COLEÇÃO

DESAFIOS DAS ENGENHARIAS:

ENGENHARIA SANITÁRIA 2

CLEISEANO EMANUEL DA SILVA PANIAGUA
(ORGANIZADOR)

Atena Editora
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APRESENTAÇÃO

O e-book: “Coleção desafios das engenharias: Engenharia Sanitária 2” é constituído por vinte e cinco capítulos de livros que foram devidamente selecionados por membros que integram o corpo editorial da Atena Editora. Diante disso, este e-book foi dividido em quatro unidades temáticas de grande relevância.

A primeira é constituída por sete capítulos que tratam da importância de se monitorar os parâmetros físico-químicos e biológicos da água destinada ao abastecimento público, provenientes de águas superficiais ou subterrâneas (poço artesiano). Por ser um recurso natural e cada vez mais escasso em termos de padrões de potabilidade, faz-se necessário a adoção de uma consciência coletiva que leve a redução do consumo *per capita* a nível mundial.

Os capítulos de 8 a 15 apresentam estudos que reforçam a importância de se investigar alternativas a fim de se estabelecer melhores condições de confinamento, destinação final e desaguamento do lodo gerado na ETA. Além disso, é apresentada a importância de melhorar e empregar técnicas de tratamento de efluente hospitalar e provenientes de instituições de ensino.

A terceira temática apresenta trabalhos que tratam da importância do conhecimento sobre resíduos na formação de futuros profissionais da biologia. Outro estudo apresenta a importância e o devido reconhecimento que os catadores de recicláveis representam para a sociedade e que contribuem para apolítica reversa de materiais recicláveis. Já outros trabalhos, procuram avaliar o uso de lodo de ETA e de rejeitos da mineração como matéria-prima a ser incorporada em substituição aos extraídos da natureza. Por fim, é apresentado um trabalho que validou uma metodologia QuEChERS-CLAE/FL na determinação do antibiótico Tetraciclina em cama de aviários.

O último tema é composto por quatro trabalhos que reportam a utilização de biomassa tanto para remoção de cor de águas residuárias, quanto como matéria-prima para a produção de bioetanol. Além disso, apresenta um trabalho que traz uma discussão em voga em relação aos possíveis riscos associados à utilização de agrotóxicos e por último um trabalho que trata do desenvolvimento de estratégias de *designs* para o reuso de espaços urbanos abertos para o público como espaços de acesso ao público.

Diante desta variedade de estudos, provenientes de pesquisadores (as) de diferentes partes do Brasil e com contribuições provenientes de pesquisadores de Portugal e da Itália, a Atena Editora publica e disponibiliza de forma gratuita em seu *site* e em outras plataformas digitais, contribuindo para a divulgação do conhecimento cientifico gerado nas instituições de ensino do Brasil e de outros países. Assim, a Atena Editora vem trabalhando, buscando, estimulando e incentivando cada vez mais os pesquisadores do Brasil e de outros países a publicarem seus trabalhos com garantia de qualidade e excelência em forma de livros ou capítulos de livros.

Cleiseano Emanuel da Silva Paniagua

SUMÁRIO

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CAPÍTULO 25

URBAN OPEN SPACES RE-USE: DESIGN STRATEGIES

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ABSTRACT: The paper identifies appropriate design strategies of urban open space re-use that operate according to the logic of mitigation and adaptation and that allow the conservation and redevelopment of natural resources in the area and the connection between ecological and environmental values for an overall enhancement of the built environment.

The re-use of urban open spaces focused on activation of new processes of functional, environmental and social reconnection, well satisfies some needs that can be traced back to the thorny issue of safety and, in general, to the improvement of the quality of life. In particular, the following considerations start from the idea of reconstructing the relations between the natural and built environment through a "productive" development of the territory and they share the interest for environmentally friendly technologies use.

The paper also will show design proposal in contexts characterized by specific critical social and technological-environmental issues. The re-use strategies, the natural and landscape reconfiguration, the usability in general are all closely related aspects to achieving a renewed ecological-environmental quality of the territory as a whole.

KEYWORDS: Open space re-use, environmental quality, systemic approach, cartographic open data.

1 | TERRITORIAL ANALYSIS THROUGH CARTOGRAPHIC DATA (NICOLA PISACANE)

This contribution introduces to land analysis through the cartographic study by means of methodologies and tools specific to the discipline of mapping and large-scale drawing. Drawing, in fact, as a medium of communication allows not only the visualization but also synchronous and diachronic comparisons of an area through comparative reading of data and information.

In particular, at territorial scale data has to be collected into a single technology platform, a GIS system that manage the urban data and information. This representation system has enabled transferring information on different fields of interest, which constitute an open and dynamic system of knowledge. The overlay of information provides judgment and evaluation

tools, analytical and synthetic of the territorial area, competing with the representation of reality and its critical description for the exploitation of the territory through choices made based on active and dynamic monitoring.

Furthermore many data has been acquired by in situ survey through geolocation systems that allow to track a map in real time. This technological opportunity has completely changed the way in which urban space is perceived and represented. Realtime, sensors, GPS devices, information sharing today allow the experimentation of new forms of land design. The city is therefore the best laboratory for these new modes of surveying and representation. Digital systems then become the media for sharing information. Such devices and systems, however, should not be understood as a prevarication of man and his experience by virtue of widespread technology, but as means that promote man's relationship with the territory. Today, the pervasiveness of satellite images obtained with great simplicity and usable from any mobile device, app or map search engines give us with extreme simplicity visions of the planet always updated and always more precise through road maps, satellite photos, hybrid representations, with 360-degree photographic visualizations or even with applications that simulate three-dimensionality through augmented reality that represents a new frontier, overcome the convergence between the real world and the virtual world is coming to fruition. The goal of mapping the entire Earth's surface is reached, the web map platforms are beginning to explore not only metaphorically new planets. This innovation is no stranger to public administrations, which are increasingly offering the possibility of consulting, using and downloading map and data-base data from their web portals. The user today at any level is lucky enough to be able to access territorial information with extreme simplicity by acquiring data that is always up-to-date, accurate and questionable useful for the acquisition of knowledge or for subsequent elaborations. A participatory model that through the contribution of users continuously grows content, integrating it with others, generating a complex knowledge of the territory through which the content is shared with other users ensuring, although still with some limitations, the dissemination of knowledge through an increasingly direct and collaborative relationship between users so that they are all more actively and directly involved in decisions and choices through a platform of information and communication technology easily accessible to everyone via the web (Dent et al, 2008). Participation must take place at three levels: information, consultation and active participation; only dynamic involvement can help to deepen the knowledge of any territory. We move on to a modern concept of belonging to a territory in the need of knowledge and transparency and therefore communication, aimed at a comprehensive strategy of reorganization. The process must re-establish a two-way communication system with all stakeholders in continuous feedback of information that flows into a single integrated system.

This paper will present the cartographic analysis carried out through GIS (Geographical Information System) platform of a large area in Pozzuoli Municipality in Italy. The case study, related to a large open space close to coastline, will be an example of the methodological

approach used and therefore extendable to other territories (Peter et al., 2015).

Specifically for the area of interest of the applications subsequently discussed, attention was focused on the analyses related to the development of the municipal territory, to transformation of the area during the time and to services and mobility system available for citizens and tourists (Figure 1). The area, during the time, has been changed not only through the human action, but also for natural phenomena that changed the profile of coastline (Figure 2). Therefore, the GIS platform has been populated with cartographic data that testify to the urban evolution of the building through the comparison of maps and satellite data. This information was taken from the National Italian Geoportal which through the WMS (Web Map Service) offers raster layers with both historicized and current national extension.

This service together with WFS (Web Feature Service) one allows under the 2007/2/CE Directive "to download copies of territorial data sets or part of them and, where feasible, to access them directly". The WFS protocol provides, similar to WMS, a simple web interface to directly request vector geographical objects with descriptions of the individual spatial objects contained within the area of interest to be processed (spatial coordinates and any alphanumeric attributes). Data collected are in particular related to 'Inventory of the use of the lands of Italy' and 'Corine Land Cover (year 2012)'. These vector layers have been uploaded inside the GIS platform in order to evaluate the hypothesis of re-use of some urban areas in the case study area. These IT media provide with a map and data base containing information from differentiated surveys and analyses and useful support for decision-making.

Satellite data instead has also been taken through the XYZ tool that allows the overlay of satellite images taken from geographical portals such as BingMap and Google Map. With reference to vector data, the source was the database of Regione Campania and ISTAT which reports datasets of population census results in 1991, 2001 and 2011 that also gives back useful data and evaluations related not only to increases and decreases in the population but also related to construction and its quality.

Specifically the GIS project has stratified the municipal information, not only referring to the infrastructure of connection and services of the municipal areas but also the analysis of the evolution of the built-up areas and the evaluations related to the increase in the population and buildings (Figure 3).

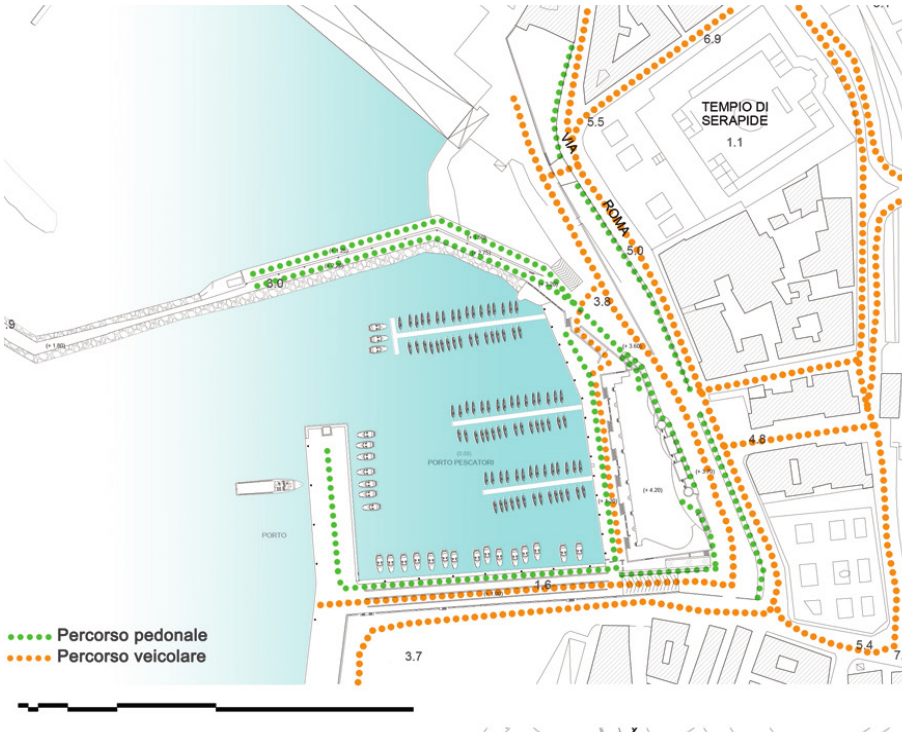

Figure 1 - Pozzuoli study area: vehicular and pedestrian paths. (Credit: L. De Nicola).

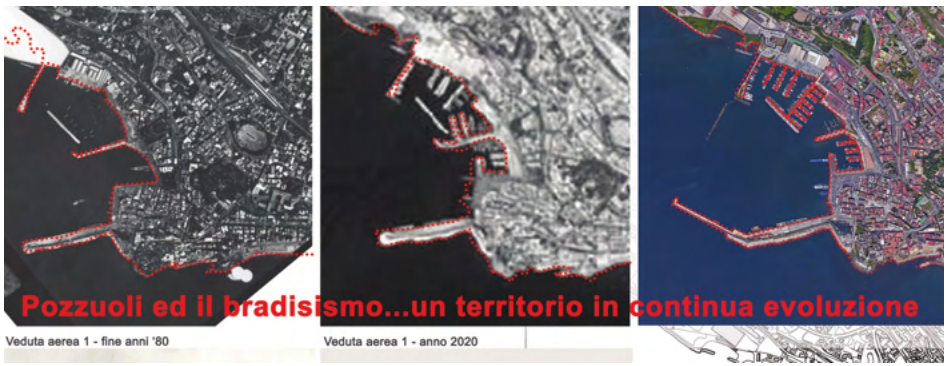

Figure 2 - Pozzuoli study area: Cartographic comparison during years 1981, 2003, 2020. (Credit: L. De Nicola).

Figure 3 - Pozzuoli Study area: potential and critical aspects. (Credit: L. De Nicola).

2 | FROM INITIAL ANALYSIS TO DESIGN STRATEGIES (ROSSELLA FRANCHINO)

As part of the interventions of environmental rebalancing of highly urbanized contexts, it is particularly important to renew open spaces (Bassani 2011) (Marcus e Francis 1998) (Wolley 2004) that are configured as complex systems capable of acquiring the role of nodal elements. The renewal of these spaces constitutes an added value for the urban fabric, especially in the presence of unfavourable environmental conditions or when the eco-systemic balance is compromised, playing a significant role in the activation of revitalization processes.

The analysis and design technologies that can be used in the re-use of degraded urban areas interventions differ from the traditional ones used for a single building or in building contexts, since being applied to the environment, they must consider a complexity of variously interrelated factors.

The environmental transformations are dynamic and depend essentially on how the moving systems are inserted and possibly alter the static systems. Among the dynamic systems, it is worth mentioning the energetic and service ones as well as those that regulate mobility. Precisely due to this specificity, an appropriate analysis method could be the matrix, where the environmental characteristics are associated to the factors that have an influence on them with a gradual assessment reported in the intersection element. The system, based

on the matrix representation, despite its schematic nature, can represent a methodology that allows to approach the complexity of the object under analysis.

This methodology also allows to observe the environment in its uniqueness and unrepeatability since everywhere physical and biological transformation processes can be configured which do not appear anywhere else except for their basic characteristics. In order to address a re-use of degraded urban areas study with the aforementioned conditions, a preliminary analysis is particularly important, with it consisting of a careful and detailed examination of the environmental conditions of the context to be studied so as to not only highlight what the factors that determine the degradation conditions are, but also classify them on a functional sensitivity scale. It is therefore possible to understand upon which elements to intervene and how to carry out any interventions that can truly obtain a new and recovered environment. Moreover, this preliminary stage must be able to identify among the various possible conditions to be achieved, what may be defined as valorisation, i.e. what allows for the best use of the natural resources (landscape, climate, etc.), but also controls the ecological footprint that the proposed intervention has on the environment that surrounds it.

To this end, a methodology for collecting information and knowledge is proposed for the preliminary analysis phase, which can be defined as territorial audit. The audit differs from the usual surveys on the conditions of a territory because it is carried out by drawing information and knowledge from all information sources, from all those who operate at any level of responsibility and use. In the audit, the prevailing information is provided by knowledge, even if not fully expressed, which entails co-responsibility in the quality and quantity of the information on the part of those who provide it.

A well-established method of audit carried out to date in categories of problems in other sectors, for example the energy audit, is the interview based on a targeted questionnaire. This tool makes it possible to acquire non-library information and therefore to have available a mass of knowledge whose criticality can be modulated for the purposes of the result to be pursued. Downstream of the definition of the audit, precisely because of the peculiarity of the same, the results obtained can be transferred in graphical presentations, possibly graph-numerical and used for the drafting of an environmental detection card, “degradation sheet” that allows a quick and complete reading of all environmental damage of the site and can provide valid technical indications eco-oriented for a subsequent deepening of the environmental control and enhancement intervention.

In addition, from the analysis, the transition to the project still has a particular typicality when the object of the design is the protection of the local environmental conditions from the impact of development and anthropisation. Thus, the project must be run by a unified multidisciplinary professionalism through a coordination that always takes into consideration the goals of the design as well as the factors that it must review and change as they evolve. The structure of the redevelopment project is, therefore, complex and based on an integrated and coordinated set of interventions on the mobility and viability, the green and furniture, plant

and infrastructure systems, relationship spaces, the building envelopes. The objectives are to qualify life, protect health, enhance safety, facilitate the relationships between the inhabitants. To approach the planning of activities for the environmental rebalancing of urbanized territories requires carefully identifying the possible interference between the natural and anthropogenic aspects with the issues related to the sustainability of urbanization, conservation of biodiversity, the controlling of the use of the land and territorial fragmentation (Franchino, 2017). The redevelopment interventions of the territory move with particular interest, among other aspects, towards the ecological conservation of biodiversity (Francis, Chadwick 2013) (Elmqvist et al., 2013) in order to safeguard the natural processes that form the basis of the survival of ecosystems. To arrive at an applicative definition of the concepts previously discussed, is presented below a redevelopment design proposal of four adjacent urban open spaces in Lusciano municipality (Italy) which, due to its highly urbanized features, presents itself as an interesting application of productive redevelopment using eco-oriented technology strategies (Figure 5). The results of the initial climate-environmental analysis relating to the urban open spaces studied allowed a preliminary understanding of the environmental issues of these areas (Figure 4). This has enabled the following to be calibrated appropriately the environmental recovery interventions that improve the relations between the site and the environment with maximum sustainability capacity. For each of these urban areas, the application of appropriate and innovative systems of urban farming have been hypothesized that transform the areas, often characterized by degradation and degeneration, into completely renewed contexts and, at the same time, also helps to stimulate productive activities. Specific attention is also paid to technologies for the recovery of rainwater using passive systems such as green street and rain garden.

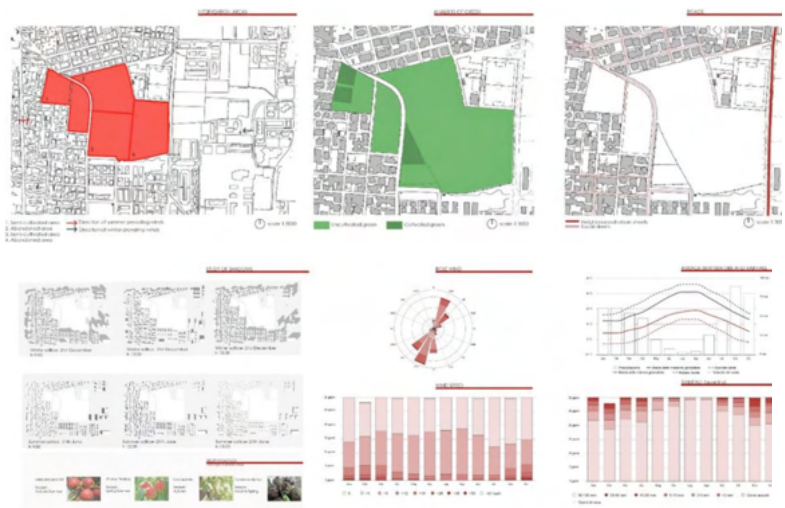

Figure 4 - Re-use of urban areas in Lusciano (Italy)_initial analysis (Credits: C. Brio Albano, M. Calabrese, Y. D'Aniello, R. Gala).

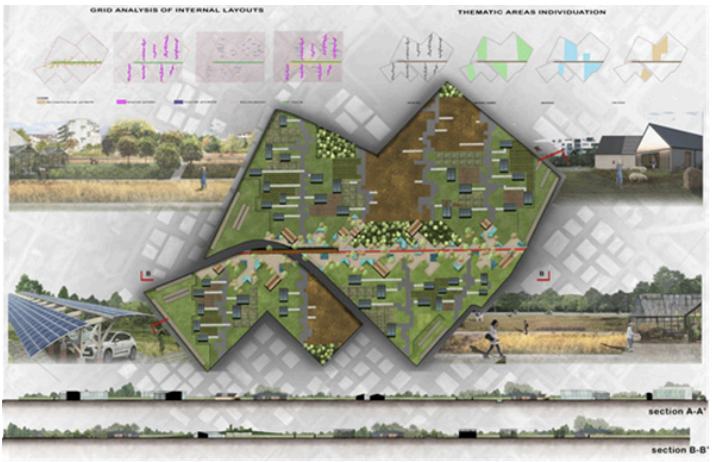

Figure 5 - Re-use of urban areas in Lusciano (Italy)_concept proposal (Credits: C. Brio Albano, M. Calabrese, Y. D'Aniello, R. Gala).

3 | THE SYSTEMIC APPROACH: IMPROVING FRUITIVE AND ENVIRONMENTAL QUALITY (CATERINA FRETTOLOSO)

Public open spaces represent the main resource available to public administrations on which to build integrated and wide-ranging policies of urban planning, morphological and functional requalification of the urban fabric and social and economic regeneration (Biennial of Public Space, 2013), but this resource must be managed according to a systemic approach. The role that not only the built heritage but above all open spaces can play as tools for rebalancing the environment and mitigating the effects of climate change and, in general, in support of urban regeneration processes, strongly emerges. This awareness, from a proposal point of view, translates into the experimentation of methodological approaches in which the collective space, in its different declinations, is interpreted as an articulated system whose different levels of accessibility, usability, permeability and naturalness characterise its specific quality.

The importance of open spaces on an urban scale can in fact be traced back to a series of thematic areas such as: redevelopment for the promotion of social function, recovery of ecological-environmental value, maintenance of services for adaptation to climate change, preservation of the natural territory from progressive urbanisation (Rebeschini, 2013). The organisational system of open spaces in re-use interventions must therefore respond to specific functional needs dictated by modes of collective life increasingly oriented towards a growing flexibility that does not mean, as often occurs, the lack of a design choice. Rather, it means working on the recognisability of surfaces and the comfort of spatial elements, according to an integrated approach to design in which technological and functional aspects necessarily intertwine with social and environmental ones.

Especially if we think in terms of "environmental and ecological functions" and,

therefore, of “ecosystem services” (microclimatic improvement, noise protection, influence on the hydrological cycle - rainwater management, identification of habitats for wild plants and animals), a methodological approach centred on the concept of “micro-intervention” and “connection” could be strategic.

The idea recalls the concept of urban acupuncture introduced by Jaime Lerner. This approach “*thanks to the identification of particularly sensitive areas, predisposed to real ‘micro-surgery’ operations,* [suggests] *small non-invasive operations capable of subsequently extending their effects to the surrounding area, supporting new evolutionary stages of the system. This operating method works with small dimensions, finding in the ‘micro-formula’ the effectiveness of the action. This is a line of reasoning that covers both spatial and social issues*” (Sciarrone, 2015). The micro formula not only allows for greater control over the project itself and its subsequent management, but also contributes to the re-composition of the full/empty, building/open space relationship through the creation of a connective tissue that acts as a “complete” but also “infiltrating” system with respect to the urban context responding, moreover, to the need to “*encourage the growth of urban quality, accessibility and permeability of use. Open spaces such as internal courtyards, abandoned residual micro-areas, interstitial spaces between buildings can offer significant potential for regeneration: the redesign and differentiation of routes, the inclusion in networks and ecological corridors, allow these micro-spaces to be included in an integrated environmental system in transformation*” (Boeri, 2017).

In fact, the fruitive and environmental improvement of urban environments also lies in the fact that they can be connected in a network whose connections are functional to movement and, in general, to the creation of an articulated system of spaces characterised by different levels of naturalness in which, that is, green and grey areas alternate and integrate to respond to the current environmental and functional criticalities. This approach, starting from an in-depth knowledge of the existing connective fabric and of the users’ ways of physically and perceptually using the city itself, can be interpreted as a tool for creating the necessary conditions for both functional and environmental improvement and for mending the built environment of the intervention context.

In some experiments, this reconnection starts from the built environment to activate renaturalisation mechanisms, creating high-performance micro spaces that become pieces of a larger urban mosaic. One of Hamburg’s objectives, for example, in response to climate change, is to become greener by planting a total of one hundred hectares of green roofs in the metropolitan area over the next decade. This solution was arrived at after assessing that green roof are more cost-effective than extending the sewerage system to cope with the greater amount of rainwater expected in the future. The connection of urban open spaces is important for several reasons. From an ecological point of view, for the improvement of the ecosystem quality, it allows to create corridors and connections to avoid confinement in closed biotopes. From the user’s point of view, the networking of urban spaces makes movement safer and access to individual spaces easier. Also, according to structural considerations,

connected spaces are more effective in articulating the urban fabric and facilitating orientation. Finally, from the environmental point of view, the network logic allows the preservation of the natural resources present in the territory and the connection between the environmental and landscape values of the areas for an overall enhancement of the territory.

It is therefore necessary to operate according to regenerative cycles capable of activating transformation processes closely linked to resilience through actions of adaptation of urban systems so that they increase their adaptive capacity in situations of anthropic and environmental criticality (Figure 6).

In this scenario, the capacity of open spaces to combine social, environmental, and economic values is strengthened and, therefore, the key role they play within the city system as catalysts (not only in relation to usability and comfort but also to cultural identity) in the activation of diversified processes of urban regeneration. These transformation processes often also involve compromised areas which, according to this approach, can take on a new function in the socio-economic dynamics of the city (Figure 7): new poles of attraction, new connection systems, an increase in environmental quality and, finally, an increase in safety through the conscious and correct use of the recovered spaces.

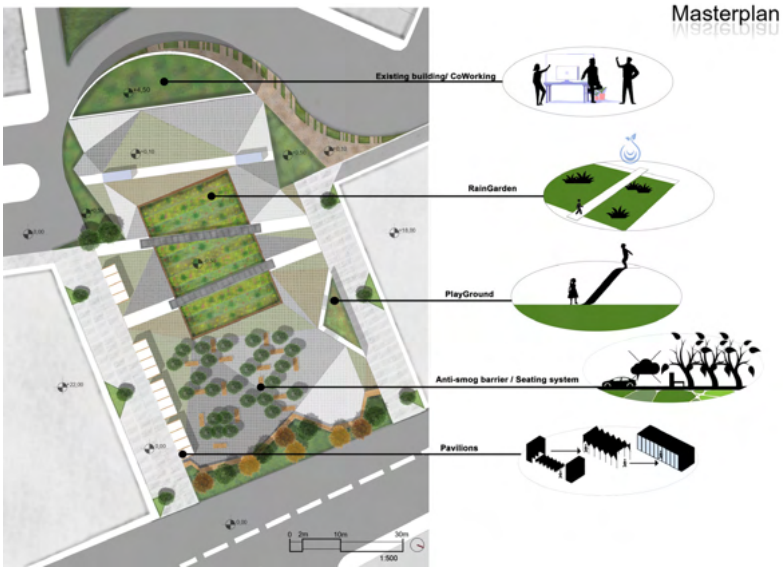

Figure 6 - Eco-oriented strategies for the temporary re-use of collective spaces. (Credit: Felice Piccolo).

Figure 7 - Tempelhof Airport, Berlin 2019. (Credit: C. Frettoloso).

4 | CONCLUSIONS

Starting from the considerations matured by the authors in the field of research on the collective urban open spaces re-use, the importance to define design strategies closely related both to an appropriate representation of the territory and to a technological-environmental analysis emerges.

The paper also stresses the need to adopt a systemic approach to the design of urban open spaces to optimise the available natural resources and enhance their role as activators of social, ecological and environmental regenerative processes.

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SOBRE O ORGANIZADOR

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