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Biodiversity in the urban park of Lama Balice between protection and enhancement: the BASE project

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Abstract

The BASE (Balice Smart Environment) Project systemically concerns the offer model and the community management of the urban Park Lama Balice, which has been able to express itself through the collaborations activated from time to time, but with important possibilities to develop and preserve important exemplarities because of its own shape as Metropolitan Park. Lama Balice is different from the other Apulian (Italy) regional protected areas which are specifically and geographically isolated, in fact, gaining the morphology of "hybrid Park", it can expand the meshes of ecological networks around a strong man-made core like the Metropolitan City of Bari, strongly influencing urban development not just related to the planning, but also to the culture, its potential to characterize the metropolitan area through values as naturalness, biodiversity, environmental sustainability, ecology and proximity ecosystems representing the milestones of the European concept of Smart Cities. A Smart Environment characterized with an Environmental Education Center (EEA) strongly typified by new technology and able to face the challenges of managing, protection and community enhancement of protected areas through the links between the historic plots of landscape, protection of biodiversity and challenges and opportunities of the modern world. The Proposal, structured on fully convergent levels of intervention, is inspired by the most recent European guidelines concerning the Protected Areas Management. It aims to increase fruition, protection and enhancement of environmental assets and present biodiversity, consolidating an integrated supply system as an absolute innovation in the region and one of the most important in the Mediterranean area.

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Introduction

Urban areas often represent very critical territorial entities characterized with a high concentration of human activities impacting on urban ecosystems. This underlines the importance of considering the urban environment in an ecosystem way, in order to highlight the traits related to material and energy flows, to resources natural cycles as well as biotic and abiotic components of substrate for living beings. Therefore the urban ecosystem could be analyzed through its parts as ecological factors, starting from the idea of a urban ecology as instrument of knowledge of physical spaces and urban functional cycles, in other words, evaluating both the abiotic (biotope) and the biotic (biocenosis) parts, considering the urban abiotic parts integrated with urban life processes (Tarsitano, 2003). This approach allows to understand the human interaction with those elements, the interferences of human activities with natural processes, the consequences of human activities and the effect of anthropic buildings on environment and its level of fragmentation, from local to global level, highlighting the degree of tensions and the degree of integration. In this context, the 'urban metabolism' concept is essential because it allows to underline the fact that the urban ecosystem takes many resources to survive and to accomplish a series of activities while returning back some other ones. The environmental context including the city, is mostly important as a "source of resources" in terms of production and reservoir capacity, and as cleansing for what concerns recycle and waste absorption (Vasishth *et al.*, 2002). In biological terms, the city is a low productivity system depending, for its energy demand, almost totally from outside and still addresses outside the waste dump produced from energetic uses. Since every action needs energy, a good way to study ecosystems is analyzing how that energy flows through them, this can happen also for urban ecosystems. Studying urban systems, a strong energy demand becomes very clear, and it increases as much as the city grows. Generally, the growth of pro capita consumption is not in a direct relationship with the growth of the population number (Wiener, 1950), but with the development of new lifestyles

(Navek and Liebermann, 1984) and the use of new production processes (Tricart, 1993). Other way round, in case of natural ecosystems, the balance between the system energetic flows, is given from the relationships between different trophic levels in the food chain, between producers and consumers. The energy flowing in different ecosystems (source and quality), determines at every levels the types and number of organisms, models of development processes and human populations lifestyle (Verneti, 1990).

Therefore briefly, the urban Park represents an extraordinary of natural and bio-diverse opportunity for a heavily anthropized and infrastructure area like the Metropolitan City of Bari. As the green heart of the Metropolitan City of Bari, the Park since it was set up, it has been considered as a powerful "antibody" and an ecological corridor for plant and or animal species, but also as focus of environmental education activities for schools, associations, researchers and naturalists working in that area. The eco-network model represented in Lama Balice is nearly extraordinary and strategic for the development of a contemporary City as Bari is intended to be: on one side as a territorial area to improve, to qualify and to characterize by arranging trails and fitted natural experiences for resident people as well as tourists; on the other side as an ecosystem, better to say an agro-ecosystem, able to get an ecological and productive rebalancing inside the City.

The amazing morphological and physical interpenetration between Lama Balice and the Metropolitan City of Bari reveals an *unicum* in the regional area, when the protected area is not intended as an isolated area in relation to the anthropized environment, on the contrary it plastically represents that connection observing the city-countryside pact wished for all community tendencies about environmental safeguarding and promoting theme, ecological compensation and synthesis between the urban elements and the landscape ones.

It is not a coincidence that during the last years Lama Balice gained special attention from Regional and

Metropolitan government that, thanks to the associative pattern around the Park, promoted the launch of different actions to enhance and promote the Park' re-birth. That is an approach to the Park as a dynamic and not static resource, realizing a qualification way on the Programming 2014-2020, based on testing new initiatives aligned with Smart City guidelines.

As expected, the Park has many more potentialities and the Project will focus on them: for example "paths to preserve and promote biodiversity", still sadly represented in the traditional way of a landscape garrison; the productive agricultural landscape hosted in the Park, has no sense of community; the environmental education novices, it is still very hard to find the right place and tools to deal with contemporary paradigms; scientific research, it has a strong fragmentation and lacks a specific direction inside the Park.

Last but not least, the very recent discovery of 10.000 dinosaur footprints (3-4 footprints per sqm) (Fig. 1) during a geological visit to search for hypogea and natural caves around the Selpquarry in the Park and not yet properly promoted. Therefore, the extraordinariness of Lama Balice Park is really symbolized by its richness of latent reserves but also and overall from its natural evolution into a smart ecosystem serving the Metropolitan Area willing to qualify and place itself on the future competitive stages, trying to invest a lot on environmental efficiency, preserving and promoting the biodiversity and the landscape quality (MAB Italia Project 11, 1991).

But to follow the proposed way, the Park needs to consolidate its own organization systematizing cultural, scientific, social and associative resources present in the territory which are the heart of this project as well as its technical and infrastructural equipment (Ferraro and Hanauer, 2014, Veech, 2003, Raimondi *et al.*, 2013, Tarsitano, 2003). The aims to enhance and promote the Natural Parks and Protected Areas of the regions involved.



Fig. 1. Thousands of dinosaur footprints dating back to about 70 million years ago. The dinosaur footprints in Lama Balice are a huge asset from a paleontological point of view, representing an evidence of what the Apulian environment was in the various geological eras and the presence of dinosaurs in the region. During 2013, some dinosaurs' footprints were discovered in the reserve. Other traces were found near Bari. Each site belongs to different geological periods, that go from the end of Jurassic age until the Cretaceous age (ca. from 180 to 70 millions of years).

The objective of the BASE Project is to align the management system and the bidding standards of Lama Balice Urban Park to the paradigms of protection, smart development and enhancement, systematizing the scientific and associative skills across the region and involving the local communities. The work of reorganization of the Park proposal is structured on three thematic lines:

The scientific-educational theme, through the constitution of a CEA like a new generation (multitouch tables, 3D blackboards and panels) exhibition center within the old Masseria and the core of the Park (Villa Framarino, XII century), as well as through the plan to enhance and increase the accessibility of themed paleontological paths (more than 10,000 tracks of dinosaurs can be visited, those footprints have been recently discovered in the area and not yet properly exploited) as well as biodiversity protection and enhancement inside Lama Balice;

The theme of the participative protection of the territory, through new technologies to prevent - together with the resident communities - the effects of adverse weather phenomena (thermo-pluviometric control units), and the consequence of little or great administrative offenses causing fires, spills, waste dumps inside the Park (using drones equipped with photographic detection and infrared systems, APP for geo-referenced signaling from the soil);

The theme of long-term sustainability, through the community agricultural production, branding new short chain products with the logo "Lama Balice", creating a local farmers consortium and through an innovation process for precision and organic farming techniques.

Material and methods

Study Area

The Lama Balice Urban Park is a protected area of about 500 hectares in the middle of the Metropolitan City of Bari.

The land became natural reserve on March 24, 1980. Later, in 1997, it was re-included in the list of the regional protected areas; it became Regional Natural Park thanks to the Regional. Act on 05 June, 2007.

The area goes from Bari to Bitonto and the regional Park takes its name from the so called *lama* (a karstic split) and it represents one of the largest ecological corridor in the Metropolitan City of Bari, with its 37 km of length (from the Murgia plateau to the sea) (Fig. 2).

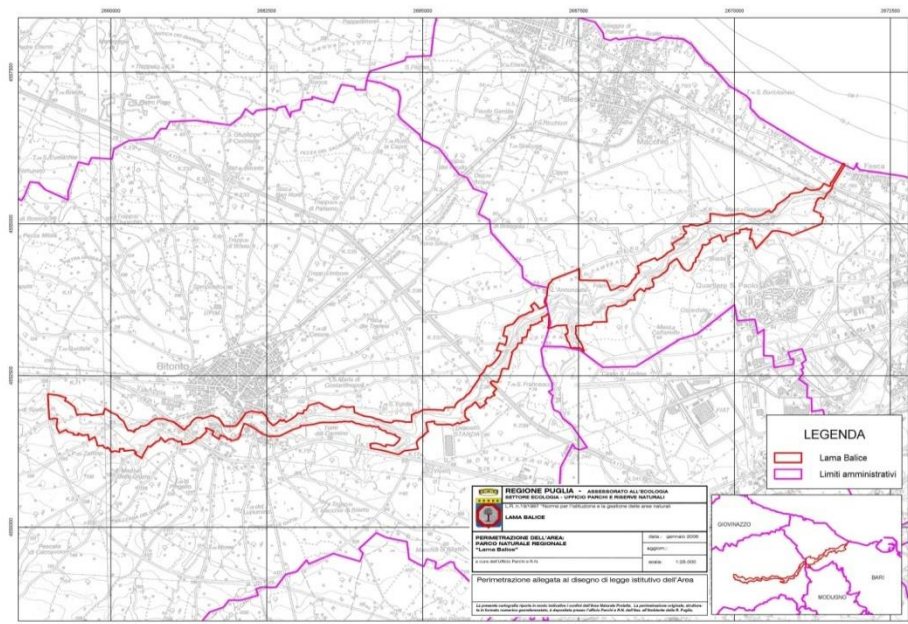


Fig. 2. The perimeter of the park Lama Balice. Lama Balice is a park characterized by a Mediterranean, hemophilic and xerophilic vegetation. The microhabitat and the natural vegetation combined to the presence of agro-ecosystems offer a stable environmental worthiness. Lama Balice presents an elevate biodiversity about the fauna.

The area has also a high landscape and cultural value and, thanks to the presence of karst phenomena that shaped the limestone of the area (making possible the original rural architecture: farms, hypogea, natural caves and dry stone walls) (Fig. 3) numerous prehistoric remains such as rock settlements. The main aspect of the territory is characterized by landscapes that are the result of an action of a thousand years old erosion caused by the wind and

the rainwater which have shaped over the centuries the calcareous plateau forms, by creating an exceptional heritage of karstic phenomena (Williams, 2008, Andriani and Walsh, 2009). The most widespread are the karstic basins and sinkholes. The most obvious consequence of the karst is the almost total disappearance of surface hydrography, perennial watercourses that is perennial watercourse such as lakes and streams, of which today only the numerous erosion furrows, the so-called "*lame*" remain.



Fig. 3. Dry stone walls. Constant elements over the centuries in Lama Balice are dry walls: they were realized with calcareous rocks in order to delimit an estate or to separate the wood from the pasture-land, the sown field from the orchard. The ravine still hosts natural vegetation typical of Mediterranean scrub-land (maquis), as well as stretches cultivated with olive groves, vineyards and vegetable gardens. All settlements were linked to the productive activities of the territory and gave origin to a society based on agriculture and pastoral farming: there is a strong connection to the structures or their rests that were found here (natural and anthropic caves, dry-stoned and rural buildings, country houses).

The *lama* starts between the cities Ruvo di Puglia and Corato, crosses the lands of Bitonto and ends up to the north side of Bari (Apulia Region, Italy) (Fig. 4). *Tiflis* was the ancient name of the torrent running through the *lama*: the stream is dry most of the time, just in case of abundant rainfalls it really starts to grow and flow because of rainfall water. The name Balice comes from the Latin medieval term “*Baligium*”, which means “valley”, and the *lama* was named in a document of the Red Book of Bit on to: “*Baligium qua igitur Barium*”, which means “the valley that drives you to Bari”. Some parts of the *lama* are low and curvy, other parts are very steep and present an interesting rocks stratification. The karstic nature of the territory is marked with the presence of a large number of natural cavities and caves carved by man (Fig. 5), in which proto-historic remains were found. All the Lama Balice basin is characterized by medieval country-houses, churches and *Masserie* (Typical Apulian farms) (Fig. 6).

Villa Framarino is situated inside the *lama*, it is an ancient farm built up in the Middle Age and recently restored, it has become the headquarter and the core of the main activities in the Park (Fig. 7). The *lama* is a rest area for birdlife and there are some parts dedicated to agriculture and other ones covered with typical mediterraneanmaquis (macedonian oak, kermes oak, holm oaks, shrubs). The *lama* has also an historical importance for the so-called “Chianchiarello caves” representing an evidence of a city already existing in the Paleolithic era. As well as its high naturalistic value, the protected area has a historical importance thanks to the amazing discovery of tools and flints inside the natural caves, proving the presence of human beings since the Neolithic era. There are also many others historical evidences from different ages as medieval churches, many examples of rural architecture and fortified farms. The bed of this particular and very rich ecological corridor is huge, the shores quite steep, often characterized by emerging rocks. A context allowing the existence of spots of vegetation as *sclerophite* in which is possible to observe the phyllirea (*Phillyrea latifolia*), the lentisk (*Pistacia lentiscus*), the carob tree (*Ceratonia siliqua*) or to admire plant species as the wild asparagus, the wild orchids and the aromatic plants as mint, sage and thyme. Flat rocky areas on the top of the shores are occupied by a low garrigue of helierysum (*Helicrysum italicum*) and some scattered samples of Aleppo pine.



Fig. 4. Location of Lama Balice. Lama Balice has always been a place of strategic importance for folks and animals, because it is a crossroads between the hinterland and the coast. It provided shelters and water, even in arid climates, since Neolithic period: different lithium finds were found near Bari and Bitonto (Apulian region, Italy).

In these areas, there are some evidences about prehistoric villages, dolmen and menhir.



Fig. 5. The karstic nature of the territory. Lama Balice Canion is characterized by fourth different stone tipologyes: Compact Mesozoic marine limestones, lightly hardened Quaternary beach calcarenites, Oloceniccanion bottom debries and recent carbonate alteration soils. Mesozoik sediment resembles to the Calcare di Bari Formation 159 -91 Milioniears old, calcareous sands resemble the Carlcarenite di Gravina Formation formed in an interval of about 5.3 Milion years agò and debris and recent soils result contemporaneous to the canion formation from 4 Milinon years to recent times. Comparing geodiversity and biodiversity could be seen that where the nude rock is cropping the more biodiversity could be seen and this allows to give to the Regional parck a geoparck vocation.



Fig. 6. Masseria surrounded by Lama. It is possible to recognize some finds in Lama Balice that witness the rural history of our territory. Some rests of different urban settlements were found in the area, hidden by the Mediterranean flora and closer to anthropic areas that are getting bigger and bigger.

Archeological finds showed the presence of some settlements during the Old Neolithic period (Masseria Maselli), until the last Bronze Age and the beginning of Iron Age. We can only find some rests of some buildings that rose in the territory and some rupestrian settlements and undercrofts, found in the tufaceous soil, as witnesses of the Middle Ages and rural history (medieval country houses and rural churches totally disappeared). However, there are some farms near Lama Balice: built between XVI and XIX century, they often rise on preexistent structures and were enlarged with defensive systems, such as boundary walls and little towers, or with chapels and churches or even with some stable, livestock and storages. Particular attention is given to dry-stoned buildings, realized with sheets of calcareous rock ("Chianche" or "Chiancarelle") connected with the rural world.



Fig. 7. The Villa Framarino, located on the left side of the lama Balice, falls in an area rich in traces of the past. Near the Villa there are several paths parallel to the medieval street Via Traiana.

The *lama* presents an elevate biodiversity about the fauna. Foxes (*Vulpes vulpes*) and hedgehogs (*Erinaceus europaeus*) live stably here. There are raptors too, such as kestrels (*Falco tinnunculus*), buzzards (*Buteo buteo*) and some species of owls (*Asio otus* and *Athene noctua*). Bats (*Chiroptera Blumenbach*) are even considered a priority species by the European Community; they live in rocky zones (caverns and caves). Temporary ponds are useful for the reproduction of different types of amphibians; green frogs (*Rana esculenta*), emerald toads (*Bufo viridis*) and common toads (*Bufo bufo*) live in Lama

Balice with some reptiles, such as green lizards (*Lacerta bilineata*), tokays (*Tarentola mauritanica*) and colubers (*Hierophis viridiflavus*). Lama Balice with its deep and large split is a preferential migration route for many raptor species and during springtime it's easy to see some honey buzzards (*Pernis apivorus*) following the eroded path. The importance of erosive cracks (especially if they are deep and well preserved) as migration route, it attracts diurnal raptors as well as aquatic species, but also sandpipers as the woodcock (*Scolopax rusticola*) sighted nearby the sclerophyll spots in the lama at the beginning of November or at the end of March - beginning of April. Finally, it is very important to underline the presence of a wintering colony of around twenty cormorants (*Phalacrocorax carbo*), sighted at the Marisabella loop, visiting the Bari port area and coast since few years.

Project layout

The BASE Project layout consists of the following main activities:

1. co-design and preparation of the Environmental Education Centre (CEA) "Lama Balice", organization of environmental education for schools, researchers and universities, improved by seminars, workshops and scientific residences for naturalists, geologists, environmental biologists and landscape architects;
2. design and preparation of the multimedia Dinosaurs Museum with high scientific and technological content;
3. co-design and creation of accessibility paths for disabled people, all the paths will be scenically like-minded and characterized with a new generation of signs via QR Code and Web APP and then it is scheduled the organization of laboratory-paths for students, nature lovers and tourists always being mindful of associations and citizens with a strong focus on the theme of paleontology newly discovered and with high potential and biodiversity.
4. design and realization of technological aids (thermo-pluviometric control units) and modern participatory monitoring systems of the area

through drones and web APP with geo-referencing from the soil, furthermore there will be the performance of training activities and skills transfer to the forester associations and the dissemination of good practices on active and community self-conservation;

5. design and realization of modern systems for organic and precision farming through drones for an innovation process in agriculture (control of plant growth, water stress, nitrogen deficiency, presence of disease) by means of the creation of a community cooperative or a farmers consortium, the preparation of a procedural guideline and the promotion of a quality short chain brand "Lama Balice" to enhance the small production of the Park and attract young international cooperators within the willing workers circuits;
6. design and realization of a participatory model of social, environmental and cultural communication focused on the systematization of the Project messages to create replication and cooperation mechanisms with other countries in the Adriatic and Mediterranean area.

Integrated-participatory planning

Tackling the above-described issues requires what can be termed as an 'integrated-participatory' control. Integrated-participatory planning is the most modern instrument available for planning and organizing all human activity in mixed areas: those areas are both urban and extra-urban.

One of the basic elements is carrying out a detailed analysis of the area and the material and energy flows coursing through it, in order to define how to restructure and reconvert the area itself, from every point of view: social, business, infrastructure, housing and environment. All of this must be done, indeed, in an integrated and participatory way (Tarsitano, 2006). "Integrated" means managing a system in all its complexity in such a way as to ensure that all its component parts work together harmoniously, whilst respecting the environmental and social/cultural equilibrium.

“Participatory” means that planning includes deep and active cooperation among the social partners, the business community and the citizenry at large. In other words, the plan is not only the upshot of the work of some ‘experts’, it is not some top-down plan foisted on a community but rather a plan which has developed organically with the full support and input of citizens and subject to checks and balances, changes and restructuring during the course of its implementation (Fig. 8) (Tarsitano, 2006).

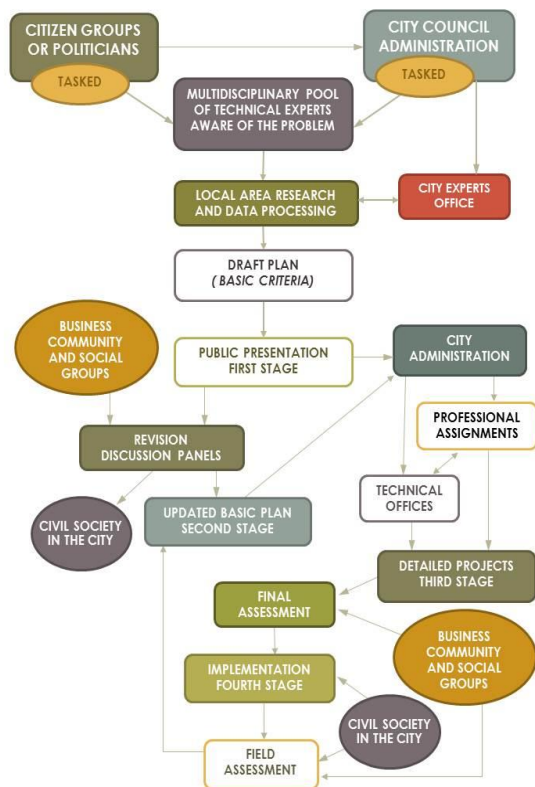


Fig. 8. Brief history of integrated-participatory planning. The aim of integrated-participatory planning is to understand and protect the natural environment which is so vital to the maintenance of life; to protect the quality of life in cities. It follows that the basis for planning must be the ability for life to maintain itself.

In this context it is possible to adopt methodologies reconciling specific needs - that can be defined as ‘global’ needs with what can be defined as ‘local’ needs in such a way to draw up targeted action plans based on that given reality. In this way, the ‘Plan’s’ instruments become special operational instruments.

Urban sustainability indicators can become very useful analytical and evaluative tools for the assessment of actions and strategies adopted in cities. The indicators can also be used as regulation tools to adjust sustainable city planning policies to foster quality of life, biodiversity and health of environment. Useful tools for this job are an environmental atlas of the city, a mapping of city biotopes and biocenosis and the drafting of ecological balance sheets in order to gain a deeper understanding of environment health state (Tarsitano, 2006) and in order to draw up detailed and itemized plans for: infrastructure, housing, business zones, city fauna, city garden, public gardens and agricultural ecosystems. All these plans can be read as ecosystems. The use of an ecological balance sheet helps to understand environment health state and to achieve a better grasp of the pressures of human activities on a specific area, not to mention its usefulness in terms of environment protection and in terms of helping environment recover when responding to environmental, health and social problems (Tarsitano, 2003).

Regional Ecological Balance Sheet method (REBS)

The data gathered from every stage of action and in the course of the final assessment shall be processed by means of the Regional Ecological Balance Sheet method (REBS). On the basis of the initial screening, the REBS method is mainly predicated upon a general and sectoral analysis of all those elements – the REBS input and output elements that contribute to define the playing factors. For each environmental component, is made a specific study on the relative factors of incidence and human actions. General indicators referring to various sectors are established in order to proceed to the decision-making stage and the weighing of specific indicators (McCool and Stankey, 2004). Those steps are all taken from a holistic perspective. The next stage is to aggregate the data or weigh both the general and the specific indicators in order to establish indexes. The final stage is the construction of specific reality simulation models, with updating stages built into the process.

These assessments pertain, above all, to vulnerability levels, to critical state level and to the potential of the ecosystem. At the end of this assessment stage, a sustainability matrix shall be established (Cause/effect and the incidence levels); intervention plans shall be drafted, including proposals for changing the current technical management levels in urban settings (Margoluis *et al.*, 2013).

Results and discussion

The BASE project, besides the reuse and prequalification of a under-used public good, recorded the increase of environmental awareness in the community of the Metropolitan City of Bari and the Apulia Region, through the presence of the Center for Environmental Education and the paths created inside the Park.

The main quantitative indicators, identified to measure the achievement of the first expected result (R1) are described in Table 1. The verification sources used for collecting the data needed to measure R1 indicators have been the stipulation of conventions with schools and research bodies and evaluating the satisfaction questionnaires given to park visitors. Strengthening the park system for protection and environmental enhancement, through the use of new technologies, the edutainment mode to promote the transmission of educational content and to improve environmental protection (Drones, thermo-pluviometric control units, dedicated website and APP, an online Game, touch-screen simulators) and the involvement of different communities belonging to Lama Balice.

The improvement of productions and the increase in sales of agricultural realities in the Park, through the creation of a consortium or community cooperative and the registration of an agricultural brand "Lama Balice". The involvement and participation of citizens and farms through innovative instruments for the context (community cooperative, the brand "Lama Balice") and through a by means of a structured communication campaign (Coad *et al.*, 2015).

Table 1. About the results (quantitatively intended) BASE estimates the full involvement of the following main beneficiaries.

*	3.600 students (30 schools and 180 classrooms);
*	50 researchers and 30 willing workers;
*	500 participants in guided tours;
*	150 disabled people involved;
*	100 local residents involved in protection activities;
*	15 companies involved to create a consortium or a community cooperative;
*	5.000 unique users on the Project website portal e-commerce section.

The so far treated considerations should be carefully considered and evaluated in the ecosystem approach to urban planning, highlighting the value of the regional heritage in all its components: environmental, urban, cultural and social, trying to counter the "deterritorialization" process. In fact, the ecosystem approach allows to consider the territory in terms of coevolution as a historic achievement coming from interactions between human settlements and environment, between nature and culture (Svancara *et al.*, 2005). Ecological criteria for protection and design allow the merger of city and landscape, through the detection of valid indicators for urban sustainability and indicators for ecological fragmentation in territorial planning, such as:

- Biodiversity and natural areas (the city is structured as a mosaic of habitats);
- Emergency indexes and the renewable energy use in urban areas ratio;
- Indexes of population/recycling/recovery ratio;
- Indexes of materials cycle;
- Introduction of the ecological footprint parameter, as a constraint to urban planning.

Although the use of urban sustainability indicators must be done carefully, avoiding to fall into new reductionism forms of complex phenomena occurring in urban ecosystems, continuing to consider them in the totality but also in their specific properties and then comparing them at local level (Coetzee *et al.*, 2014); promoting the approach of a "local self-sustainable development" (Gray *et al.*, 2016) enhancing both the local resources or the identity of a place through the identification of local

homeostasis and long-standing balances with the integration of different territorial components: natural environment, built environment, human environment as expected in the BASE Project.

The strengthening of territorial identities, the reconstruction of interrupted co-evolutionary relations between human settlement and environment, encourages the re-establishment of a durable and sustainable balance to set against environmental and social degradation. Specifically, considering in this case "the ecosystem Apulia", it seems particularly relevant the role played by the *Lame system*, as indeed Lama Balice, that insists on the entire Apulian area (Fig.9), for the re-balance of urban ecosystems in terms of "local self-sustainable development". The *Lame* are important ecological and landscape systems, proper ecological corridors, crossing the city, giving the possibility to start local homeostasis (ecological balance) and hydro geological preservation of urban pattern, protecting and enhancing it.

The typical flora and fauna of the *Lame* represents a kind of "embanked ecological corridor" running through the nearby towns and lands. The presence of typical plant species (Mediterranean and sub-Mediterranean vegetation) and the presence of many animal species, has many functions within the cities crossed by the *Lame* (Tarsitano, 2003, 2006, 2013).

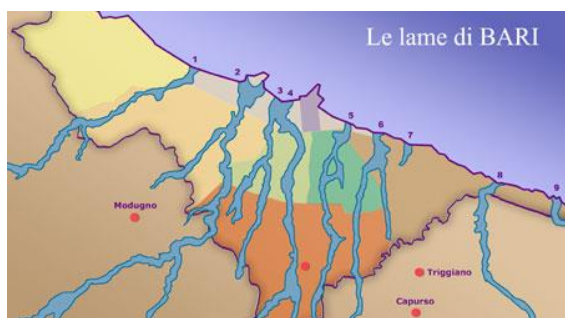


Fig. 9. The Lama system in Apulia. In one area of the municipality of Bari recognize traits of nine main *lame*, organized in an extraordinarily complex ecological system and that grow like a fan. Proceeding from the northwest to the southeast, follow each Lama Balice, Lamasinata, Villa Lamberti, Picone, Dense, Valenzano, San Marco, San Giorgio and Giotta.

Lame vegetation and fauna help nature protection, representing a mosaic of heterogeneous biotopes and the defense of landscape framework, framing elements which deserve attention, and then increasing the urban landscape attractiveness.

The *Lame* green areas, together with other green spaces in the city, influence the urban climate, mainly on summery temperatures. Vegetation, through the transpiration, subtracts a significant percentage of solar irradiation, refreshing and humidifying the air and moreover it is a natural barrier against noise and pollution (Johnson and Handel, 2016). The released energy, as a result of combustions and other activities in the city, is primarily dissipated as heat, increased by the heat returned from surfaces, after the absorption of solar irradiation in the daytime, therefore urban climate is hotter and drier than adjacent areas.

Atmosphere is heated up above the city, forming updrafts which rise and draw moist air from surrounding areas, creating a natural ventilation system, helping to dilute the emissions of central cores and freshening atmosphere (Aerts and Honnay, 2011). Therefore, the continuous green system is quite beneficial, creating a real ecological network running through the city to connect to the countryside and to the *Lame*, creating a set of ventilation corridors (Tarsitano, 2013). An Apulian landscape peculiarity is the dense dry stone walls (Limestones) network typifying the countryside around the *Lame* and besides the historical, cultural and social value, becomes a kind of tank, "atmospheric steam condensers", able to collect water from the condensation in the hot daylight hours and return it to the ground during the night cooling and dawn until saturation, and then later make that water available to root systems of plants growing around (Fig. 3).

Beside the ecological functions, those areas have strong social functions because they represent a recreation moment as they are a cultural experience and there is the incredible possibility to get it through the knowledge of flora and fauna,

spreading environmental awareness among citizens and discovering a historical and cultural identity. As well as to counteract the loss of animal and vegetable biodiversity, the *Lame* also play a key-role as faunistic corridor for the movement of animal populations (Tarsitano, 2006) and as buffer zones through the stepping stones (punctiform connection cores), in a linear or a cord or a mosaic form, also in management and control of the synanthropic fauna (Tarsitano, 2006) coming from the city, having functional characteristics that let the species move through different cores in a territorial matrix (degraded urban pattern) made of inadequate environments for their stay.

Conclusion

Therefore, the objective is to promote conservation, protection, improvement and optimal allocation for territorial and environmental resources and therefore it should be prohibited all the possible actions directed to degrade, harm or delete those resources, meant as single entities or as complex equilibrium (Geldmann *et al.*, 2013). Economic development must be well-suited with the carrying capacity of the planet's ecosystems and well-adjusted with the goals of a democratic, right, fair and inclusive society (Tarsitano, 2006). The defense of historical and cultural identity, the preservation of the landscape quality system, its environmental components and its social and productive use, in the framework of the principle of sustainable and less unsustainable development, are the results that can be obtained for a "local self-sustainable development" (Pressey *et al.*, 2015). Furthermore, the project aims to activate all the active resources gravitating around the Park and to influence the outcome of a development process aiming now to get back to national and international scenarios of eco-systemic management, (Balmford *et al.*, 2002) also through the gradual growth of intervention thanks to the additional community funds 2014-2020 attracted in the medium to long-term period. The BASE model offers the full involvement of stakeholders into the Project, not only at the use and implementation stages, but even previously as component parts at the co-design phase. Around the 9 partners operational group,

for the duration of the project phase (24 months), all the social realities, working on the Project themes, have been involved: schools, universities, research institutions (University of Bari, Bari Polytechnic, IAMB) and protection, enhancement and territorial security bodies (Regional Agency for Environmental Protection, Forest Rangers, Firefighters, Apulian Aqueduct, etc.), up to the representatives of agricultural producers associations and to every supply chain involved in the brand. Last but not least, Apulian citizens in various social forms, from families to kindergartens students, primary and secondary education schools, environment, trekking and archeology lovers. A special focus will be given to disabled people, Lama Balice can really become an extraordinary opportunity for integration, for experimentation and for educational and environmental learning, moreover for training and working for agricultural chains and social farming (Boyazoglu, 1992).

First of all the BASE Project is inherently sustainable because of its partnership and institutional wealth; secondly for its capacity to generate profitability in each intervention line (ticketing, merchandising, visiting, agricultural distribution, optimization of production processes, e-commerce); thirdly, from its full adherence to the driving principles of national and regional Community Programming 2014-2020, concerning the innovation issues applied to complex ecosystems and environmental contexts (Horizon 2020, Smart Puglia 2020 - Bari Smart City, PPTR, Ministry for University and Research, interreg Italy-Greece and Italy-Albania-Croatia-Montenegro, IPA, RDP 2014-2020).

A model Project is proposed because of its forms, absolutely innovative methods and technology in the field of Park management in Italy which may qualify Lama Balice as an active cultural example, capable of producing formation mechanisms, skills transfer and the placement on main circuits of protected areas also on international scale (Eklund and Cabeza, 2016, Barnes *et al.*, 2016, Leverington *et al.*, 2010).

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