recognized to be dangerous for health and the environment. Other key provisions are introduced to avoid pollution increases from greater motor vehicle fleet, and from new industrial installations. Furthermore, “the law calls for new stationary sources (e.g., power plants and factories) to use the best available technology, and allows less stringent standards for existing sources” (EPA, 2016).

Since its adoption, the U.S. has achieved a great number of dramatic air quality improvements under the Clean Air Act. First of all, aggregate emissions of six common pollutants dropped an average of 69% between 1970 and 2014 while GDP grew by 238% (EPA, 2016); a main reason is that vehicles are much cleaner thanks to the emission standards for new motor vehicles set by the Clean Air Act, and as consequence all the zones that registered high levels of carbon monoxide in 1991 now meet the national air quality standards required by the law.

A peer-reviewed EPA study issued originally in 2003 (DeMockerc, 2003) and updated in 2011 analyzed the benefits and costs of the Clean Air Act between 1990 and 2020 finding that the benefits estimate exceeds costs by a factor of more than 30 to one. In particular, according to this study, in 2020 the Clean Air Act amendments will prevent over 230 thousand early deaths, 17 million work days and 120 thousand emergency room visits, as well as 200 thousand heart diseases and 75 thousand chronic bronchitis. At the same, these health benefits will be also responsible of an economic improvement that will occur because better air leads to better health and productivity for workers as well as savings on medical expenses for air pollution related health issues. In the end, the costs for pollution control will be largely offset by economic, health, and environmental benefits.

Although the expected positive consequences of this regulation should satisfy all parties, a great debate about EPA and the Clean Air Act is ongoing in the US at the moment. As reported by The New York Times (Davenport, 2016), the Act’s “rules impose restrictions on business, industry and agriculture, limiting the amount and types of pollutants that can be emitted into the air and water, as well as where and how landowners can use their property. The regulations can sometimes impose billions of dollars of costs on industry, requiring companies to install expensive pollution control technology and in some cases to shut down polluting facilities”. For all these reasons the Republican Party has the specific intention of changing the size, scope and structure of the EPA, limiting its power to set pollution standards, and even some Democrats are questioning the Agency authority. These critics that the EPA has lately been called to face are not the only ones. Indeed, an increasing number of Americans demand for a new updated environmental law, because they consider the Clean Air Act out of date. For example, the lack of any regulation in terms of greenhouse gases – probably not considered a problem in 1990 when the law was amended for the last time – whose accumulation is increasing triggering climate change, is considered unacceptable.

In conclusion, the Clean Air Act continues to represent a milestone for environmental protection but, at the same time, the need for an advanced approach to climate change and air pollution is urgent.



THE EUROPEAN CLEAN AIR POLICY PACKAGE (2013)

The Clean Air Policy Package adopted by the European Commission in 2013 includes a set of cost-effective measures that aim to provide a strong direction to healthier society and environment, save significant direct and indirect costs, improve productivity across the economy, promote innovation and create growth and jobs. Polluted air, indeed, is an invisible killer with enormous economic costs – estimated at 3 to 9 % of EU GDP, as declared by Janez Potocnik during the press conference opening – because poor air quality has health impacts, as well as increases medical costs, reduces economic productivity and damages crops and buildings.

The Clean Air Policy Package is based on the full review of both the latest scientific evidence on air pollution and existing EU air policy and it is the results of almost three years of intensive consultations with stakeholders. The main conclusion drawn in the review is that despite the progress the EU made in the last decades, we are far from achieving the air pollution levels recommended by the World Health Organization (WHO), and there is lot more that can be done also because better air offers interesting economic opportunities for the EU, especially for clean technology sectors.

The Package includes four main instruments, which are briefly described below.

- A new Clean Air Programme for Europe, which sets the overall policy framework up to 2030. It includes measures to make sure that the all citizens will enjoy the same level of air quality protection and that the existing EU air quality standard are respected everywhere.
- A proposal for a revised NEC Directive for the EU's new commitments under the amended Gothenburg Protocol, which is necessary to honour EU's international obligations with regard to new national emission ceilings for 2020.
- A revised National Emission Ceilings Directive with stricter national ceilings called "emission reduction commitments" for the six main pollutants for 2020 and 2030, that aim to bring down overall pollution emissions significantly in the most cost-effective way. These revised national emission ceilings represent the principal instrument to bring EU on the right pathway towards achieving WHO air quality guidelines, and they will partly be delivered by national legislation, giving some freedom to Member States to take action on air pollution based on their own particular circumstances.
- A proposal for a new Directive to cut emissions from medium-sized combustion installations, such as energy plants for street blocks or large buildings, and small industry installations.

These four components together aim at bringing major health and environmental benefits, in particular by 2030, and compared to business as usual scenario, the Clean Air Package is estimated to:

- avoid 58.000 premature deaths;
- save 123.000 km² of ecosystems from nitrogen pollution;
- save 56.000 km² of protected Natura 2000 areas from nitrogen pollution;
- save 19 000 km² of forest ecosystems from acidification (EU, 2013).

Health benefits alone will save society €40-140 billion in external costs and provide about €3 billion in direct benefits due to higher productivity of the workforce, lower healthcare costs, higher crop yields and less damage to buildings. The proposal will also add the equivalent of around 100 000 additional jobs due to increased productivity and competitiveness because of fewer workdays lost. In the end, the Clean Air Package is estimated to have a positive net impact on economic growth (EU, 2013).



THE CHINA NEW AIR LAW (2015)

In summer 2015, the National People's Congress of China adopted the Air Pollution and Control Law, also called the New Air Law, which has come into full effect starting January 1st. The New Air Law revised a 15-year old air pollution law doubling in length the original document, and restricting different sources of smog as well as making information about air pollution and the environment easily to read to the public.

Cities play a central role, unsurprisingly since they are booming and the levels of air pollution within their boundaries are more than alarming. The New Air Law, indeed, obliges cities to adopt and implement plans to ensure they are on track to meet national air quality targets and, if they are not, they are required to submit correction plans to achieve these targets in the short term. In addition, cities have to keep their plans updated and share with their supervising government agencies and the public every implementation update, so to provide great transparency. Furthermore, specifically for coastal areas where air quality suffers because of ships fueled by sulphur-intensive heavy oil, the Law requires the establishment of a control area for pollutant discharge of ships and ships entering that area must conform to specific emission requirements. One of the main changes introduced by the New Air Law is related to monitoring greenhouse gas emissions that, for the first time in China's history, is now finally considered a priority. The New Air Law cuts GHGs by introducing several measures to control coal use and transportation emissions. In addition to it, the Law allows regional governments to establish zones where burning fuels that emit a large amount of pollutants are prohibited. Inevitably there are also some critics to the New Air Law, arguing that "the legislation should be enforced through government powers, rather than just expressions of intent" (Quin, 2015), however the new regulation on air pollution undoubtedly represents a first commitment towards a cleaner China.

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IMAGE SOURCES

Fig. 1 https://en.wikipedia.org/wiki/Air_pollution; Fig. 2 <http://www.forbes.com/sites/larrybell/2014/01/14/clean-air-act-epas-charade-to-justify-war-on-coal-plants/#294dba1b1351>; Fig. 3 www.southeast-europe.net; Fig. 4 https://en.wikipedia.org/wiki/Flag_of_China

ENERGY, POLLUTION AND THE
DEGRADATION OF THE URBAN ENVIRONMENT

REVIEW PAGES: URBAN PRACTICES

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In this number

**PLANNING FOR E-MOBILITY:
TWO CASE STUDIES**

Transport is responsible for around a quarter of EU greenhouse gas emissions, making it the second biggest greenhouse gas emitting sector after energy. Road transport alone contributes about one-fifth of the EU's total emissions of carbon dioxide (CO₂), the main greenhouse gas (EEA, 2014). As part of the European strategies until 2030 and 2050, the European Commission points out the need to reduce GHG emissions from transport by at least 60 % until middle of the century (2050) with respect to 1990 levels (Papa et al., 2016). These decarbonisation targets required significant economical, social and technological changes (Coppola and Arsenio, 2015). In this contest, the concept of electromobility (e-Mobility) presents a significant contribution toward traffic decarbonisation and address a variety of mobility issues concerning the environmental and societal effects of transportation. Electromobility can be defined as the use of electric powertrain technologies, in-vehicle information, communication technologies and connected infrastructures to enable the electric propulsion of vehicles and fleets (Naranjo et al., 2014). It has been recognized as a major field of innovation throughout the coming decades and the dominant technology for future urban mobility (Geels et al., 2012). E-Mobility solutions provide a new opportunity for a sustainable transportation environment. Efforts made to reach the goal by many aspects like intelligent vehicle, smart road, V-2-X communications, are proved to have considerable effectiveness. It is believed that the green, sustainable, safe, intelligent transportation systems will be benefit to reduce air pollution and obtain eco-friendly transportation systems (Geels et al., 2012). Motivated by the need to address fuel efficiency and emission requirements, as well as market demands for lower operational costs, a large number of plans for e-Mobility have been conducted and great efforts have been made by many cities. The success of e-mobility initiatives requires a strong collaboration between private and public actors. The municipality's role is to set regulations and standards, encourage interoperability and to provide incentives. The private sector's role is to bring the new technology to the market and enforce mass production and thereby reduce costs. This contribution focuses on the role of public actors and presents two international case studies of cities that have developed plans, initiatives and regulation to support e-mobility:

- London (United Kingdom)
- Amsterdam (the Netherlands)



LONDON

With over 7.3 million inhabitants, London is the capital and most populous city of England and the United Kingdom. The city has one of the largest urban transport networks in the world, serving over three million passenger every day (TfL, 2014). However, the city suffers traffic congestion and pollution, since about one third of all trips are made by car. Road transport produces about 16 per cent of London's CO₂ emission and roughly 50 per cent of the nitrogen dioxide (NO₂) emissions in the city are caused by traffic (TfL, 2014). Air pollution in London is a matter of life and death, causing approximately 9,500 early deaths every year (Walton et al., 2015).

The drive to decarbonize road transport and improve air quality in London is enshrined in several London's public policy such as the *Mayor's Transport Strategy* (2010), the *Air Quality Strategy* (2010), and the *Climate Change Mitigation and Energy Strategy* (2010). The first attempt to introduce e-mobility solutions in the British capital can be traced back to 2009 when the city published *An Electric Vehicle Delivery Plan for London*, an ambitious strategy for electric mobility aimed to reduce CO₂ emissions and improve air quality.

The strategy is based on three pillars:

- *Infrastructures*. Electric Vehicles (EVs) have a shorter range than comparable petrol/diesel vehicles. The lack of charging infrastructure is a major barrier to the greater use of EVs. In this regard, the plan proposes three different charging networks serving different types of users and equipped with different technologies, distributed on-street, in off-street public car parks and station car parks. The *slow* charging network (up to 3kW) is for customers who travel and then park for a considerable time at one location. On the contrary, the *fast* charging points (7-22kW) assist those that only wish to stop for a short period of time (e.g. 30 minutes) and need to quickly charge their vehicle. Finally, the *rapid* charging points (43-50kW) serve drivers embarking on longer trip or for specific market segments, such as taxis and commercial vehicles, where they may not wish to be delayed for an extended period.
- *Public sector vehicle fleets*. The plan aims to achieve economies of scale in procurement of EVs by combining the vehicle requirements across different public sector fleets. In the public transport sector, for instance, Transport for London (TfL), following a high profile design competition, introduced 600 new diesel-electric hybrid vehicles. The *New Bus for London*, designed as a 21st century version of the historic *Routemaster* are driven by an electric motor and powered by batteries that are recharged by a diesel generator (that only runs when the batteries need recharging). EVs have been introduced also in other public sector vehicle fleets such as that of local and central Government departments, police and firefighter departments. These fleets will act as a further stimulus to the market and will demonstrate that the public sector at all levels is committed to shift to electric vehicles. Furthermore, TfL is currently conducting a Low Carbon Taxi trial, to establish the capability of technologies to reduce carbon emissions from London's black cabs.
- *Incentives, Marketing and Communication*. In order to increase the uptake of electric vehicles, a number of incentives have been established. These includes economic incentives for consumers to purchase a plug-in electric vehicle, a 100% discount from the London congestion charge, parking for free in some municipal park areas as well, drive in bus lanes. The plan also establishes marketing and communication strategies to make EVs an attractive alternative to petrol and diesel vehicles.



AMSTERDAM

With over 820,000 inhabitants, Amsterdam is the largest city in the Netherlands and the cultural and financial center of the country. The city is served by an extended public transport network made of metro lines, tram and bus as well as inland waterways making. Furthermore, Amsterdam is a bicycle-friendly city and is home of one of the most developed bike lane network in the world. However the city has an air pollution problem, especially with regards to the emissions of nitrogen dioxide that exceed limit values at many locations in the city, exposing the population to dangerous levels of pollution (Milieudefensie, 2013).

Problems in terms of air quality conditions and noise pollution together with the objective of promoting a sustainable and greener development of the city, has stimulated local authorities to undertake an aggressive action plans to transform Amsterdam into a clean, smart and sustainable city. The municipality committed to reduce by 40% its CO₂ emissions compared with 1990 levels by 2025 (while targeting a reduction of 70-80% by 2040) and to locally produce one third of its energy needs through renewable sources by the same time. The city electro-mobility initiative, called *Amsterdam Electric*, is a very aggressive action plan aiming to decarbonize the entire transport system of the city by 2040, targeting 200,000 electric vehicles in the urban area. The plan comprises various initiatives with very high demanding targets in terms of citywide infrastructures and user adoption of EVs. Since 2009, the city has been promoting the adoption of another form of sustainable transport: electric vehicles. The initiative has seen a raft of measures introduced in the city to encourage uptake of clean, electric transport. The city of Amsterdam launched its e-mobility programme at the event "Amsterdam Electric" in March 2009. E-car drivers from all over Europe attended with their e-cars: a surprise because at that time there were hardly any e-cars available in the market. The strategy is based on three pillars:

- *Subsidize Electric Vehicles.* One of the main pillars of the current policy is to subsidize EVs for frequent road users, such as taxis, vans, and lorries. As a rule, the subsidy that an applicant receives is dependent on the type of vehicle and the emissions of that vehicle. Only applicants whose business is located in Amsterdam or one the surrounding municipalities and who drive in the Environmental Zone at least five times per week are eligible for a subsidy.
- *Infrastructures.* Many EVs users do not have direct access to the necessary facilities. This issue was addressed by rolling out a charging infrastructure on both public and private land. In Amsterdam public land receives more attention because of the lack of space in this densely populated city. Amsterdam was the first city in Europe to organise a call for tenders for charging poles in public space (in the spring of 2009). Electricity supplier NUON was awarded the contract and, together with network provider Alliander, installed 100 charging poles, each containing two charging points, in Amsterdam that supplied renewable energy. Following the successful implementation of the charging network, in 2010, a second tender, for another 1000 charging points, was awarded to two energy companies. An interesting aspect of the charging network development was that the Local councils do not anticipate the market by placing charging poles in arbitrary locations but instead react to a request from a resident who has purchased an EV and needs a charging pole close to home. A charging station should preferably be no further than 200 m from the applicant's house, in a place that does not hinder other residents.
- *Communication.* In order to increase the uptake of electric vehicles, the plan establishes marketing and communication strategies to make EVs an attractive alternative to petrol and diesel vehicles.

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IMAGE SOURCES

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ENERGY, POLLUTION AND THE
DEGRADATION OF THE URBAN ENVIRONMENT

REVIEW PAGES: NEWS AND EVENTS

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URBAN ENVIRONMENTAL PROBLEMS AFFECTING
QUALITY OF LIFE

The year 2007 marks an important turning point in the human history, when for the first time, people living in the cities have overtaken the 50% of the whole world population. Are the cities able to manage this ongoing phenomenon, guaranteeing high level of quality of life for all their citizens?

It is undeniable that the growth of cities is driven by hopes and dreams for a better life, in so far as they can offer investors security, infrastructure and efficiency, thus providing more educational and career opportunities, better access to high quality health and emergency services, and as well as a number of other positives. On the other hand, in many cases, cities have been castigated as centers of disease, social unrest and insecurity, and they have been often blamed for causing environmental catastrophes, for marginalizing communities, for diminishing the quality of life especially of the least-favored social classes.

In this context, the concern over the quality of modern life is one of the main topic of the debate on the urban development of contemporary society and is not a case that quality of life is one of the most recurring phrase in the smart city definitions, as one of the main objective for the future cities (Papa et al., 2015).. "A major reason for this growing interest in issues relating to life quality is the paradox of affluence in modern societies in which concern over the quality of life has increased proportionately with technological progress and increases in income" (Pacione, 2003). The main assumption of this theory is that quality of life is not necessarily a simple function of material wealth. It led different studies to the search for new indicators, other than those based on GNP, that will reflect more adequately the overall health of citizens based on the awareness of the importance of other factors, including the social, political and environmental health. Central to this developing interest in quality of life is, therefore, the research on the relationship between people and their everyday urban environments. On this ground, the arguments of the actual debate among urban planners is basically referred to causes and consequences of the main urban environmental problems intended as threats to present and future human well-being in urban areas. The selected conferences represent an opportunity for an in-depth to share the most recent studies and experiences on this topic, with special regard to the following issues:

- Urban drainage;
- Land-use planning, and social housing and public buildings construction policies;
- Links between social and environmental determinants of health in urban settings;
- Smart Environment & Urban Networking;
- The environmental impact of the construction industry.



ICUD 2017 : 19TH INTERNATIONAL CONFERENCE ON URBAN DRAINAGE

Where: Paris – France

When: 18 - 19 April 2017

www.waset.org/conference/2017/04/paris/ICUD

Among the environmental problems, water system management have become increasingly important.

Urban drainage systems are in general failing in their functions mainly due to non-stationary climate and rapid urbanization. As these systems are becoming less efficient, issues such as sewer overflows and increase in urban flooding leading to surge in pollutant loads to receiving water bodies are becoming pervasive rapidly. Therefore, carefully selected adaptive measures are required for the provision of sustainable drainage systems, by using a more holistic approach in order to integrate water network in the wider urban system.

ICUD 2017: 19th International Conference on Urban Drainage represent an opportunity to bring together scientists, researchers and research scholars to exchange their experiences and research results on all aspects of Urban Drainage, providing an interdisciplinary platform to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted.



CONFERENCE - LIVING AND SUSTAINABILITY

Where: London – United Kingdom

When: 9 - 10 February 2017

<http://www.lsbu.ac.uk/conferences/living-sustainability-built-environment>

Another important issue affecting the urban environment is connected with the building sector that contributes up to 30% of global annual green house gas emissions and consumes up to 40% of all energy. Given the massive growth in new construction in economies in transition, it cannot be ignored. However, integral to environmental effects are the social implications of unsustainable practices: Land-use planning, as well as housing and public buildings construction policies, often influences community attributes such as soil contamination, traffic density, unaffordable housing, excessive running costs and divided communities to name but a few. Premised on this dual understanding of sustainability the conference is focused on three specific areas:

- Housing
- Commercial buildings
- Urban design.

Within these themes the conference aims to focus the debate on the following issues:

Sustainable construction; eco-retrofitting; resilience; adapting to climate change; building sustainability assessment tools; construction engineering; eco-materials and technologies; and life cycle analysis.

Affordable housing; design for life; sustainable communities; effective public transit; low-tech, low-cost self - build, participatory planning; and social inclusion.

The conference welcomes international contributions from across sectors, such as environmental engineers, sustainable architects, urban planners, infrastructure designers, building technologists, policy makers and others.



ICUEEH 2017 : 19TH INTERNATIONAL CONFERENCE ON URBAN ENVIRONMENT AND ENVIRONMENTAL HEALTH

Where: Venice - Italy

When: 13-14 April, 2017

www.waset.org/conference/2017/04/venice/ICUEEH

Cities around the world face with many environmental health challenges including contamination of air, water and soil, traffic congestion, noise, "urban heat island" amplification of heat waves, and poor housing conditions exacerbated by unsustainable urban development and climate change. The urban environment involves health hazards with an inequitable distribution of exposures and vulnerabilities, but it also involves opportunities for implementing interventions for health equity. On this topic, many researches focused on the links between social and environmental determinants of health in urban settings. Interventions to improve health equity through the environment include actions and policies that deal with proximal risk factors in deprived urban areas, such as safe drinking water supply, reduced air pollution from household cooking and heating as well as from vehicles and industry, reduced traffic injury hazards and noise, improved working environment, and reduced heat stress because of global climate change.

The ICUEEH 2017: 19th International Conference on Urban Environment and Environmental Health represent a good occasion to fix some important points about this issue; it aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results and to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Urban Environment and Environmental Health.



SEUNET 2016 : IEEE WIMOB 2016 WORKSHOP ON SMART ENVIRONMENTS & URBAN NETWORKING

Where: New York – United States

When: 17 - 19 October 2016

<http://www.polymtl.ca/seunet2016/index.html>

As cities experience events which are no longer manageable through the traditional tools available to local administrations, identification of state-of-the-art methods to organize and manage the urban system has become essential. For this reason a lot of studies of cities relies more and more on advanced mathematical models especially networks and new "science of cities" emerges. Such models can be used from describing the fundamental concepts of urban development up to the description and optimization of physical networks, such as power, water or telecommunications. Networks can help us also understand city economics and various aspects of human interactions within cities with particular application in health and the flow of people and goods. Finally, the natural environment and even the climate of cities can be modeled and managed as networks. Although Information and Communication Technologies (ICTs) play a critical and potential role in empowering next-generation smart-environments and more specifically smart cities applications, they bring up a number of technical and environmental challenges that need to be tackled.

The objective of this workshop is to bring together under one roof together leading academic scientists and researchers, in order to provide a platform for discussion on basic and potential challenges of ICTs technologies in dynamic urban environments.



EBUILT-2016. TOWARDS A SUSTAINABLE URBAN ENVIRONMENT

Where: Iasi – Romania

When: 16 - 19 November 2016

<http://ebuiltiasi.com/>

In the mentioned context also Civil engineering, traditionally focused on construction, is opening the fields of investigation to different aspects of the built environment like ageing infrastructure and buildings coupled with a strong demand to reduce the environmental impact of the construction industry as a whole.

In this perspective, the objective of the EBUILT-2016 Conference is to strengthen the cooperation between the major players in the field of Civil Engineering: Academia, through fundamental or applied research, Industrial Partners, who are facing ever stricter regulations in terms of environmental protection and Decision Makers, who should enhance the welfare of society. The main topics of this conference are the followings:

- Safety, Reliability and Integrated Risk Management;
- Maintenance and Rehabilitation of Buildings;
- Sustainability, Innovative Materials and Design;
- Performant Lifelines;
- Indoor Environment and Energy Efficiency;
- Applied Mathematics and Physics;
- GIS, Remote Sensing and Urban Planning;
- Transportation Infrastructure Engineering.

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IMAGE SOURCES

The image shown in the first page is taken from: <http://news.colgate.edu/scene/2014/11/urban-legends.html>

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