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The green planning in the urban design context, tendencies, multiscales and multipurpose.

Plánování zeleně v urbanistických souvislostech. Tendence, měřítka a víceúčelovost

La planificación verde en el contexto del diseño urbano. Tendencias, multiescalaridad y multipropósito.

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Dr. Pedro Calaza -Martínez[2].

1. Introduction.

This text is the summary of the lecture ***The green planning in the urban design context, tendencies, multiscales and multipurpose***, given in Czech University of Life Sciences in Prague.

This text tries to set out different reflections and goes in depth different methodological approaches of the possibilities of a more natural territorial planning, especially in the cities, where lives more than 50% of world population, along the lines of the ecological planning and the last proposals of green infrastructure, analyzing its varied components and the benefits that they generate.

The lecture has three parts: the first one is about the conceptual and historical framework of ecoplanning and its adequacy of the modern cities, specially biophilic cities; a second part is about some case studies in Spain: a big park (San Pedro), historical garden restoration (Los Cantones) and a small ecodesign (Plaza del Libro), and the third part is about different projects of Research and Development in the framework of green spaces design, installations and management.

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To this end, first, I think that it is interesting to clarify two previous aspects that will be developed in different parts of this communication to try to avoid bias in its conceptual approach; the first of these is that, as an engineer, I have studied and used mathematics like a means of job/study and like essential tool in different disciplines related with engineering and although, I agree with the remarks of the brilliant mathematics teacher from Edinburgh University thoroughly, Michael Atiyah (1929), who affirms with good reason that "*mathematics are an universal language to study problems*", half science and half tool, when we immerse ourselves into the study of biological elements, like the components of green infrastructure, a series of determinants of processes, of variables and parameters come into play, often controllable with difficulty which complicate, to some extent, and at once enrich the situation. This is the case of the trees, shrubs, green roofs, vertical gardens, turf, etc…in the city. We are not projecting architecture or engineering, Landscape is a 4D concept and we can´t control all the parameters that we are using with numbers, we work with different processes and its relationships inside a global framework with biotic, abiotic and anthropic elements, they form a complex system that sometimes can surprise us, but it enriches the result and it is the key for life.

Secondly, although I will use the term ¿new urbanism? or *ecoplanning*, it is necessary to remember that they are no new (different authors made deeply reflections about them in the past…) and to bear in mind the inherent and dependent relations between territory, landscape, urbanism, society and vegetation considering that, nowadays, the approaches and strategies of territorial planning tackle all these concepts and its interrelations, especially in the part of components of green infrastructure, at the three levels: local, regional and (inter)national.

2.- Urban evolution. Territorial planning and green infrastructure.

The first questions that I would like to ask are the following: which is the condition of the cities in the world? which is the condition of the population that lives in those cities?¿which is the future?

In 1800, there were only two cities with a million of persons: London and Beijing. Nowadays, more of a hundred of cities have more than 20 millions of inhabitants and accommodate 540 millions of persons. In the UNFPA report (2011), Batatunde Osotimehin affirmed that on 31 October there would be 7.000 millions of persons and that in 13 years time there would be 1.000 more. He reflects on this and suggests that instead of asking us if we are too many people, perhaps we should ask us *¿what can I do to our world was better*? It is alarming that the 50% of the world´s population lives in cities since 2010, above all in the regions more developed where the numbers reach the level of about 75%. According to Forman (2010), 5 billions of persons, about the 60% of the world´s population, will live in urban areas in 2030. In Western Europe, the percentage of population in large cities is about 80%, emphasizing countries as France (85%), United Kingdom (80%), Germany (74%), Spain (77%) and Czech Republic (74%).

According to UNPD data, the population in the cities grows rapidly until reach 70 millions of persons by year. In fact, it is an obvious worry and the result of international considerations. Steward T.A. Pickett, scientist from Institute of Ecosystem Studies, already discussed in the foreword of Forman´s book (2010, p. xiii) that had been coined the term "*first urban century*"; the century in which the human has begun to be a being an *urban species* numerically.

This effect is easily visible in the urban evolution of cities like, Istanbul, Las Vegas, Santiago de Chile,…. In particular, according a Wessel´s study (2012), in Bogotá there were 711.520 inhabitants in 1950 and in the year 2.000 there were almost 7 millions; the growth is amazing.

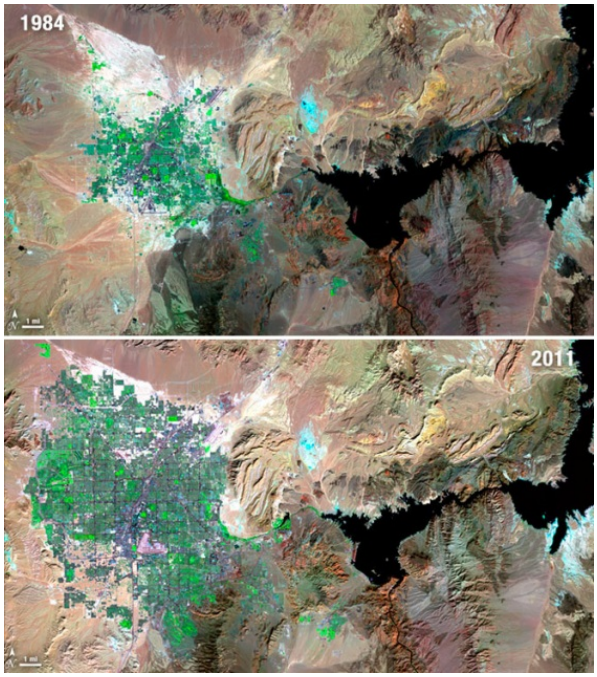

Figure 1. Urban Evolution of Las Vegas (EEUU) form 1984 (top) to 2011 (bottom). Source:http://www.wired.com/wiredscience / 2012/07/landsat-city-change/ (Mason 2012).

Everybody is aware of that they are cities with high pollution, high population density where persons live rapidly, and the ...***time***...is important to quality of life and to the perception of landscape. There are different researchers that analyze the *Timescaping*, the different perceptions of landscape depending of time. Sometimes, the time is a key element in shaping the ephemeral landscapes like the famous tomato party, *la Tomatina*, in Buñol (Valencia), Spain, war episodes as the *Batalla de las Navas de Tolosa* or religious events like the Holy Week that invades the streets and changes the perception of urban scenarios. Even, sometimes, violent events of the own nature configure these ephemeral landscapes, for example when the crowns of trees were "decorated" with millions of spiders and their cobwebs during the last heavy rains in Pakistan…. coming back to the subject of time, people in big cities lives quickly and that affects the quality of life, and that is where we must work to improve the quality of life and the welfare.

In view of these circumstances, we must reflect on different concepts and about the future, about ecology, environment, quality of life, urbanism, nature … this is, in analogy to Charles Dicken "a Tale of Two Cities"; "a good city" which offers culture, work, opportunities…and "a bad city" which generates loss of contact with nature, health problems… as the famous writer and philosopher Thoureau said: "*millions of people feeling lonely together*".

Another important problem is the "urban heat island" effect which may be reduced by the use of vegetation in cities. Moreover, from a general point of view, the diseases are changing and they are becoming to be a global problem and for that reason we must consider new perspectives, as the use of green areas to do exercise, with the purpose of minimizing different stress impacts, respiratory diseases, cardiovascular risk…

We know that the "fast urbanization" has caused that the natural environments has been replaced by modern environments and great and serious repercussions in public health and social welfare have been generated. These problems are made worse in cities with high population density and few public green areas…, but we have an opportunity …that is our need of feeling nature. We are aware that nowadays, the first physical contact of many children with nature is in the cities, and we ought to take advantage of that fact. This advantage allows me to introduce the term biophilia, coined by Wilson (1984), although the first was Erich Fromm, who once defined it more broadly as "the passionate love of life and of all that is alive" (Fromm, 1973, p. 365–366). This expression means "*the human bond with other species*", that inherent predilection of man to nature, the deep affiliations humans have with nature are rooted in our biology. We have to take advantage of this feeling and to integrate strategies, mechanisms and natural elements into the territorial planning, combining biophilia, green planning and public health to achieve healthier cities. In Europe, there are interesting examples like London, Brondy, Paris or Bath (World Heritage site and green planning paradigm) that work along these lines. Specifically, in Spain, we have good examples (Vitoria) but many of them are of poor quality too for which reason we have a hard work ahead of us. However, nowadays, engineers, architects, urban designers and landscape architects reflect on the relations between ecology, urbanism, society, landscape and sustainability and they are starting to hybridize concepts and to develop interesting lines of work synergically. In Spain, for example, most of the last territorial development projects are carried out by means of multidisciplinary teamworks where these kinds of strategies are combined.

In any case, this is not new, there are many authors that have worked in this field for centuries, yes, centuries and I would like to stand out three of them:

The British architect and critic Cedric Price in his famous metaphor "the city like eggs" defined the city of the XXI century like a scrambled eggs dish, where the urban and natural tissues get mixed up, hybridize and coexist, looking for a perfect harmony. This metaphor continues to be very used, as Schenk from Next Architects explained in the discourse that offered en the Architect Academy Groeningen (Hooijer 2011).

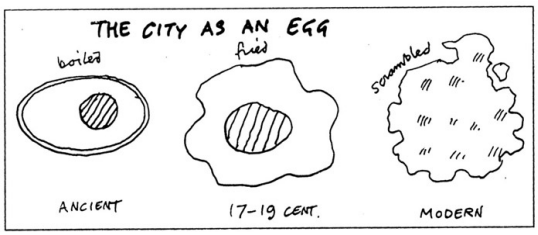

Figure 2. "The city like a egg" by Cedric Price. Source: (http://holeintheclouds.net/category/photograpy-credits/image-credit-cedric-price 2012>).

In this way, it is suggested that landscape may be the model to the third urban form, logical development from the first form emerged in the agrarian Neolithic which contains a central urban nucleus and its protected surroundings, and from the second urban form when the Industrial Revolution allows the city extension, breaking the perimeter limit, the initial closing. This third form is more organic, in the words of Shane (2006, p.58) "opener, decentralized, autorganized and with a pattern of postmodern matrix". In short, the aim is to promote green spaces like city natural theatres. This conceptual approach agrees with one of the movement´s founders Landscape Urbanism, James Corner (2006), who used a very clear word game that connects with the Cedric Price´s suggestions "The city in the landscape and the landscape in the city" directly.

The second well-known person that I want to emphasize is Ian McHarg, landscape architect of Scottish origin, who is very interesting because of three aspects: firstly, for being the father of Landscape Ecology; secondly, because he is the precursor of modern geographical information systems (he followed the idea of Warren Manning[3], who

[3] Warren H. Manning (1860-1938) developed more than 1600 design and planning projects in 45 states of USA. Manning tackled the projects from a regional perspective. Manning was influenced by Olmsted during his years working for him. He is the designer of the method of

prepared in 1923 a plan for USA, the first example of a megascale landscape planning) and lastly, he is the author of the famous book "Design in Nature" (McHarg 1969) which stabilized the basis of a territorial planning more integrated in landscape and prepared the way that many other specialists would follow in this field: Anne Spirn, Hough, Lyle, and in an other line by Fabos, Little, Steiner, Steiniz, etc…

In his framework, the ecoplanning defined as "strategies and techniques that combine urbanism and nature to create healthy, civilising, and enriching places to live" " (Williams, 2000) is the optimal way to design the cities of the XXI century, looking for *the city in the nature* and *the nature in the city* in a holistic view of the systems. This approach may be tackle from ecological sciences in architecture, landscape architecture and urban landscape design. Makhzuomi and Pungetti (1999) exposed this relationship and the way to achieve an ecological design from this three fonts.

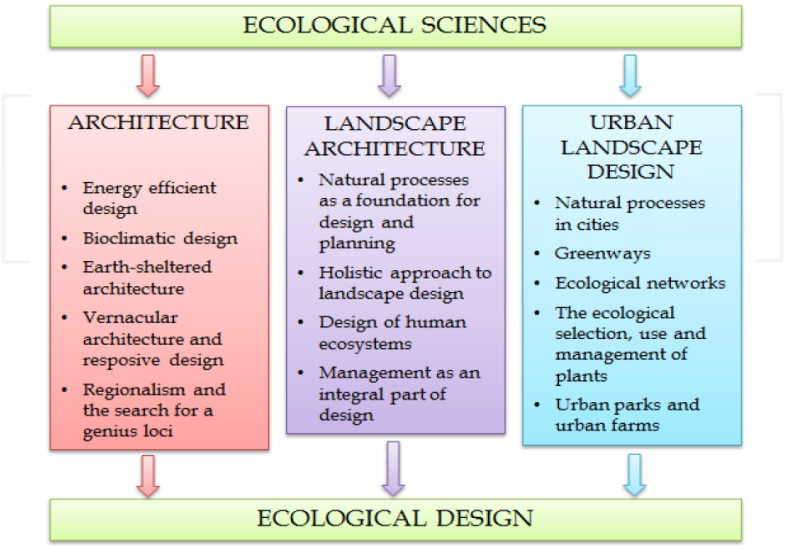

Figure 3. The interface of ecology with architecture, landscape architecture and urban landscape design (Makhzuomi and Pungetti, 1999)

Celek (2013) explained the 5 principles of the implication of ecological design in the landscape of the cities. He exposed a brief summary of the general implications of each of the five principles of urban ecology for ecologically motivated landscape design and management.

superposition of maps that Ian McHarg used later, and it is the base to the development of GIS systems. He was one of the 11 founders of ASLA.

Table 1. Principles summary of implication for landscape design (Celek, 2013).

Principles	Summary of Implication for Landscape Design:
Cities are ecosystems	Design affects all components of human ecosystems.
Cities are heterogeneous	Design should enhance heterogeneity, and its ecological functions.
Cities are dynamic	Design must accommodate internal and external changes projects can experience.
Human and natural processes interact in cities	Design should recognize and plan for feedbacks between social and natural processes.
Ecological processes remain important in cities	Remnant ecological processes yielding ecological services should be maintained or restored.

Nowadays, there are interesting international movements like landscape urbanism (Waldheim, 2006), ecological urbanism (Mostafavi and Doherty, 2010) and landscape ecological urbanism (Steiner, 2011) that are being used in different countries and are changing the way to observe and understand the cities.

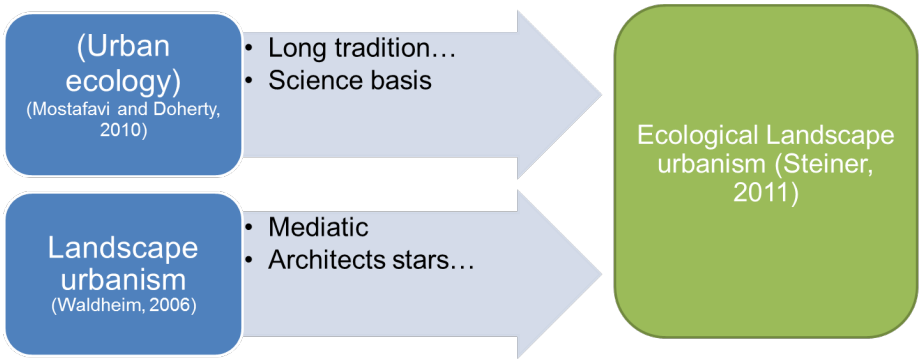

Figure 4. New? international movements in the ecological planning framework.

"*Landscape urbanism describes a disciplinary realignment currently under way which landscape replaces architecture as the basic building block of contemporary urbanism. For many across a range of disciplines, landscape has become both the lens through which the contemporary city is represented and the medium trough which it is constructed*" (Waldheim, 2006).

As we see, these authors propose reflects, philosophy, methods and proposals that must be used considering that modern society needs a solution. We know, also, that every day green infrastructure gathers more importance, but exactly what does this concept means? For many people is all that which is not grey infrastructure, that is, roads, electrical installations, different kinds of infrastructures…we can say that it is a type of positive and negative in a photograph, the grey and the green. We can find numerous definitions at international level, I think that Benedict and Mc Mahon (2006) offered one of the most complete: "*An interconnected network of green space and other environmental assets that conserves the functions of the natural ecosystem and provides associated benefits to people*".

European Union have just published (May 6, 2013) the European green infrastructure strategy and defines it as "…*a successfully tested tool for providing ecological, economic and social benefits through natural solutions. It helps us to understand the value of the benefits that nature provides to human society and to mobilise investments to sustain and enhance them*".

And it insists on the fact that the g*reen Infrastructure is based on the principle that protecting and enhancing nature and natural processes, and the many benefits human society gets from nature, are consciously integrated into spatial planning and territorial development. Compared to single-purpose, grey infrastructure, GI has many benefits.*

Also, it underlines the importance of the integration of these approaches in great cities, where more than 60% of the EU population lives. *GI features in cities deliver health-related benefits such as clean air and better water quality. Healthy ecosystems also reduce the spread of vector-borne diseases. Implementing Green Infrastructure features in urban areas creates a greater sense of community, strengthens the link with voluntary actions undertaken by civil society, and helps combat social exclusion and isolation. They benefit the individual and the community physically, psychologically, emotionally and socio-economically. GI creates opportunities to connect urban and rural areas and provides appealing places to live and work in.*

This proposal of integrating nature into city, keeping in mind certain kind of benefits is not new either. We find many historic examples in the international

framework like the Haarlem Forest at Holland, the Johan Henrich von Thunen´s approaches, Ebenezer Howard´s Garden City, the Le Corbusier´s approaches between sun, green and space….the incorporation of trees alignments to architectonical and recreational functioning, one of the first designed in Spain is located at Ferrol although nowadays it is unfortunately in terrible conditions, it is one case study that is set out in this paper.

In this moment, I would like to present my third personage chosen, although I am aware that he is a very well-known for all those that work or have interest in landscape, he is Frederik Law Olmsted, one of the first to work with concepts relating to green infrastructure and how it provides benefits to population, significant examples are *Central Park* and *Boston´s Emerald Necklace*. Moreover, for some authors, he is regarded as father of landscape architecture.

All previously mentioned signs of the cities condition show up the importance of the search of solutions and mechanisms to guarantee the population ways of life in cities and great cities, on the right track of sustainability, quality, health, economy and environment, both in new urban growth and in the applications that produce the effect of the shrinking cities identified and diagnosed in cities like Leipzig, Detroit, Ivanovo, Manchester, Liverpool or Hague.

Figure 5. Recuperation of old military battery to public park as hub to the development of Green infrastructure. La Coruña. Galicia. España. Source: Council of La Coruña. Environment Area. 2003.

It is important to outline that GI is multiscale strategy but it is specially recommended for cities, as evidenced by EU (2013) who have just published the European GI strategy and defines it as "…*a successfully tested tool for providing ecological, economic and social benefits through natural solutions. ...*" and in others publication as Mell (2012) or Ahern (2007).

It is important to keep the integrator nature of this strategy in mind, because deals together with planning elements, landscape ecology and human geography, merging them into the concept and allowing its use from a multidisciplinar approach. Mell (2008) reflects on how the GI should be included in territorial planning at all levels, arguing that the potentiality of social, ecological and environmental benefits should be stressed because they are being understood and visualized by the territorial planners, and besides, they are beginning to be valued economically. Politics and planning integration, landscape multifunctionality and organizational cooperation are ideas that are strengthening the use of green infrastructure.

Being a strategic tool of territorial planning more coherent, rational and aesthetic, it provides a serie of ecosystem services, many of them quantifiable (Mell, 2013), that, in short, represents a system of economic savings. Undeniably, both GI and its various components as greenways, parks, etc... have a strong nature of multifunctionality that is supported by numerous scientific and technical studies (Fabos, 1995; Mell, 2010; Tzoulas *et al*., 2007) such as a) To minimize the effects of climate change: using vegetation as temperature regulator (Gill, Handley, Ennos, & Pauleit, 2007) and to remove CO_2, VOCs and O_3. b) The regeneration of territories: the potential of GI to capture pollutants, to improve visual quality, etc., c) Biodiversity and wildlife preservation is one of the mainstay of landscape ecology approaches. d) The reinforcement of community ties, improving social interaction, inclusion and cohesion (Burgess, Harrison, & Limb, 1998). e) Economic growth and investments; the rise in land value, the local economic regeneration (Venn & Niemela, 2004); Richard Smardon, expert from NY University, in a recent visit to Spain, commented that "greener is a city, fewer taxes its necessary to pay" (Olona, 2012), defending landscape protection like an economic development way.

In addition, one worry of mine is the relationship between **public health**, **wellbeing** and **green infrastructure**, GI is the key for improvement both physically and psychologically, supported by evidences that shows that it can improve the quality of life, through psychological health, welfare, increase life expectancy (O´Brien, Williams & Stewart, 2010).

We know that there are different studies which relate size, quality or position of green spaces to quality of life or public health (Maas et al. 2006; Kaczynski & Henderson, 2007; Calaza and Ribeiro 2013). In this wide variety of studies, we emphasize works such as that of Forest Research (2010), where GI benefits are analyzed or that of Tzoulas et al. (2007) who studied the implementation of GI and public health in its different variants (cardiovascular, immune, respiratory, skeletal, stress, etc.).

In Europe, it is recommended that each citizen should have a green area greater than 5000 m^2 at less than 300 meters from its home to guarantee the accessibility and the possibility of doing exercise during 30 minutes every day (ECI 2003; ANGST 2010; Wendel-Voss et al. 2004).

Hence, a rising body of scientific evidences suggests that the contact with GS in its different typologies improves the health visibly, perhaps, by the biophilic feeling (Wilson, 1984), that reflects the mankind bond with other living beings, that man inherent preference by nature, which means fondness by plants and other living beings.

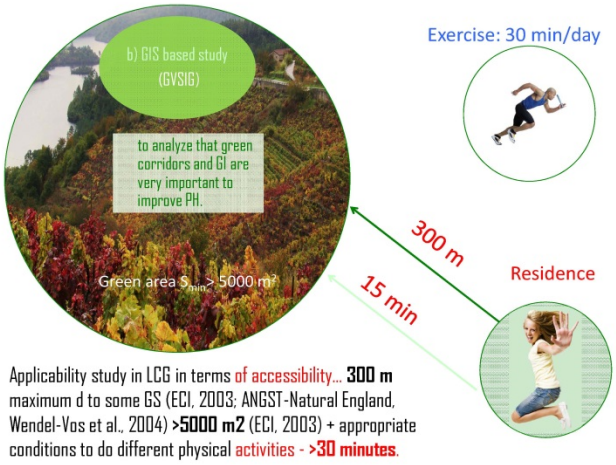

Figure 6. European recommendations to accessibility to green spaces.

We must try that the approaches coexist, that hybridization exists between them, that urban acupuncture processes happens in very populated areas, that natural systems mingle with anthropic systems, in the never-ending search of the sustainability, urban naturation, the incorporation and integration into cities of natural landscapes like element of (green) infrastructure, an ecosystemic services generator.

Another aspect that we have to bear in mind relating to urban pathology is the case of the new growths and transformations of our cities, because it is necessary that we don´t fall into "*urbanalización*" (Spanish play on words: urbanize + trivialize), word coined by Francesc Muñoz (2008), in processes of creation of monocultural urban landscapes, losing in this way the characteristic heritage of each particular place. We are liable to develop proposals of processes that include obvious bonds with the history and culture of the place, achieving attractive and dynamic places that the citizen feels part of it.

2.1.-Perspective, conclusions and opportunities.

It is obvious that we are in an important point to think about the new? design of cities, and besides, we have the tools, reflections, knowledge and interest to carry out smartly.

We can conclude the following:

1. Necessity of incorporating naturalistic arguments as such urban ecology, reurbanism, common scenery, … in the modern cities.

2. Ecoplanning or ecological planning in cities is a perfect tool and solution to improve the quality of life, wellbeing and public health, also it is an economical savings method.

3. Green infrastructure, as strong concept, represents a solution to actual problems applied at different scales, in different contexts and to different functions.

4. It is important to study in depth the conceptual framework and to apply the ideas of green infrastructure coherently. To exchange utopia for reality by means of a strategic planning of high quality green networks.

5. It is necessary to promote the ecosystemic services. Economy-argument.

6. It is necessary to work in multidisciplinary tables and to integrate the preservation and the maintenance from the initial phases in a coherent and technical way.

3.- Case studies.

After the first part of theoretical introduction, several case studies developed in Spain are exposed bellow. Those examples more representative have been selected to include different situations because of size, situation, singularity and as well as the methodology of intervention, including a big public park (Park of San Pedro in Corunna), a historical garden (Los Cantones de Molíns in Ferrol) and a small intervention with an approach of sustainability and ecology (Square of the Book in Corunna). These projects and their execution (Los Cantones it has not been executed yet), are explained and commenting in detail both the morphology of the development of the project, the previous studies, the proposal and the result, and the successes and the most singular mistakes. It should be pointed that the approach of design of green spaces has changed in the last years, including now the ecology and holistic integration in the city system.

3.1.- Parque De San Pedro. La Coruña. Spain.

Authors of the project: Pedro Calaza, Javier Padín y Juan José López de Heredia.

Year of the project 1: 1999.

Restoration and adaptation of the old coastal battery located at Mount of San Pedro.

Year of the project 2: 2000.

Restoration and adaption of the no built-up area in Mount of San Pedro Park.

Year of the project 3: 2006.

Design and execution of the green space of the surroundings restaurant in Mount of San Pedro Park.

Execution years: 1999-2007.

Project execution company: Malvecin, S.L.

Total amount: 3.700.000 euro.

This large public park, real green lung of the city, is fruit of a series of projects and transformations that began at the end of the last century, originated by an increasing concern for the restoration of an old military space with important historical and cultural significance. We emphasize among its values, the archaeology, the historical and didactic contain, the astonishing sea view and its potential like an impressive viewpoint towards the city.

Over the years, this project has been gradually completed in different stages and nowadays thanks to the investments, the ideas and the effort of many people, this park has become a green icon of the city.

Genesis and work description.

We know that the sea spaces emerge from the relation of various configurator elements such as climate and microclimate, proximity of the sea, and its thermostat effect, flora of the coast, the water, the landscape,apart from a wide number of anthropic factors. They are spaces that have a series of peculiar characteristics which are fundamental in any action in the landscape:

- Socials; they are characterized by a great impact in the population and/or in the economy.
- Legislative; restrictions due to the Coastal Law and of the proper administrations.
- Physiographic characteristics.
- Landscape features.

Taking this premise as a starting point, we try to find the best solution to minimize the impact on any of these special features, devoting particular emphasis on the natural landscape morphology to achieve integrate completely our action in the surrounding environment and besides, helping to avoid the anthropic pressure.

Figure 7. General plan of San Pedro´s Park.

Historical outline.

From a military point of view, Mount of San Pedro had a perfect strategic position because from here, an absolute defence of the entry of enemy ships to the Ria de Ferrol was possible.

Undoubtedly, its old military origin as positioning of a coast battery was its most distinctive because of two reasons; on one hand, its restricted access for civil people during this military period created a great interest for discovering the scenario and on the other hand, the military installations and, above all the two huge cannons Vickers 38.1 cm, were converted into sculptures and integrated into the park design.

When we raised the work to order the different use zones in the park, we bore in mind two characteristics with a marvellous potential, first of all, its special location over the open sea, close of the Bay together with the Torre de Hercules, world heritage, and secondly, it was endowed by its high altitude, 142m above sea level, with a privileged view.

Figure 8. Historical images of the army battery of San Pedro.

Design philosophy and aesthetics principles.

Once we developed an alternative strategies analysis, and taking the adaptation to the existing morphology as premise, we achieve a solution where the visual softness was the dominant feature, combining the respect for the natural forms and using the artillery pieces, converted into sculptural elements, like main focal points in the framework design.

These huge sculptures will be magnified so that the perceptions that are tried to transmit, the composition moods using design words, were a series of feelings that spring from the contrast amongst the historical memories, the army spirit and the winding and gentle route of the paths and the bushy compositions.

Many "moods" could be cited such as peacefulness, magnificence, meditation, bigness of scale, prestige, impact... All of them acquire a very important added value given by the society curiosity because of the discovery of those installations for a long time restricted owing to its military use.

Figure 9. Perspectives of San Pedro´s Park.

The approach of curiosity and mystery has been fundamental when it comes to opening the door to a public eager for discovering all the beautiful places along the park. This attitude emphasizes the play where the visitor will discover, little by little, the different zones while walk in the park (this design criterion was described by D´ezallier Dargenville as early as the Baroque period).

Other feelings that we want to transmit are those of peace, rest or auditory and visual perception that are offered by the vastness of the open sea contrasting with the feeling of being overawed by its violent surf in days of storm.

Context in design is a concept, an image, a metaphor that includes a lot of needs, impressions, materials and aesthetic principles that collectively make up an understanding of the inspiration of the place, its character and its role in the user´s life. From our point of view, the relaxation, the view, the rest, the nature, the peace, a large scale, sociability, conviviality... are positive words that, perhaps, we associate with a green space, and that form the context of the park.

Many places have more than a defined character, have a presence, a particular atmosphere and even seem to draw people. That *genius loci* appears reflected in the inspiration of the restoration of a sculptural museum of historical-military elements

In order to attain such purpose, these elements must be completely blended with the landscape in such a way as appear making a full part of the environment , but which at the same time clarify that they are landscape dominant milestones, the own purpose of the park because the design context derive from them.

All the basic principles of landscape architecture projects have been taken into account; the balance, the link, the scale, the proportion and the colour defined in relation with the respect to the military elements, above mentioned as main design points, avoiding all type of aesthetics chromatic aberrations and scale jumps too sudden; the species selection, which involves the election of texture, colour, bearing or plant growth habit, was carried out taking into account the edaphoclimatological determinants, and to avoid the creation of plant focal points with excessive entity that played down importance of the sculptural elements.

The asymmetry, the contrast and the winding forms of all the elements have been chosento attempt to compensate the stiffness of the military elements and to integrate

into the surrounding landscape to the maximum. The zenith of these forms is achieved with the ways and paths routes which cross the park and take us indirectly to all the military hides that were preserved, to all that hidden hides cited above.

Another essential element in the whole of the park is the vegetal maze, the only concession to the symmetry, as representative of a part of the history, and as another focal point of mystery and curiosity. The maze is one of the oldest symbol of the mankind and means strength.

For millenniums, it has been engraved on the wood, stone or clay, also placed on the ground using stones or even drawn in manuscripts. During the last six centuries, it has been created with shrubs and trees in the gardens with the purpose of dominating and bending the nature.

Characteristics of the park:

Perimeter: 2000m.

Landscape arranged area: 91107m

Main and secondary paths: 4000m.

Parking spaces: 150 cars and 6 buses.

Singular elements:

Vegetable maze: 2000m^2

Presence of an endemic species: *Angelica pachycarpa*.

Pound with waterfall made in matrix rock.

Interpretation centre of the coast battery.

Annual visits: 300.000-350.000 persons.

3.3.- LOS CANTONES DE FERROL.

Project by:

Pedro Calaza Martínez. Dr. Engineering.

José Manuel Casabella. Dr. Architect.

Figure 10. Aerial photo of Los Cantones de Ferrol (Spain)

Historical outline

La Magdalena Area was designed by military engineers, and its first phase was contemporaneous to Arsenal construction. The first projects by Montaigu or De la Croix, were followed by another more ambitious by Jorge Juan in 1755. In this moment a interclassicist city was projected.

The first historical reference that refers to the creation of an alameda (tree avenue) in the city dates of 1751 and corresponds to the project of New Population prepared by the French engineer Joseph de La Croix. His plan was still embryonic, since it was limited itself to a simple tree beltway around the designed establishment. Nevertheless it is significant because it showed typical characteristics present in the first avenues by having a peripheral sense or, if it is preferred, using the Lavedan words, as if it was an authentic "way of round". This suggests that La Croix when designing his plan, he beared in mind the first urban tree walks which arose as a result of the demolition of walls and fortifications.

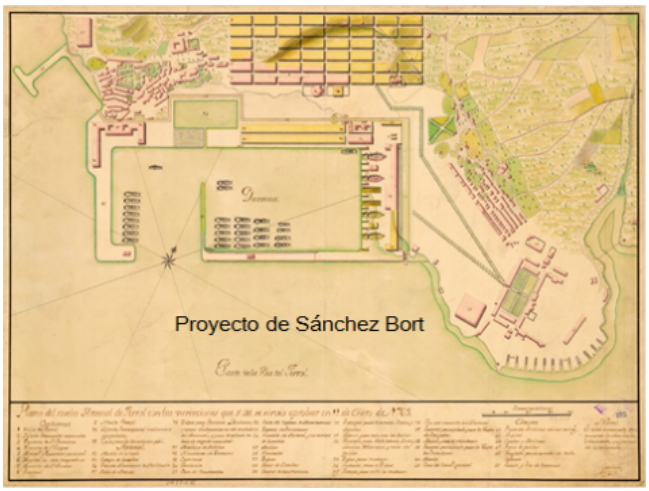

Figure 11. Sánchez Bort planning city Project. 17xx

As noted above, this green space has its origin in the XVIII th century, throughout all this time it has suffered different changes of tracing and modifications. At present we find a very interesting legacy, impressive trees of different species, a rational tracing with a very strict longitudinal axes, special and different a public space in the city. An important part of the history of Ferrol which is precise to enhance and to respect. We have the obligation to reach a design that brings together these values with the new needs of the population.

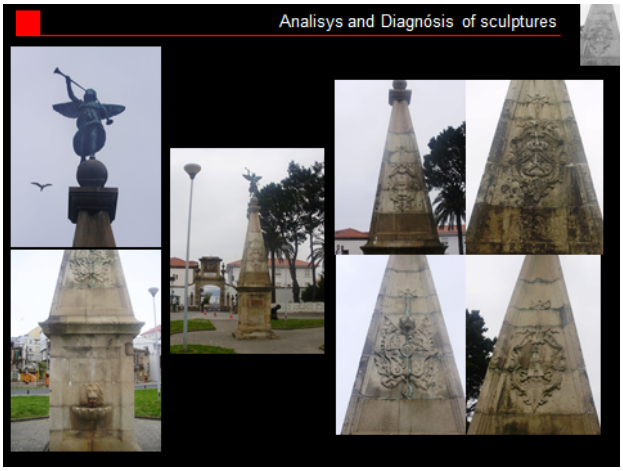

Figure 12. *La Fama* Historical Font (1789)

Project determinants

For the achievement of the project an exhaustive analysis of the situation and current condition of the spaces understood within the area of intervention was carried out and a study of the historical evolution of the different stages, through the place has been formed, was developed trying to decode the characteristics of each one of its parts and to isolate or to

identify both the elements of architectural and sculptural character (paving, furniture, signaling. etc.), and the most significant vegetable character (trees, shrubs, plants, etc.), in order to prepare a catalog allowing to systematize the parts in which the intervention was necessary.

Current state

Figure 15. Current state of Los Cantones de Ferrol (Spain).

The area represents the historical garden par excellence of the city, created since XVIIIth century. Over the years it has been consolidated and at present it is the fruit of different interventions that were to a greater or lesser extent apropiate. Currently, we find the typical historical park in a state of semi-neglect, not because the maintenance typology but because most of the facilities has become obsolete. Eclecticism is evident in the hard elements that it presents, the paving has been steadily deteriorating over time and at present it is very degraded and even, the same kind of paving has not been replaced in some areas. Within the framework of the existing vegetation, we can say that it is the area with major botanical wealth of the city and with the most singular trees(we can see the dendrometric results in the figure 14), by age and size. In fact many of them are already catalogued like the alignment of *Platanus x Hispanica*, *Magnolia grandiflora*, *Tilia tomentosa*, Araucaria of Norfolk, etc. however their current condition is no good.

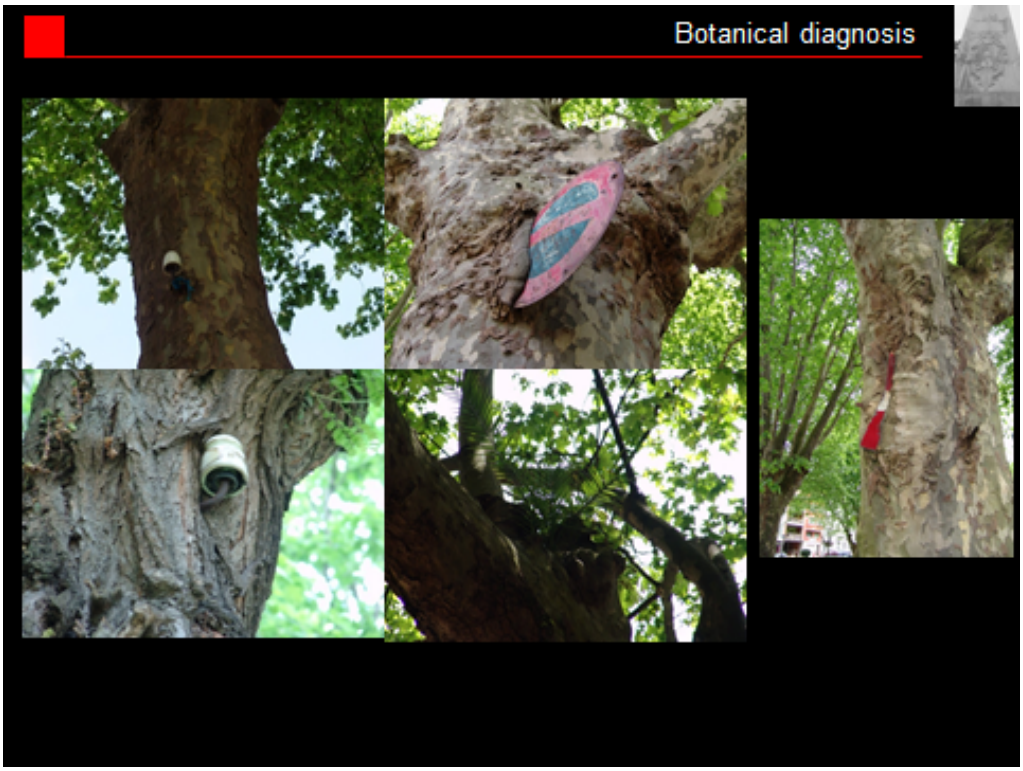

Figure 13. Actual situation of historical tree alignment.

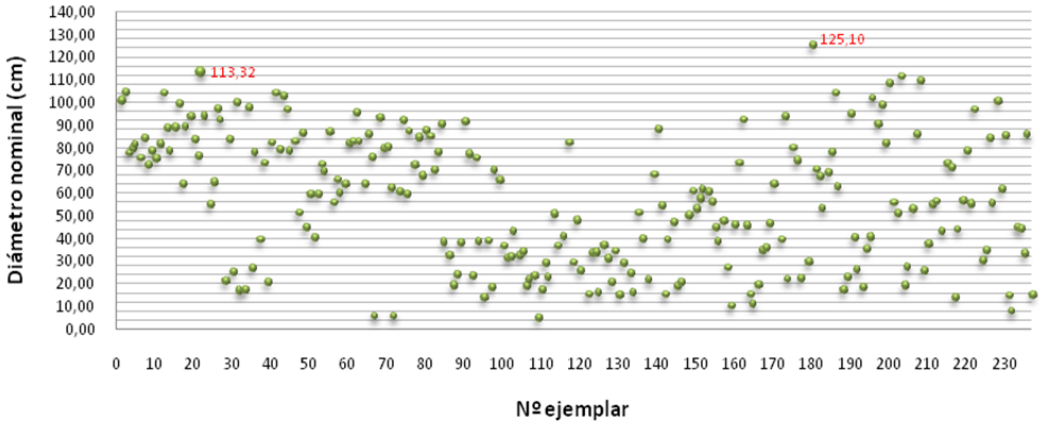

Figure 14. Dendrometric distribution of tree diameters. Los Cantones of Ferrol (Spain).

We can divide the Park in several sectors:

1 Alameda de Suanzes

The design of this area of the gardens comes from the first tracings carried out throughout XVIIIth century, with a very characteristic linear structure, from the plantations of six or seven ranks of trees, generally poplars (hence the name alameda). Nowadays only two of these ranks survive, although the trees are already not original poplars, but *Platanus x hispanica* of big importance.

2 Cantón de Molins

When new buildings were incorporated in the field of triangular form that complete the existing space between the quarter of La Magdalena and adjacent streets, the avenue of Suanzes of the Alameda was modified, giving rise to a new walk that takes the name of Canton de Molins. By the passing of time, it become a very crowded place, which acquires the condition of the ancient "lounges" of the typology of *Paseo del Prado* in Madrid or in the Havana.

3 Cantón Bajo

The form of the low part of the gardens comes from a transformation of its tracing suffered in the XIXth century that turned this part of the ancient avenue into a romantic garden or, if it is preferred Frenchified. Flowerbeds and clumps and plantations of new species from different places of the world were incorporated. A different design from the one originally planed was developed in this area. It allows to organize the space articulating different sectors delimited by areas of lawn, shrubs and flowers that divided the place and made it more attractive. Over time, this was the most crowded area because it was paved and had monuments and other elements of street furniture of more common use.

4 Plaza de las Angustias

This area of the garden is organized by means of flowerbeds of radial tracing around the circular square that has the sculpture of Sánchez Barcaiztegui. The splendid existing urban trees deserve a treatment of the parterre, in order to the superficial roots are buried. For this reason its tracing has been simplified and increased its size, so that it allows its working and the incorporation of grounds and new plantations of lawn, now eliminated. Likewise, the new tracing, which is inspired in the current one, will improve likewise the pedestrian trips and the spatial legibility in its entirety.

Description of the adopted solution

Design and landscaping

In general terms, a wider overall design is showed, that covers a larger area, and that is necessary to give the garden a sense of homogeneity and of unit to the whole space. The pedestrian area in front of the buildings parallel to Los Cantons and the roads of Las Angustias are incorporated to offer a global design of the space that might be tackled in different phases.

The proposal includes the recovery of the Walk of Las Chaliñas, obtaining a big surface for pedestrian from the theater Jofre up to the Church, gaining a space for the pedestrian, both of communication and of place of recreation. Thus a big public space, a big garden with new pedestrian areas in which the existing thing is promoted, the history and the botanical wealth are generated, with an interesting fusion between the *ancient* and the*new*, but inside the same common frame.

For the design, the general idea of trying to maintain and promote the existing tracing was taken in account reinforcing the longitudinal axes marked by the Avenue of Suanzes and

Canton Bajo. It is an area with an incomparable botanical wealth in the city and with a historical legacy that is precise to promote. The premises are the following:

1) To promote the existing longitudinal axes like fundamental lines of the framework of the design, improving in this way the different visual basins of the garden and respecting its historical values.

2) To rearrange the different parterres improving the geometry of the garden ensemble, promoting the forms towards more geometric models.

3) The geometry and the axes are reinforced by means of the plantation of a hedge perimetral in the most external parts of Canton Bajo which it will transmit a more formal image of the area and will consolidate the views from the center of the axes.

4) To respect to the maximum the existing tree specimens and proposing new protections (*Magnolia acuminata* or *Buxus balearica*).

5) Different transplants and cutting downs of trees in poor condition or out of context are proposed.

6) Proposal of treatments in each of the flowerbeds by means of the progress of the conditions of the soil (edaphology, system of irrigation…) and massifs plantations.

7) Proposal of incorporation of new units of species similar to those that exist in the garden to generate monospecific spots that in punctual moments, as flowering or the fall of the sheets, offer added values.

8) In the ancient walk of Las Delicias there is proposed the laying of a continuous bank of granite that works as small wall of containment and allows to increase the level of the soil improving the quality of the environment for the magnolias and allowing the plantation of tapizantes (*Pachysandra terminalis*) resistant to the shade that improve the esthetics of the area.

9) The paving must have a character of unit and for this reason we propose to limit the laying of the pavings to two types: flamed granite and the stabilized ground of the Avenue.

10) In the same way the use of a series of designs of points of light to avoid having too many types in the park that break this this *sense of unit* is proposed.

11) The green space is extended in the Park of Las Angustias, specifically in the area of the Irmandiños street, where the pedestrian communication will be improved and where we propose a small alignment of deciduous trees that stand out by its flowering, the species are *Prunus serrulata* 'Shiro-fugen', *Prunus amanogawa* or similar.

12) Use of elements of adequate urban furniture and use of the existing ones.

13) The hard materials will have to be in consonance with the design philosophy.

In accordance with established principles, it is projected in a line of integral design and respectful with the existing one, trying to look for a balance between the new needs of the users and the historical tracing.

The landscaped areas will be occupied by species perfectly adapted to the existing climate, forming groups of high ornamental level as for composition and chromatism.

Figure 16. Proposal for Los cantones de Ferrol (Spain).

Summary of the proposal of intervention.

The main lines of design with vegetation are based in promoting and complementing to the existing trees aggrupation. Spots of vegetation that consolidate the existing groups are projected and massif shrubs will be used in certain very specific areas, since the real protagonists of the garden will be the trees.

Avenue of Suanzes. For this area, it is proposed to preserve the current paving, repairing the damages caused by the torrents, to repair and to relocate the existing furniture (banks, wastebaskets, cartels, etc.), and others of minor entity, like the lamppost repairs, intensifying the lighting in someone on its parts.

Canton of Molíns. The intervention consideres or includes the renewal of the paving covering the current pavement in concrete with granite flagstones, the improvement of the parterres on which the magnolios are growing in order to conceal its roots by means of granite banks. At the same time it will be necessary to re-lead the rainwaters to the sewerage network rectifying its tracing.

Canton Bajo. The intervention that is proposed for this part of the gardens consists, on the one hand, of regularizing the parterres, following similar geometric criteria; to improve the paving; to eliminate vegetable species not appropiate to the environment; to relocate sculptures and monuments which site seems inappropiated, positioning the fountain of Fame (*Fuente de La Fama*) in its original place again.

The aspects most representative of the intervention focus on the paving with granite of a linear itinerary, in parallel with the Avenue, indicating a comfortable and structured itinerary of this area, and the introduction of a hedge of box of 1,20 meters in high as a boundary with the Canton Bajo.

Square of Las Angustias. The new tracing, which is inspired in the current one, will improve likewise the pedestrian trips and the spatial legibility of the garden.

3.2.- PLAZA DEL LIBRO.

The *Square of the Book* is a small green space placed in the heart of the city of Corunna. It owes its name to the fact that in this area there were numerous bookstores where most of the population bought books.

Figure 17. Situation Square of the book (La Coruña, Spain).

The square is located in a kind of islet, surrounded by roads and for big buildings, what causes, up to a point, the wind presence for the effect tunnel. The square is paved by blacktop covered for slurry and, in the square, there are only a source water and several benches. Currently, it is only visited by elderly people in the neighborhood because its character is not understood and its aesthetic and facilities are debatable.

Figure 18. Situation before renovation works.

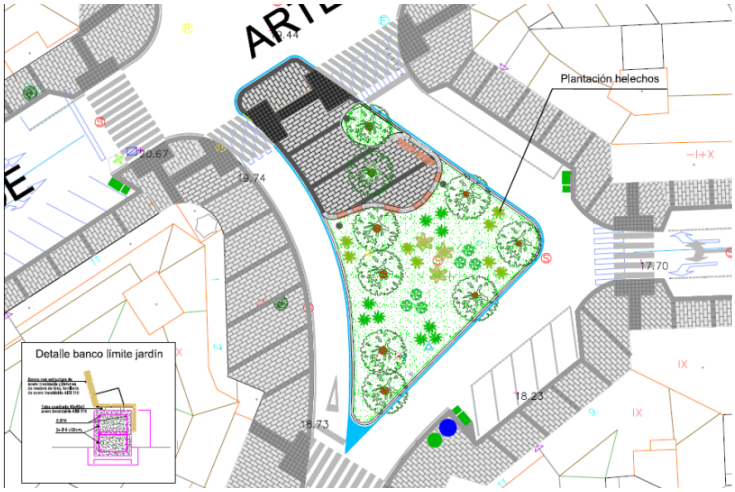

Figure 19. Sketch of one first design.

The space stands out principally for the presence of 6 units of the species Platanus x hispanica of big size (centenaries) which has been allowed a free growth fortunately, they present an interesting anatomical development. The shrubs stratum does not offer a significant value, Fatsia japonica, Eugenia myrtiflora, Camellia japónica, etc.

The ecological characteristics of the area are reduced by the type of surface treatments and the management realized up to the date.

In September, 2013, the city council decided to renew the square and the first idea was the paving of the set, without bearing in mind the existing trees, neither the dynamics of European urban design nor to design spaces for the people …

Nevertheless, they allowed us to bring ideas and we transmitted that the network of green spaces of the city should be joined, should be ecologically coherent and that the design should be developed following the line of the hybridization of the green with the gray in the search of healthier and more green cities and a better welfare. In order to be able to transmit our project, we use different solid arguments, first, the presence of the unique trees of singular value, second, the imperious need not to lose green space in the city, knowing the quantity of benefits that it generates, and, third that the microspaces also are very necessary in the cities (in fact there are studies as Fu & Zhao (2010)) that affirm that sometimes they are more frequently used to rest and to do exercise since, in certain situations, the residents prefer near small areas than far and big zones), especially in very dense cities where the people visit with more frequency the most nearby spaces.



Figure 20. Images of molding the land forms and last fertile layer distribution. Square of the book (La Coruña, Spain).

To all this, we added the ecological and environmental approach, using the Square of the Book as a field of essay of an ecological performance on a small scale, in which the intervention proposal had to pursue a series of targets:

a) Integral improvement of the situation of the big trees.

b) To improve the soil condition (edaphic) and the management of the rainwaters.

c) Incorporation in the design of a distinguishing approach as for the design of small urban spaces (different species, scalar groups, chromatic, functional …).

d) To minimize the grey parts (hardscape).

e) Minimal maintenance.

f) Ecological integral treatment of the possible phytopathologies.

With these targets the square was designed with organic forms, carrying ground movements with a miscellany of silica sand, commercial substrata and vegetable land of high quality, being always respectful with the levels of the base of the trees to avoid physiological problems. Spread of shade species but that were transmitting clarity to do games of colors and luminosity in the spring and summer epochs were selected.

The selected species have been:

Agapanthus Goldstrike
Heuchera Caramel
Heuchera FDark Secret
Heuchera
Loropetalum Plum Georgeous
Azalea sp. de otoño
Rhododendron Vileya
Calas
Zantedeschia ateiopica
Acanthus mollis
Fatsia japonica
Alocasia veitchii
Gardenia jasminoide
Hosta 'Alpina' Albomarginata Blue Moon...
Osmunda regalis
Hydrangea arborescens
Hydrangea aspera 'Hot chocolate'
Montsera deliciosa
Pachysandra japonica
Sarcoccoca Bergenia sp.
Hibiscus rosa sinensis
Datura sp.
Aucuba japonicum
Cymbidium sp.
Farfugium japonicum
Acer palmatum

Figure 23. Images of plantation operations and final result. Square of the book (La Coruña, Spain).

The square was completed by system of irrigation, of sanitation, lighting and paving with banks to guarantee the use of the people who usually visit the area.

Like colophon, this intervention was tried to be understood by the population and for that reason a sign was designed and installed in the square, in which the philosophy of the intervention and the species used were shown, improving the transmission of the ecological values and the botanical knowledge of the population.

Figure 21. Cartel of the intervention in the square to communicate to the population the philosophy of the project and botanical information.

Like a curiosity, in February 2014, the species *Rhododendron vileya* (tropical rhododendron) was attacked by aphides and fags' larvae were used to eliminate them. This fact reinforces the image of the *nature in the city*.

4.- Research and development projects.

On the other hand, and since I develop also a work of investigation hard linked to the design and management of green spaces, I am going to expose four projects developed for the progress of introduction and management of the vegetation in the cities.

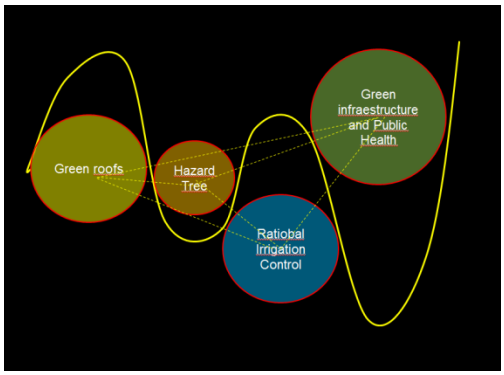

Figure 23. Research and development Lines.

A development project of a system of extensive ecological green roof adapted to a few certain geographical and climatic peculiarities, in which different targets have been achieved like a) characterization of a substratum adapted for these situations taking residues as elements of its composition of different origin: construction, urban solid residues and gravel of pine from the forest sector (of great importance in the Galician community), b) compilation and selection of native genotipes of species of *Sedum sp*. according to its speed of growth, coverage and adaptability to special situations (poor soil, droughts conditions, etc.) .

The second project is an investigation focused on the progress of the knowledge of the biomechanical characteristics of the trees, of key importance in the study of the vegetation when the projects are done in already consolidated areas. It has fundamental importance in the integral management of the trees in the cities to safeguard the citizens. The study of innovation developed in the Coruña developed a detailed analysis of 17000 tree units, including their biomechanics, dendrometric, botanical and physiological characteristics. We analyzed all the trees and studied the biomechanical symptoms and the probability of collapse from different international validated methods.

The third project is relative to the rational management of the water of irrigation, it is in execution phase and consists of developing a wireless telematic system for data transmission for hidrozones and being able to calculate the precise real irrigation dose according to the microclimatic characteristics and the existing vegetation (by means of the calculation of the Ks of the ornamental species more commonly used in the area). The project includes the development and adaptation of a new tube of polyethilene, with antimicrobial sheet and with sensors to detect escapes. The essential approach is for use in facilities of green spaces.

The last project analyzes the inherent relationship between the green spaces and the public health, in this case by means of the promotion of the physical exercise. It is an investigation that I am developing using statistical studies in the population of the city of the Coruña by means of the study of the urban scenery, the identification of the most visited spaces, the reason, the distance from the residences, type of uses, duration of the visit, type of physical exercise and category as methods confirmed internationally such as IPAQ. The target is to verify that the strategies of green infrastructure are a tool of planning that improves the physical exercise of the population, its health, quality of life and to demonstrate that they are an existing form of economic savings, taking into account that the preventive medicine produces major saving since the treatment is before the illness takes place. The partial results are very interesting and I am now in the phase of the statistical analysis, the preliminary results will be presented in the Conference of ECLAS of Oporto of this year.

Figure 24. Different stages of the R&D Project. Substrate characterization, Sedum selection and implantation on University of Santiago de Compostela roofs.

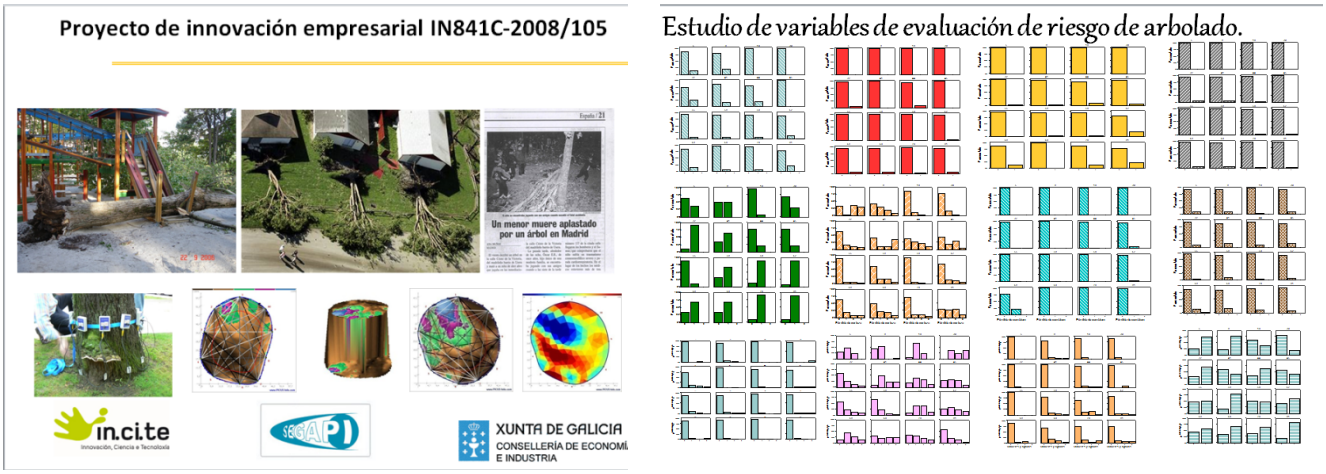

Figure 25. Conceptual image of the R&D project about hazard tree risk and results of statistical analysis of hazard tree symptoms. .

Figure 26. Poster (that it is going to be showed in ECLAS Congress) of preliminary results of the R&D project about the relationship between GI and Public health that is carrying out in La Coruña

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