

Urban Environmental Education and Sustainability in Lama Balice Regional Natural Park

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Abstract

A variety of emerging environmental education practices address the needs that are increasingly linked to contexts that are even more urban. These practices are becoming increasingly important, especially considering that in 2008 (Seto et al., 2010; Crossette, 2010) the urban population of the world surpassed the rural one and, the UN estimates that 60% of the eight billions of inhabitants of the planet will live in the city.

Frank et al. (1994) recognize that urban environmental education has the same objectives as traditional environmental education: encouraging awareness, knowledge, attitudinal training, skills development and participation in solving environmental problems, but it has a specific characteristic because it occurs in urban areas, with urban citizens and dealing with urban environmental systems and problems.

This paper describes the BASE project (Balice Smart Environment) which took place in Bari from 21st November 2016 to 16th June 2018 at Lama Balice Regional Natural Park. This represents an extraordinary natural and bio-diverse opportunity within a strongly anthropized and infrastructural area such as the metropolitan city of Bari (Italy). As it represents a green heart of the city, the Park is considered a powerful 'antibody' both because it is an ecological corridor for plant or animal species, and because it is implemented through the work of the Environmental Education Experience Center of Villa Framarino (EEEC), together with its activities for schools, as well as for associations, researchers and naturalists of our territory. The resulting eco-network model is an extraordinary and strategic tool for the development of a metropolitan city like Bari: on the one hand as a territorial area to improve, qualify and give it value, by organizing paths and natural experiences for residents and tourists; on the other hand as an ecosystem able to achieve an ecological, productive and community rebalancing within the city.

Keywords: Urban Environmental Education, cities, urban ecosystems, participation, Lama Balice

Introduction

The urban dimension of sustainable development is one of the themes characterizing the UN Agenda 2030: it is important to consider that almost all 17 Sustainable Development Goals

(SDGs) of the Agenda refer to the city, in particular the eleventh goal, which pursues precisely the construction of "Sustainable and Resilient Cities" (UN, 2015).

One of the reasons why the urban dimension of sustainable development becomes increasingly central lies in the fact that, since 2008 (Seto et al., 2010; Crossette, 2010), the world population that inhabited cities had become greater than the present population in rural areas. The United Nations, moreover, estimates that in 2030 about 60% of the 8 billion inhabitants of the planet will live in cities; a percentage that will increase when considering the European situation where urban population dwelling in urban areas is estimated, by 2030, more than 70% of the total (DESA, 2009). Considering the complexity of the situations that will occur, the cities will therefore deal with a series of challenges related to the ability to:

- fight urban poverty;
- managing the flows of migrants, encouraging integration projects;
- promote a development that can be environmentally, economically and socially sustainable so as not to adversely affect the quality of water, air and soil;
- improve the quality of life and services.

By consequence, the most part of the challenge to achieve the goals of the UN 2030 Agenda has to be played in cities. This is also what emerges from the Amsterdam Pact for the creation of an Urban Agenda for the European Union, signed on 30th May 2016 (*Pact of Amsterdam*), as also underlined during the United Nations Conference on Human Settlements and Urban Sustainable Development. From this Conference came *Habitat III*, the new World Urban Agenda which is to complement of the 2030 Agenda and which proposes a rethinking of urban structures so that they can become safer, more inclusive, greener and sustainable places.

The achievement of these goals is conditioned by the implementation of a localization process in order to ensure that the *Sustainable Development Goals* can be supported by the local authorities according to the specific context. Italy ranks at the 29th place out of 156 in the ranking of countries for the objectives of the Agenda 2030 (ASviS, 2018). These data highlight the need that Government and citizens (individuals and groups) are committed together to improve the situation of our country compared to the SDGs and to ensure that cities are increasingly sustainable, resilient, inclusive and secure. In fact, the achievement of these objectives is based on the role that science and politics will have on the future, but they cannot be separated from a widespread public commitment.

Environmental education, in its urban dimension, can play a critical role in promoting public commitment through paths that make it possible to clarify and communicate the challenges, the values, the actions and the methods of sustainable, resilient, livable cities; especially if we consider that cities expand and develop together with a growing number of people who choose them as places to live and grow.

The urban dimension of Environmental Education at the service of the city, its challenges, its changes

The rapid urbanization and the rapid development of cities has changed "the face of the earth" probably more than any other human activity throughout history (Bologna, 2013, p.251). By consequence, the cities and the dynamics that generate these changes can be important for the

development of solutions to the real problems that populations live and it becomes a tool to ensure greater fairness and greater justice at the global level, being the origin, as shown by the extensive literature on *learning* and *smart cities*, of individual and collective learning paths. Following the presence of an increasing percentage of urban dwellers compared to rural areas, there is a growing need that environmental education can face these challenges, as well as fill the gap concerning the critical engagement with the themes and problems of the city (Crosley, 2013).

The importance of urban contexts does not limit only to the most widespread one, relating to the conservation and protection of natural areas, but it pay attention to human-environment interactions that are structured and generated in everyday contexts lived and experienced. It is certainly this attention to human-environment interactions at the origin of the this increasingly interest in such domain in recent years, especially in the Anglo-Saxon and in Latin America contexts, with regard to studies and research in the field of environmental justice and the ecology of poverty, as well as landscape education and urban ecology.

Environmental education can be one of the most desirable ways to promote the development of environmental citizenship, considered as an important element in view of the transition towards sustainability (Dobson, 2007), through *place-based* education and the involvement of students to take part in collective efforts that can serve as community building practices (Schild, 2016).

In fact, participation is a decisive element in the paths of environmental education because it fosters a real belonging and an authentic protagonism of citizens by encouraging the assumption of greater responsibility in solving problems and as well as future choices for their territory (Iori, 2003).

Urban environmental education, in particular, can play a key role in the knowledge and promotion of the examples deriving from urban biodiversity, ecosystem services and nature, of which most urban residents are too little aware. Sensitive to the cultural and local context of reference, it can encourage residents to care about their environment and give them the necessary knowledge for action, helping people to understand the ways in which social change can be started and included in their cities and in socio-ecological contexts. In this regard, urban environmental education can encourage the rebuilding and promotion of new forms of development of existing cities, educating people to imagine and manage green infrastructure, to influence urban planning and to change human behavior and attitude in relation to the environment. In fact, it

«has the same objectives as traditional environmental education: to encourage awareness, knowledge, attitude formation, skill development, and participation in solving environmental problems. [...] Urban Environmental Education differ from traditional Environmental Education because of its context, the diversity of the audience, and the relative abundance of resources available to teachers and learners in urban setting. Urban Environmental Education is unique because it happens in urban areas, with urban people, and deals with urban environmental systems and issues» (Frank & Zamm, 1994).

Systematic urban environmental education practices can favor the creation of urban socio-ecological systems through the improvement of biological diversity and ecosystem services

and through the activation of participatory processes (Krasny & Tidball, 2009) able to perceive as the urban environment, the natural world and the global environment are strongly interconnected and interacting together (Frank & Zamm, 1994).

The context of the Project: Lama Balice

The Urban Park of Lama Balice represents an extraordinary opportunity of naturalness and biodiversity for a territory, such as that of the Metropolitan City of Bari, Apulia (Italy), strongly anthropized and infrastructured. Green heart of the metropolitan area of Bari, since the Park is proposed as a solid "antibody" and ecological corridor not only for its plants and/or animal species, but also for everything related to the environmental educational activity for schools, associations, researchers and naturalists involved in the territory. In fact, the eco-network model that represents Lama Balice is almost extraordinary and strategic for the development of a contemporary city which Bari intends to represent: on the one hand a territory to be upgraded and qualified, within which to realize paths and equipped naturalistic experiences, fully exploitable both for residents and tourist; on the other hand, as an ecosystem and an agro-ecosystem to which ecological and productive rebalancing functions can be assigned within the City (Tarsitano et al., 2017). The extraordinary morphological and physical interpenetration between Lama Balice and the Metropolitan City of Bari highlights a whole being used on the regional territory, where the protected area has not a specific isolation face to the anthropized landscape, but it represents a model of interaction between the city and country, a sort of deal always welcomed in all the community guidelines on the environmental protection and enhancement, ecological compensation and synthesis between the urban elements and those of the landscape.

In order to structure itself in continuity with these guidelines, the Park needs to consolidate its organization by systematizing the cultural, scientific, social and associative resources of the territory that today constitute the heart of this project as well as its technological and infrastructural tools.

Objectives

The BASE Project (*Balice Smart Environment*), proposed by a network of nine socially qualified partners, scientifically relevant, identitary for the territory and institutionally representative, is proposed also as a resource not only for Lama Balice Natural Regional Park, but for the whole context of the Metropolitan City of Bari, which has focused in recent years a strong propensity to the issues of protection and landscape enhancement from an 'intelligent' perspective. The proposal, structured on fully convergent levels of intervention, is inspired by the most recent European guidelines on Protected Areas. It aims to increase the use, protection and enhancement of environmental assets and biodiversity, consolidating an integrated supply system that constitutes an absolute precedent on the regional territory and among the most significant ones in the Mediterranean area.

Methodology and Planning

A work of reorganization of the Park's proposal structured on 3 thematic lines:

- the scientific-educational theme, through the constitution and the instrumental equipment of an EE EC (Environmental Education Experience Center) intended as a new generation of *exhibition center* (multi-touch tables, blackboards and 3D panels) in the context of the oldest Farmhouse in the heart of the Park (Villa Framarino, 12th century), as well as through the proposal of enhancing and increasing accessibility of the paleontological routes and paths (in order to make usable more than 10,000 dinosaur footprints recently discovered in the area and not yet adequately valued) together with the protection and enhancement of the biodiversity of Lama Balice;
- the theme of the participatory protection of the territory, through the instrumental equipment of new technologies aimed at preventing - together with the resident communities - both the effects of harmful atmospheric phenomena (thermo-pluviometric plants) and the commission of small or large administrative offenses that can determine fires, spills, waste discharges inside the Park (through the use of drones equipped with photographic detection systems also infrared, bottom-up georeference APP);
- the theme of long-term sustainability, through the agricultural production of communities, the branding of 'Lama Balice' short-chain products, the creation of a community cooperative of agricultural producers in the area and the process innovation, so determined from the new techniques of sustainable and biological agriculture.

The Project layout consists of the following main activities:

1. co-planning and preparation of the Environmental Education Experience Center and organization of environmental education courses for schools, researchers and universities, accompanied by seminars, workshops and scientific meetings for naturalists, geologists, environmental biologists, landscape architects;
2. design and construction of the Multimedia Museum of Dinosaurs with high scientific and technological content;
3. co-design and construction of trails with high accessibility for people with disabilities, ensuring environmental compatibility together with new generation signs by QR Code and web APP and organization of workshops for students, people, nature tourists, associations and citizens with a strong focus on the recently discovered paleontological theme with high potential and biodiversity.

4. design and implementation of technological devices (thermo-pluviometric plants) and advanced systems for participatory monitoring of the territory by means of aerial drones and bottom-up web georeference APP, with training and transfer of skills to Forest Rangers and dissemination of good practices of active and community self-defense;
5. design and implementation of advanced systems of precision organic farming using aerial drones for process innovation in agriculture (control of plant growth, water stress, nitrogen deficiency, disease presence) with the activation of a community cooperative, the drafting of a technical specification and the promotion of 'Lama Balice' short chain quality label aimed at enhancing the production in the Park and attracting young international cooperators within the circuits of the *willing workers*;
6. Design and implementation of a participatory model of social, environmental and cultural communication that can focus on the systematization of the Project aims to create replicability and cooperation mechanisms with other countries in the Adriatic and Mediterranean area.

Results and Discussion

The Ba.S.E project, in addition to the reuse and redevelopment of an under-utilized public good, has recorded an increase in environmental awareness of the community of the Metropolitan City of Bari and the Apulia Region, through an increase in the attendance of the Center of Environmental Education and of the paths created inside the Park. The main quantitative indicators identified to measure the achievement of the expected results (R1) are described in Table 1 and the results achieved in Tables 2 and 3.\

Table 1 - Information on the quantitative results expected following the full involvement of the main beneficiaries of the project

3600 students (30 schools and 180 classes)
50 researchers and 30 willing workers
500 participants in guided tours
150 people with disabilities
100 resident people involved in environment protection activities
15 companies involved in the creation of a cooperative
5000 website user visits

Table 2 - Result N.1: It reports the values achieved compared to the performance indicators foreseen by the project using the verification sources indicated.

1. Number of classes of students accepted in the EEEC: 180	100%	180 classes 1. List of agreements stipulated with schools 2. Visitors' register of the Park 3. Activities booked by schools
2. Number of researchers visiting the EEEC: 120/50	240%	120 researchers 1. List of attendance at workshops and seminars 2. Visitors' book of the Park
3. Number of schools involved: 32/30	107%	32 schools 1. List of agreements signed with schools 2. Visitors' book of the Park 3. Letters of intent co-signed by partners and school managers
4. Number of High schools for environmental studies involved: 10/10	100%	10 schools 1. List of agreements stipulated with High schools for environmental and scientific studies 2. Activities booked by schools
5. Number of workshops organized in the environmental field: 260/260	100%	260 workshops 1. Register of activities; posters 2. Staff timesheet
6. % of students who respond well to the surveys during the visits: 75%	85%	85% 1. Surveys filled in by students
7. Number of participants in guided tours along the paths: 3210/500	642%	3210 visitors 1. Visitors' book of the Park 2. Group reservation book sheets
8. Number of people with disabilities involved in the workshops: 150/150	100%	150 people 1. Visitors' book of the Park 2. Record's sheets for participants to events

Table 3 - Result N.2: Report the values obtained compared to performance indicators foreseen by the project using the verification sources indicated.

Number of thermo-pluviometric plants installed: 2/2	100%	2/2 1. Delivery and installation documentation 2. Test documentation
Number of active drones for overflying, mapping and control of sensitive sites: 3/3	100%	3/3 1. Delivery and testing documentation 2. Register of surveys 3. Staff timesheet
Number of companies and citizens involved in the formulation of drone flight routes: 73/100	73%	73/100 1. Project registers, surveys 2. Staff time sheet
Number of companies and citizens involved in the formulation of drone flight routes Number of willing workers involved: 32/30	107%	32/30 1. Project registers 2. Staff timesheet

The sources of verification used to collect the necessary data to measure the R1 indicators were:

1. the signing of agreements with schools and organizations and satisfaction surveys for the visitors of the Park;
2. the strengthening of the Park's environmental protection and enhancement system, through the use of new technologies, that is to say the *Educational entertainment* modality to favor the transmission of educational contents, as well as instruments to improve environmental protection (drones, thermo-pluviometric plants, website and APP, online gaming, touch screen simulators) and the involvement of various communities belonging to Lama Balice area;
3. the improvement of production and the increase in revenues of the agricultural producers established in the Park, through the creation of a community cooperative and the registration of the agricultural brand 'Lama Balice';
4. the involvement and participation of citizens and agricultural producers through innovative tools for this new context (community cooperative, 'Lama Balice' brand) and through a structured communication campaign.

Thanks to the structuring of these three lines of intervention, it is possible to affirm that the level of achievement of the specific objective has reached an high quality : to concentrate on Lama Balice a series of models and actions aimed at its full development in a smart environment, adopting a strategy that know how to enhance its naturalistic, architectural and management components in a perspective of sustainability and exemplarity on a regional and Mediterranean scale. Fully achieved is the first of the three objectives "Design and equipment of the first center of environmental education experience within a protected regional area with high technological content". The goal was fully achieved thanks to the setting up of a multimedia system, implementable in the time with always new contents, which allows visitors to observe the habitat of the entire Lama Balice Park on a three-dimensional model, and to visualize the different components: from geology, fauna, botany and vegetation, to the historical-rural and anthropized domains in order to understand how important the balance of each of them is in the general equilibrium of the protected area.

In the fully computerized EEEEC research room, a shift from macroscopic to microscopic vision is made, thanks to the presence of two slides observation devices with sections of biological and petrographic findings. With the launch of numerous activities, the Environmental Education Experience Center succeeded in involving and attracting a large number of schools than expected. In particular, High schools specialized in the scientific-environmental and tourist studies thanks to interest concerning the aspects of protection on the one hand and the enhancement and animation of the attractors of the Park on the other. It was possible to create a constructive confrontation between the citizens of tomorrow - the students who participate in the activities of School-Work Training - encouraging the development of critical thinking about the future of the Protected Area, as well as the desire to collaborate and to spread its characteristics of uniqueness. In addition, to be able to understand that only together through a collective commitment to environmental protection and scientific dissemination, we can focus the key success for the growth of Lama Balice Regional Natural Park. Unquestionably, the activities started by the EEEEC - guided tours to Lama Balice, workshops, School-Work Training projects, EEEEC involvement with schools,

Open Day activities, participation in the Erasmus Day of the University of Bari - have produced an increase in environmental awareness among students of the Metropolitan City of Bari and the Apulia Region, through the active use of the paths within the Park and through the start of negotiations for the activation of international exchange programs (Willing Working).

The resident communities were involved and raise awareness on the project, with a view to participation and co-responsibility, so that during the fire of June 2017 they immediately alerted the operators of the EEEC and proposed to intervene personally with bulldozers and other means to stem the fire, collaborating with the authorities in charge. Excellent answers were obtained regarding the "Activation of strategies to protect the ecosystem and to fight against uncivil or illegal behavior through the use of new technologies".

Even if the georeferencing APP has not been implemented, the monitoring of the territory has been activated thanks to the use of drones and in the first months of this year three illegal spills have been identified and reported. The overflight restrictions imposed by the proximity of the international civil airport of Bari have significantly affected the ability to trace wider routes and better suited to the control needs of the protected area, limiting the possibility of involvement of the local resident community. On the other hand, the installation of the thermo-pluviometric plants at two different points of the Lama allows us to make timely surveys on the climatic parameters, particularly useful with a view to comparing the risk data for the two sites and strategic for the prevention of risks for the agricultural and non-agricultural activities on Lama Balice. As for the "Creation of a community cooperative" for the promotion of "Lama Balice" branded agricultural products, the legal form of the Social Business Community Cooperative was chosen. Established at the end of a participatory process of meetings and discussions with the territory and the resident community, Lama Park Community Cooperative is already operational and well-established towards a solid planning of initiatives of:

- Fair trade in local agricultural products: the project submitted to the Apulia Region is currently under evaluation for the establishment of a Solidarity Purchase Group, aimed at creating a short brand chain for the direct marketing of products of Lama Balice;
- research on environmental phyto-bioremedia good practices: the working group which was born within the Cooperative is drafting a project, in response to a Regional Public Notice, for the use of Cannabis Sativa as a species able to absorb through the apparatus radical heavy metals and other pollutants, thus "cleaning" the soil from these substances (the project will involve the owners of agricultural land near the nearby international airport of Bari);
- production and agro-food processing: some owners of uncultivated agricultural lands have expressed their wish to join the Cooperative by making the land available for the realization of social farming activities aimed at the inclusion of vulnerable and foreign people, unaccompanied minors;
- the product specification is being completed. It will be signed by the participating farmers and it provides for the abolition of the use of chemical products harmful to the environment and the prohibition of agricultural practices that do not comply with the protection of the protected area.

Conclusions

The Ba.S.E. Project, with its objective of aligning the management system and the supply standards of Lama Balice Regional Park with the paradigms of intelligent protection, development and valorization, has generated positive effects on the medium and long term period. With the numerous activities carried out within the EEEEC, the Dinosaur Museum and the protected area, it has awakened the interest of the local community towards Lama Balice and its potential as a tourist, economic and cultural sustainable attractor, as opposed to the model consumption of the territory that had characterized the recent past and the model of high-density housing-production close to it. Environmental education programs for schools, people and families, accompanied by seminar initiatives and workshops, but above all by willing working activities, have allowed to realize collaborations and new opportunities, such as:

- the convention for the study and recognition of the dinosaur footprints in Lama Balice, signed between the University of Bari and the Park Authority;
- the Summer School commissioned by the CEEA Uniba and aimed at the operators of the Apulian CEEA on the topics of protection and enhancement of the landscape, on communication techniques and scientific divulgation, allowing a profitable exchange between professionals as well as the rise of collaborations;
- the collaboration with the University of Bari, the Polytechnic of Bari, the Municipality of Bari and the Metropolitan Area for the organization of the Urban Festival of Sustainable Development 2018 in Bari, which has achieved great visibility at national level, thanks to Tv news and ASviS' newspapers;
- exchanges and comparisons with the Promotion Committee of the Park of Lama San Giorgio and Lama Giotta which thank to the example of the Ba.S.E. project, intends to build its own model of future management;
- agreements with the owners of private quarries which are located in the protected area who have allowed us to devise and realize Open Day visits to the areas in which the dinosaur footprints that inspired the paleontological theme of the Museum realized in Villa Framarino. Finally, the focus on "clean" and sustainable agricultural techniques at the base of the principles of sustainable organic agriculture and aimed at process innovation is helping to change the relationship between local farmers and the Park, creating the basis for the realization of a participatory model of social, environmental and cultural communication focused on the systematization of the Project's aims to create replicability and cooperation mechanisms with other countries of the Adriatic and Mediterranean area, with which the lead partner initiated relations during the first calls of the cross-border cooperation programs - Interreg - for the purpose of exporting the "Ba.SE model" in Greece, Albania and Montenegro. Environmental education initiatives have led to an integrated development of all the communities (associations, institutions, schools, citizens), favoring the discovery of the urban territory but also a greater sense of responsibility for the city and the common good represented by Lama Balice Regional Nature Park. The development of the sense of belonging and responsibility with respect to the city context as a consequence of urban environmental education paths are an element of further and in-depth research. The protection of the natural environment, the enhancement of biodiversity and the sustainability of development are issues of crucial importance to face the challenges of the contemporary

world. Creating and strengthening awareness of these issues, increasing the value of scientific research and innovation as tools for the development and well-being of every society. These are important factors for education and training for citizenship. A conscious citizenship is, in fact, the best way for the growth of a better society, able to optimize its own resources.

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