

## 1. Re-thinking public space

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**Abstract** The objectives of this paper inscribed on the theme “Architecture and Society” focus on first level, in the selection of supports related public space, namely the bike path and murals located in Polygon San Pablo, Seville. On a second level, the gray energy and CO<sub>2</sub> emissions emitted into the atmosphere in the execution of said supports and to finish studying, or alternative hypothesis proposed in search on the development of a sustainable public space.

The methodology used for the study of CO<sub>2</sub> emissions, of analyzing each of the supports depending on their constructive morphology based don different guidelines provided by “Junta de Andalucía” and the coefficients of gray energy of each solution. From these data two hypotheses that consider; the execution of the bike path with constructive morphology with greater amount of gray energy and the second assuming the execution of the bike path in proportion to the proposed solutions are developed parts.

The main conclusion is base on the absence of the discourse between the realization of sustainable support and subsequent occupation by users. Due to high CO<sub>2</sub> emissions in its execution.

In this paper we focus on sustainability as one of the possible tools for understanding thereof, together with artistic performances to add a recognizable value to society so that these areas don't constitute hostile places.

**Keywords** Super designed, Exteriority-Interiority, Ideological function, Life cycle, Value

## 1 Introduction

“...This space is the foundation upon which the possibility of a democratic rationalization policy rests.” (Delgado M. y Malet D. 2007)

When we delve into this question we are discovering that public space don't belong to us. Its own legal acceptance remind us that it's a publicly owned space; in fact the ownership of Public Administration and for this reason, only they can exercise their authority, apart from the concessions and licenses for citizens.

Public space transmits the idea of being “Super designed”, with a great importance from the conceptual point of view, because it is only allowed to be altered according to certain standards established by the State, one must understand that if public space doesn't develop along with society as desired, nor will public space which are associated with it develop.

Hannah Arendt argued:

“If the world has to include a public sphere, we can't be set for a generation and plan only for the living, but public sphere must overcome the life time of mortal men. Without this transcendence into a potential earthly immortality, no politics... no common world and public sphere are possible.” (Arendt H. 1958)

In this sense it's essential to introduce the concept “sustainable” that, in the first place has no relation to public space, due to we aren't educated to appreciate public space with this premise. It is a term focused on building, as Technical Code reminds us with its Basic Document “Energy Saving”, where the “outside” phenomenon is not considered or Architecture, consequently is only considered the “inside” phenomenon of Architecture.

“All phenomena can be experienced in two ways. These two modes are not arbitrary, so they are linked to the phenomenon and are determined by the nature of it or by two of its properties.

Exteriority-Interiority” (Kandiski V. 1926)

One possible reference consists of the UNE ISO 14001 Environmental Management Systems, which advise us of difficulty of ensuring optimum result in terms of the environment, since these results depend on the context in which the norm is inserted.

“This international norm allows an organization to use a common approach and a risk-based for integrating its environmental management system with the requirements of other management systems.” (AENOR 2015)

The purpose and scope of the rule indicates systematically different sections of an organization that contribute to the environmental support of sustainability.

This norm takes into account the so-called “lifecycle”, although doesn’t provide specific environmental performance standards.

Thinking about this “sustainable form”, involves developing a chain in time, whose durability is ensured by the use of suitable materials, according to the spatial property. This chain in time would be related to the life cycle, which can be defined as follows:

“...life cycle: Consecutive and interlinked stages of a product or service system from raw material acquisition or generation from natural resources until the final disposal.” (AENOR 2015)

If we investigate this issue, we find that this is divided into two views: “Circular cycle”, in contrast to the “linear cycle”, according to the following schemes:



Fig. 1 Linear cycle of materials. María del Mar Pérez Cambra (2015)

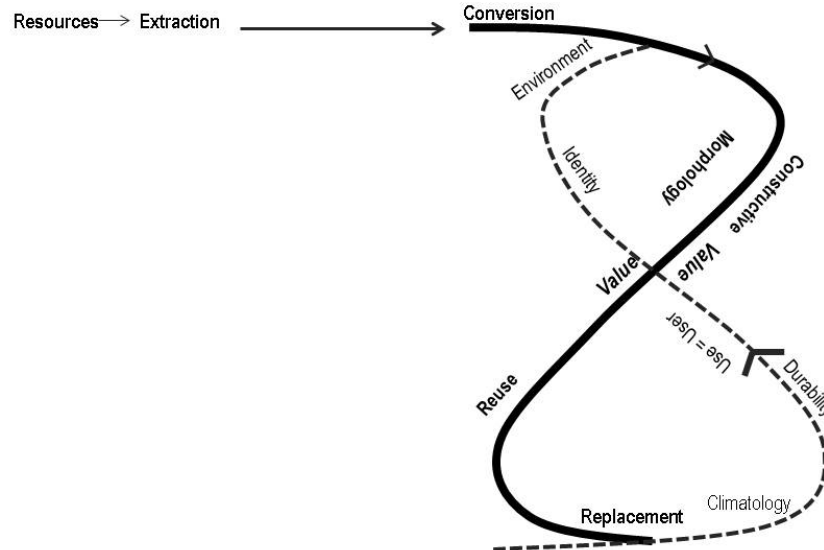


Fig. 2 Cycle Sustainable

All elements must flee from the idea of a linear cycle, due to the fact that this concludes with the obsolescence of the same cycle, while the circular cycle in-

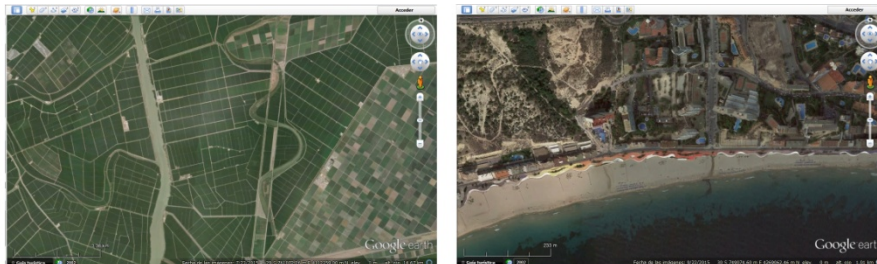
cludes the element as a living organism that develops over time. The combination of both cycles would result in what should be the beginning of the development of materials. In the same way that nature regulates self-sufficient spaces from the different processes that ensure their durability over time.

## 2 Externality public space

“The public space involves nature, we must recover the symbiosis between this and humanity, human experience and viewing ourselves as integrated beings in a larger medium.” (Guibernau M. 2015)

We all want to feel integrated with nature, with its organic and amazing ways that we aren't completely aware of is that: “countryside is changing faster than cities” (Koolhaas R. 2016) and “fun, comfort ...that we are seeking for the urban environment can only be obtained with the organization of rural”, Rem Koolhaas claimed himself.” (Koolhaas R. 2016).

In the same way with the observations of Koolhaas, this comparison is shown elaborating on the idea previously presented:



**Fig. 3** Rural organization vs Seaside promenade. (Koolhaas R. 2016)

A reflection about it is that, we have to distance ourselves and know where we stand when thinking about public space, not with the idea of generating what would be a “natural myth”, but rather delve deeper to come closer to what would be the concept of space “sustainable and public”.

## 3 Interiority public space

Returning to the critical stance of Koolhaas we go onto the issue of formalization of this concept, since “Sustainability raises many questions regarding implementation” (Koolhaas R. 2016, addressing a realistic approach, which doesn't consider sustain-

ability as that which has been or still is for us, a myth. In this sense, it is very important to consider gray energy or that embedded in materials, which is a parameter for estimating CO<sub>2</sub> emissions into the atmosphere, in each of the steps we mentioned earlier in the life cycle of materials from extraction, processing, use, aging, deconstruction and obsolescence.

For this reason, we must be very aware that with each gesture we question the presence of sustainability in architecture. We are asking ourselves to what extent is the construction of a bike path ecological if we don't consider this idea of sustainability that we have been contemplating.

### ***3.1 Seville bike path interiority***

#### **3.1.1 Seville bike path**

We could think about the impact that the execution of the bike path will have in what would be the largest network in Europe, with 486,2 km in the province of Seville (Spain), although nowadays it has 150 km.

To this end, we have considered the construction shape that appears in the draft design recommendations for cycle routes in Andalusia, where we have obtained the type sections for each type of the routes proposed depending on the environmental conditions and secondly, we have considered the coefficients of gray energy materials or that embedded in materials on the official website of Victoria University of Wellington, New Zealand.

“Purview:...when it will be possible to apply, take action to acquire the necessary competence and evaluate the effectiveness of actions taken.” (AENOR 2015)

The third step has been to obtain the gray of each solutions per linear meter to observe in detail the different results energy. In this calculation we considered 2m per 1m long of bike path and the thickness of the different substrates that are associated with each of the solutions. Then we develop a complete proposals construction solution corresponding to SR-2:

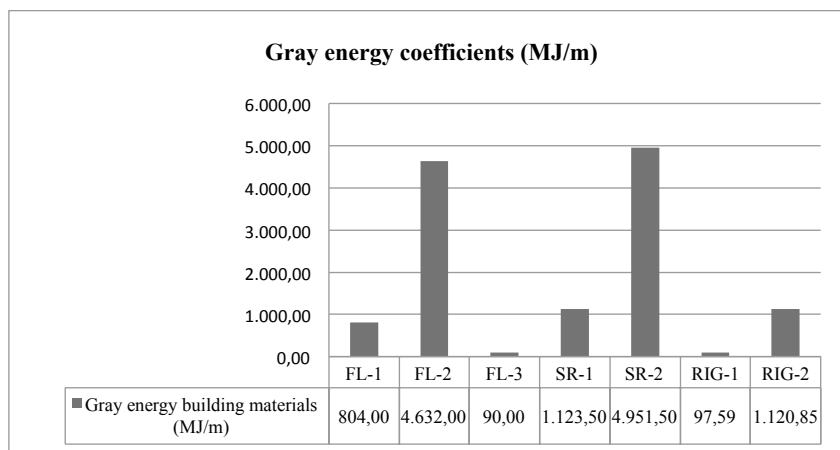
Surface treatment with gravel = 0.05 m → Coef. of embedded energy (MJ/m<sup>3</sup>) = 45.420 MJ/m<sup>3</sup>

$45,420 \text{ MJ/m}^3 \times 0.05\text{m} \times 2\text{m} = 4,542 \text{ MJ/m}$

Cement floor = 0.25 m → Coef. of embedded energy (MJ/m<sup>3</sup>) = 819 MJ/m<sup>3</sup>

$819 \text{ MJ/m}^3 \times 0.25\text{m} \times 2\text{m} = 409.5 \text{ MJ/m}$

The sum of both values equal 4,951.5 MJ/m for the constructive solution as comparative values it has a higher content of gray energy, which are presented in the following graph:



**Fig. 4** Gray coefficient according Seville bike path morphology

The first two initials of each type are associated with the mechanical behaviour of the assembly can be flexible (FL), semirigid (SR) and finally rigid (RG). The materials used as the basis of firm cited the artificial graded aggregate (ZA), cement floor (SC) and concrete (H). Within pavement materials for the surface layer include the last three mentioned above and also bituminous mixtures (MB), surface treatment of irrigation with gravel (TS), pavers of tiles and special flooring for protected areas (BA), among others.

The type FL-1 corresponds with 0.05m of MB and 0.30m of ZA.

The type FL-2 corresponds with 0.05m of TS and 0.30m of ZA.

The type FL-3 corresponds with 0.30m de ZA.

The type SR-1 corresponds with 0.05m de MB y 0.25m de SC

The type SR-2 corresponds with 0.05m de TS y 0.25m de SC

The type RIG-1 corresponds with 0.14m de H y 0.20m de ZA

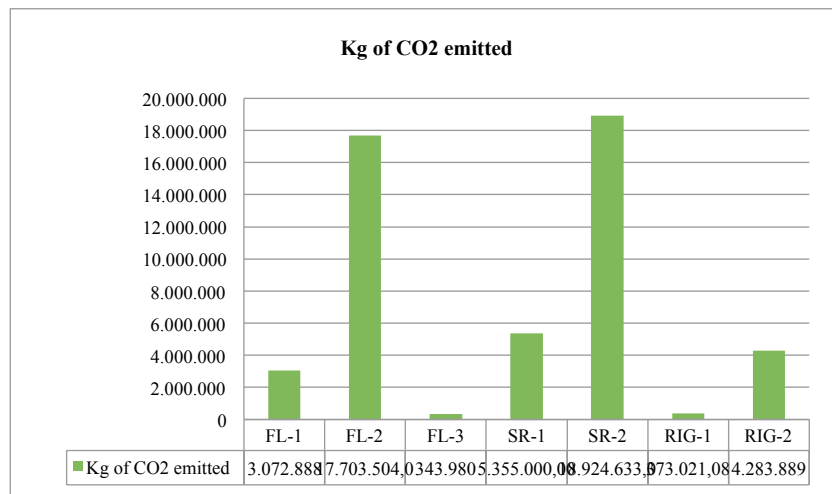
The type RIG-2 corresponds to B-A termination with 0.10m of H y 0.20 of ZA.

The surface treatment of chip seal extension considered a hydrocarbon binder (bitumen or emulsions fluid) followed by a uniform gravel, is the formalization of the bike path with more gray energy content. However, if we look at the comparison of the different pavements with the advantages and disadvantages of each, in the surface treatment of chip seal the only drawback presented is that "intrusion can encourage vegetation and maintenance". (Recomendaciones diseño ciclovía 2013)

If we make a hypothesis considering that the complete extension of bike path in the urban area of the city, which are approximately 150 km, has been executed with the solution containing a greater amount of embedded energy we are talking about more or less 135,175,500 kg of CO<sub>2</sub>, according to the calculation procedure of

the European Commission. This value could be equated with CO<sub>2</sub> emissions emitted by pulp and paper production for a year or 548,163,721 km made by car.

However we are aware that this hypothesis being the least favourable, it doesn't provide a value close to reality, so we assume then than the 150 km, have been executed in proportional shares to each of the constructive solutions proposed. Thus we obtain the following graph:



**Fig. 5** Kg of CO<sub>2</sub> emitted into the atmosphere assuming the construction of bike path in proportion to the “constructive morphology” proposal

The sum of all kg of CO<sub>2</sub> emitted into the atmosphere is about 50,056,914.78 kg of CO<sub>2</sub>, which could equip 202,990,813 km covered by a car, a value much higher than expected.

This compared with 1,178.07 T of CO<sub>2</sub> aren't emitted into the atmosphere in a year for the implementation of the bike path (City of Seville), and lead us to think about when running the bike path begins to generate 0 CO<sub>2</sub> emissions. Assuming that the total emissions of CO<sub>2</sub> in the execution of the bike path will be generated in one year would be about 43 years for the kg of CO<sub>2</sub> emitted into the atmosphere remain covered with the use of support from users.

The overriding difficulty lies in being able to generate a consistent dialogue with the discourse of sustainability where it isn't enough to generate public space where only users are responsible for their sustainable use; It is also necessary the identity of the support on which use is generated such it must be compatible with the values defended and not only its arrangement, but also its own materiality.

A recognizable value to society based on aspects physicists who could join emotional aspects of the user, essential to achieve sustainability of the system.

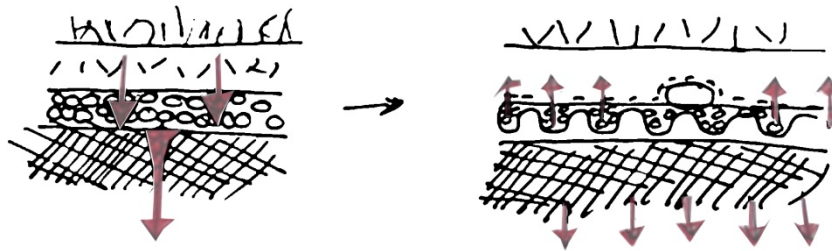


**Fig. 6** Hypothetical bike path formed by a permeable continuous surface of artificial grass consisting of an industrial carpet manufactured with plastic and synthetic materials, specifically polypropylene fibers with high recyclability and water collection system

“Ecodesigning can be understood as a integrated design and development process, which aims to reduce environmental impact and continuously improves the environmental performance of products through their life cycle...” (AENOR 2011)

In proposing a bike path hypothesis based on a permeable pavement it is essential to reflect on the water cycle system within the same, so that this isn't reduced to simple evacuation; but also its capacity to retain rainwater should be contemplated so that it can regulate naturally.

It is time to consider as architects the double phenomenon of architecture mentioned at the start of the essay, where it is essential to consider both aspects of “*interiority-exteriority*” of architecture.



**Fig. 7** framework resolution permeable pavement



## 3.2 Interiority painting murals

### 3.1.1 Polygon murals in San Pablo, Seville

All aspects that have emerged lead to considering how to develop performance in public space which will be sustainable, and therefore are durable during time. Another essential factor is to have the participation of citizens for the proper use of them.

The murals located in the industrial area of San Pablo Seville made in 2010 would be an example. Establishing a strong relationship between communities of each zone and the artist who performs the works, adding the value of the durability and the sustainability of the action. A sustainable project, that isn't very profitable in political or urban framework, but with the value of being artistically unique.

This fact ensures to a greater or lesser extent its sustainability in the social surrounding environment, contributing to the creation of "value".

*"The value of the products is determined by its functionality, which can be physical, economic, emotional and intangible. Ecodesign can have a positive impact on functionality, because:*

- a) Energy consumption and use of materials are linked to physical functionality...
- b) Reduction of materials and energy, lower packaging and transport... are related to economic functionality, for example, lower transportation costs, lower energy cost to the user;
- c) *The aesthetics and durability of materials may be elements of emotional functionality."* (AENOR 2011)

This "value" to which we refer can be linked emotionally with the user, not the physical function the same as in the case of permeable pavements, but rather to create an urban space identity.

This proposal, like the above, could raise doubts regarding the sustainability of execution, due to when we recover the mentioned gray energy coefficients, performances by water-based paint would reach the 115.000



MJ/m<sup>3</sup> gray energy. When we estimated using the same procedures with prior calculations to estimate the value of CO<sub>2</sub> emitted by the proposal and considering a mural six meters wide and 12 meters high, we get a total of 1,569.60 kg of CO<sub>2</sub>.

**Fig.8** Murals on Avenue Kansas City. Sevilla (Google 2016)

One of the possible answers to these questions regarding the implementation of this public space, could be to ensure the use of products composed of natural components, known as organic or natural paints. The composition of these paintings are made mainly from vegetable oils, such as flax, natural resins, casein or citrus or silicates when the environment is outdoor, according to sources of information.

## 4 Conclusions

As a result of the above we can deduce certain fundamental aspects in understanding what is involved in sustainable public space for society.

The main conclusion drawn from these estimated values leads to the unsustainability of the system, which is unable to generate coherent sustainable public space to show these values for its execution. It is necessary to add a physical value to the proposal.

Opposite the physical value, emotional value found in this article we linked to artistic performances, which also must be evaluated by the physical component, as we understand that one cannot be understood without the other. For this reason the study related to two aspects of the architecture mentioned at the beginning “externality-interiority” arises. On the threshold between the two it is where the sustainability of each of the solutions is located, where art plays a very important role in the collective consciousness that enjoy these places.

All this helps society adds to its own ideology the importance of sustainability in the public space and therefore be put in place in the collective consciousness.

We must re-think the solutions linked to the “sustainable” over time involving all participants during their “life cycle”, so that the actions carried out in the same are sustainable in terms of durability, supported by the citizens and therefore let’s talk about busy places.

*“Or you can open the door: to leave the isolation, delve into the “being-outside”, you take part and its pulsations are experienced with full meaning. In its permanent change, tones and noises speed surround the man, rise and fall precipitously suddenly paralyzed. The movements also engage in a game of streaks and vertical and horizontal lines, by the movement itself, tend toward different directions – chromatic stains that bind and separate into serious, yet sharp tones.” (Kandiski V. 1926)*

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