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Sustainability and cities: a proposal for implementation of a sustainable town

L. B. de M. Guimarães [a*]
[a] *Graduate Program in Industrial Engineering, Federal University of Rio Grande do Sul, Av. Osvaldo Aranha 99 5º andar, Porto Alegre, RS, 90035-190, Brazil, E-mail: liabmg@gmail.com*

Abstract. This article presents a literature review on the concept of sustainability applied to cities and a proposal for transforming a town in the south of Brazil into a sustainable town. Improvements in energy, sanitation, waste and water conditions, as well as food, clothing, education and jobs generation were considered to enhance the citizen's quality of life and environmental protection.

Keywords: sustainability, cities, towns, environmental protection, socioeconomic growth

1. Introduction

Sustainability is a major topic in many areas nowadays. When first applied on the development of products (Design for environment or DfE, Ecodesign [9], Design for Sustainability or D4S [43]), the concept spread to production processes (Cleaner Technologies [25], Pollution Prevention [17]), products and processes (Ecoeficiency [49], Clean Production [22], Cradle to cradle design [32, 33], Green Engineering [21, 31], Green Chemistry [20]), business (Triple Bottom Line [16], Zero Emissions Research Initiative or ZERI [33], Green Supply Chain [46], Green Purchasing [27]) and even cities. Considering that more than 50% of the world's population now lives in urban areas (in Brazil the rate is 87%) [10], architects and designers are discussing what is and how to build or transform a whole city into a more sustainable environment.

Jan Gehl [20] talks about the "Brasilia syndrome", referring to the modernistic concept adopted by architect Lucio Costa for the planning of Brazil's capital in 1956, and built in 1960. "Planning focused exclusively on the top scale: city and development planning" (p.196) while the small scale at eye level (i.e. the spaces for people) was neglected. Brasilia has the shape of an eagle, the head consisting of the government buildings with the residential areas in the wings. An interesting sight from the sky, although people live on the ground. Unfortunately, the syndrome is at work in new housing developments in many parts of the world in Europe, such as in Oerestad, Copenhagen, cities in China and other fast-growing regions in Asia [20]. Other most emphasized negative example of a non-people and non eco-friendly city is Los Angeles, in the USA, because of its non-compact attribute, the need of a car for moving to anywhere. The negative examples of cities in developing countries are Dubai ("a conglomerate of green buildings but a brown city according to Jan Gehl [39]) and the new cities being built in China following wrong models of the developed world: American transportation system and the modern (1930s) buildings of Europe which are being torn apart because they are not human (Jan Gehl [39]). On the other hand, some cities are going in the direction of more sustainable or ecological cities sometimes referred to as "eco-city", a term first coined by architect Richard Register [36].

* Corresponding author. Email: liabmg@gmail.com
tel: +55 (51) 3308-3948 fax: +55 (51) 3308-4007

2. What is being proposed for turning cities sustainable?

Authors like Beatley [2], Beatley and Newman [4] and Lehmann [30] comment on the need for development of creative strategies by which cities can fundamentally reduce their ecological footprints, while at the same time becoming more livable and equitable places. Ecological footprint is defined as "the land (and water) area that would be required to support a defined human population and material standard indefinitely" [48] what is achieved by green urbanism when a city [2]: 1) strives to live within its ecological limits; 2) is designed to function in ways analogous to nature; 3) strives to achieve a circular rather than a linear metabolism; 4) strives toward local and regional self-sufficiency; 5) facilitates more sustainable lifestyles; and 6) emphasizes a high quality of neighborhood and community life.

Downton [15] emphasizes the need to address urgent concerns for sustainability and the health of humans and the biosphere, therefore the purpose of the city must be to generate health and enhance sustainability. The principles for achieving that goal were set out in 1993 in the 12 Ecopolis Development Principles ([37] p. 183): 1) restore degraded land; 2) fit the bioregion; 3) balance development; 4) halt urban sprawl; 5) optimize energy performance; 6) heal the biosphere; 7) contribute to the economy; 8) provide health and security; 9) encourage community; 10) promote social equity; 11) respect history; 12) enrich the cultural landscape. Principles 1 to 6 directly address the biophysical environment, i.e., are related to the Minimization of the Ecological Footprints (Biophysical) and the others address the socio-cultural environment, i.e., the Maximization of Human Potential (Human Ecology) [15].

The most commented cities in developed countries that are getting sustainable are Copenhagen and New York, mainly because their bicycling system, people moving freely because they are compact cities, therefore the jobs, shopping and entertainment options being within easy reach of the citizens. Other examples of eco-cities are Waitakere (New Zealand), Portland (Oregon), and Vancouver (Canada) [37]. Portland has substituted a major motorway along the Willamette River for a public park. Waitakere has a plan for planting one tree for each newborn baby. Vancouver "adopted a strategy to secure low income housing, to foster housing for families with small children, and to ensure specialty housing for singles, mingles, seniors, extended families, alternative households, and any other household formation that presents itself, including a growing houseboat community" ([37] p, 130).

The plans for the city are living closer to work, cutting commuting time, de-emphasizing the car by building an advanced transit system and networks for bikeways, pedestrian paths, ferry connections and greenways by replicating the rich street life of older traditional cities [37]. Melbourne, in Australia, called by Jan Gehl the "Melbourne Miracle" has the reputation as a city that has sought to transform its downtown into a vibrant pedestrian district by creating new public spaces, re-paving the pedestrian spaces throughout downtown with blue-stone, installing new street furniture, encouraging flower shops and other smaller kiosk businesses, and new outdoor restaurants and café as well as funding public art programs.

In Developing countries, the "good" examples are Bogota, in Colombia, for its public transportation system, and Porto Alegre, in Brazil, for its participative approach concerning the decisions about the improvements to be made in the city. Curitiba, also in Brazil, for its "green" and social appeal, is the most emphasized by the experts [39]. In the 1970's, Curitiba's mayor architect Jaime Lerner planned for future expansion based on 202 km bicycle and foot path and a 483 km long of five high density speedy lines corridors for frequent public buses. Bus stops are tube stations were people are protected from the weather and pay the fare so there is no need for the driver to manage money or have another person in the bus just for doing this (as it is common in all bus lines in Brazilian cities). Curitiba's fuel consumption has been reduced by 20% comparing to other cities of the same size [20]. The money saved in building the system instead of a subway (300 times more expensive) was invested in purchasing land to restore rivers expand parks and open pedestrian streets, launching of social programs (city programs for finding jobs for street children, selective garbage collection and recycling, citizens centers where people can get all documents easily, a 24 hour clinic for the poor) and building neighborhood libraries (the "Lighthouses of Learning"). The "Green Exchange" program allowed the citizens to separate recyclable materials and garbage and take them to pick up points to exchange for food provided by the city. The garbage is sent to the dump while the recyclables are sold to pay for the system.

Sustainable Cities [40] shows some cases of sustainable cities, according to eleven parameters: 1) master plan, 2) buildings, 3) economy, 4) social issues, 5) education, 6) health, 7) energy, 8) food, 9)

transportation, 10) waste and 11) quantity of "green". Based on the statements available at [39], experts understand that a sustainable city is one that deals properly with the natural geography: the mountains, the water and the landscape (Joan Busquets [39]); is organically and dynamically in symbiosis with nature (Thomas Ermacora [39]) and has a mixture of users (Hilmar von Lojewski [39]); is compact, i.e., has density and proximity (Hilmar von Lojewski [39],Thomas Ermacora [39]) so people do not have to move so much (Jan Gehl [39]) and do not depend on cars (John Whitelegg [39]). The car free community is one that is more human because it has a lot less noise and less pollution and because parking lots give space to parks (John Whitelegg [39]). The more parks and gardens, more green the city is, what is important because human beings have an innate need to connect with the natural world (the biophilia hypothesis [3]). Another pre-requisite is beauty (Richard Burdett [39], Thomas Sieverts [39]) because if a city is not beautiful, people do not take care for it, do not assume responsibility for it and forget about it (Thomas Sieverts [39]). Also, a democratic, participative plan for future sustainable cities is mandatory for most experts (John Whitelegg [39], Hilmar von Lojewski [39]). People should express "their view about what kind of city they want to live in, and what they want it to look like, and how they think it should develop over the next 10, 20, 30 years" (John Whitelegg [39]). To achieve sustainability, the cities have to offer some sort of development for people survival (Pan Haixio [39]) therefore economical vitality is as important as low environmental impact. The cities have to get richer because sustainability demands investments. Often, the change pays itself in certain time, but there is an initial investment. The sustainable city of the future is one that has economical success (Leo Abruzzese [39]).

In summary, based on the experts´ opinions and the examples in the literature, a sustainable city is one that is designed to (or is willing to) reduce its ecological footprint (by minimizing its required inputs of energy, water, food and its output of heat, waste, air and water pollution) while improving the citizens' quality of life (health, housing, transportation and space) (Richard Burdett [39]). These ecological cities are achieved through various means, such as:

- Different agricultural systems, such as agricultural plots within the city (suburbs or centre). This reduces the distance food has to travel from countryside to the city. Cities gardens are one step to reduce the dependence of the city on getting food from the countryside, since the city will be feeding itself;
- Renewable energy sources, such as wind turbines, solar panels, and biogas in order for the city to power itself therefore reducing the dependence on more costly energy resources. Also, it is possible to reduce the need for air conditioning, by planting trees, using natural ventilation systems and green roofs, i.e., increasing the number of zero-energy building;
- Reduction of outputs, by generating the lowest quantity of waste and pollution as possible, by reducing the use of products, reusing them at a maximum, composting organic materials, recycling used material or converting them into energy;
- Improved zero-emission public transportation and increased of pedestrianization, by making driving difficult to reduce car emissions. This requires a change in city planning, with integrated business, industrial, and residential zones;
- Optimal building density, to decrease urban sprawl by seeking new ways of allowing people to live closer to the work, shops, leisure and parks.

It is evident that eco-cities focus primarily on the ecological footprint of developed countries although, in theory, the socioeconomic aspect of sustainability is involved [16, 38, Pan Haixio [39]. The reason for this might be the fact that the socioeconomic issues are no longer a problem in most developed countries. Other reason might be that are more people (urbanists and architects per capita) dealing with sustainable cities in the northern hemisphere than in the southern due to lack of expertise (to plan, administrate and govern) in the latter (Hilmar von Lojewski [39]). For developing countries, "the most promising initiative is a city without slums" [Hilmar von Lojewski [39]) as supported by Cities Alliance [12]. "However, in many developing economies there is still a very centralized govern that interferes in local decisions" (Hilmar von Lojewski [39]). Curitiba is the exception of a city in a developing country with plans and actions focusing on its citizens' quality of life.

Although Brazil is currently classified as the 7th Gross National Product (GNP) in the world [11,28,50], and its high Human Development Index (HDI) (0,699) is above the mean world HDI (0,624), ranking 73 among 169 countries [41], it still has social problems that places the country far from the developed world. Brazilian HDI is lower than the Latin American one (0,704) and its disaggregated HDI (i.e., the HDI adjusted to inequality) is only 0,509 [42], ranking 88 among 139 countries. The HDI adjusted to inequality is calculated considering the investments and obtained results in education, health, food distribution and income per capita,

where Brazil is not well evaluated. The inequality-adjusted income index (0.401), despite the Programs of income transference such as the Family Allowance [8], impacted negatively in 37.6%, inequality-adjusted education index (0.470) impacted negatively in 25.7% and life expectancy in 16.6% of the HDI adjusted index [18]. In summary, despite its economical growth, Brazil still has to improve its social condi-tions. In environmental terms, Brazil is among the 17 megadiversity countries in the world [13], holding the biggest tropical wilderness and the largest supply of fresh water on Earth (the Amazon) and 2 of the 34 world's biodiversity hotspots (the Atlantic forest and the savanna Cerrado). With a very rigid Environmen-tal Law [7], Brazil could be a conservation leader [13] but deforestation, for example, keeps on increasing [14, 23]. The reasons for not improving both environmentally and socially are lack of strength from the Govern to oblige the laws to be respected and willingness to reduce the social gap. As envisioned by Sachs [38], the broad concept of sustainability has five dimensions (social, ecological, spatial, cultural and economic) and both the social and economic ones are especially important for an emergent country like Brazil. Therefore, the adoption of sustainability in its broader sense is a means for improving both the socio-economic and environmental problems the country is still struggling with. The next sections present a proposal for transforming a town in the south of Brazil into a more sustainable town.

3. Method

Building on the criteria from the literature, the major points to be considered to get towns more sustainable in emergent countries, as is the case of Brazil, are:

1) Minimize the Ecological Footprints by emphasizing items: (7) energy, (8) food, (9) transportation, (10) waste and (11) quantity of "green" from [40] as well as improving sanitation that lacks in most Brazilian towns;

2) Maximize Human Potential by emphasizing items (3) economy, (5) education and (6) health from [40]. Item (4) social issues, such as "encourage community" are addressed by citizens' participation in the town's improvements decisions that is embedded in the participatory method for generating opportunities for improvements in the town; "promoting social justice and equity" is being addressed by increasing jobs opportunities, income and promoting public transportation and leisure. Items (1) master plan and (2) buildings and/or housing from [40] would be considered in a secondary level, since the urgency in most cities/towns in emergent countries are the elimination of poverty and socioeconomic unbalance and their prejudicial consequences, and both items demand more political and financial support, far beyond the reach of a team of ergonomists.

The first stage of the Sociotechnical Design (SD) method [24] was used to develop alternatives for transforming a town into a more sustainable one. SD is a method for eliciting/developing design opportunities to fulfill the needs and wants of the society, focusing mainly on the basic needs of the population at the base of the socioeconomic pyramid (BOP) which in Brazil is composed by about 41 million people (21.2% of the population) [34]. SD considers the use of local and abundant resources, mainly the ones considered waste, without creating new waste, that is, the use of material discarded from other production processes without the generation of new waste as proposed in the ZERI model [33]. Reuse, in cradle-to-cradle design [32,33], ensures the minimization (or elimination) of waste, which is regenerated either in the biological metabolism (i.e. is converted into biomass) or in the technical one (i.e., goes back to the manufacturing system). Therefore, four users are focused in the life cycle of the product and/or system, of the process and of the logistic support: the environment, and the three human users (the primary users who are the ones who work in the process of transforming resources into products/services; the intermediate ones, who work in the logistics and maintenance of products/services; and end users who are the ones who use the products/systems).

The method encompasses three stages: 1) the construction of the matrix of design opportunities, in which the columns are fixed, since they show the basic needs of a population, and in the rows, the raw material available in the region, especially waste, is displayed. The alternative solutions for the needs are placed in the cells. The second stage identifies the demands (needs and wants) of the three human users in relation to the alternative solutions proposed, as well as the "user" environment, based on experts' opinions. The third step is the construction of the last matrix, called the SQC matrix (Sustainability, Quality and Cost), which evaluates the alternatives by the impact of their necessary resources and safety/health outcomes. The end result for each evaluated alternative is the geometric mean of the rates of each subgroup. The SQC matrix allows the best al-

ternative solutions (i.e., the ones with higher rates) to be assessed and detailed. The best alternatives are considered to be those that optimize the concept of "cradle to cradle" and perform better (in the social, environmental and economic aspects) in the cycles of production, use and logistics of the product/service, for the four users of the model.

4. Results

The first stage of SD method was applied to develop alternatives for transforming Brazilian towns into sustainable ones. In general, towns offer few jobs and leisure opportunities, so the younger population moves to nearby larger cities. Therefore, the proposal is to generate jobs and leisure areas, improve sanitation and transportation infrastructure to keep the residents in the town and attract tourism.

The example was taken from Palmares do Sul, a town 73,56 km far from Porto Alegre, the capital of the state of Rio Grande do Sul, Brazil, with a total population of 10.854 and a HDI of 0.787 [26]. Economically, the town depends mainly on the rice plantation and processing, in a secondary level depends on the sheep breeding and in a minor proportion, on the fishing. During the period of summer (January and February) the town survives with the intense tourism to the nearby beaches, which multiplies the population by seven.

In the 1980s, the town served as an applied experimental site for cheap electricity delivery (by the amplification of the existing power lines) for the poorer farmers. According to Fabio Luiz de Oliveira Rosa, who implemented the project despite the negative reaction by federal, state and private interests [1], electricity was considered number one priority for the citizens, ahead of schools and better work conditions because electricity meant better living conditions. Within two years, some acquired water pumps, some irrigated their crops what lead to 400% increase in productivity, 70% of the beneficiaries acquire electric heated showers, 83% acquire refrigerators and 80% TV sets. Due to electrification, farmers could increase their income, by selling less expensive food, even perishable food (such as milk) since they have the fridge. As the farmers improve their economic and living conditions, they become larger consumers what was good to boost industry and commerce besides refraining rural exodus. Although the project was successful, Rosa still struggles with difficulty of getting financing to implement the project in other Brazilian towns.

The following are some viable (i.e., demanding less political and economical support) alternatives generated for Palmares do Sul, using the matrix of design opportunities of the SD method.

1) Minimize the Ecological Footprints by emphasizing the following items:

- Energy /water: energy for the city was not considered in the project because in July 2011 the National Bank for Economic and Social Development (BNDES) approved the financing of eight eolic parks in Palmares do Sul to complement the park already installed in the nearby city of Osório, to generate 150 megawatts of energy [19]. The plans for better use of water and energy is to accommodate the plants that will be installed in the city in a small area in a way that they share re-sources and the energy generated from one plant (the glass plant that uses cooking oil and/or rice husk) is used by another one (i.e., to heat the ovens of the food factory). Used cooking oil will be used as fuel for the buses to be introduced in the town.
- Food: Palmares do Sul deals with tons/year of residuals from the rice agro-industry: 95,757 tons of straw, 10,647 tons of husk, 77,765 tons of broken rice [29]. These materials are being used to develop and manufacture products to mainly better feed (with bread, cakes and cereal bars made with rice, molasses and perm culture products) the students enrolled in the public school.
- Clothing: Palmares do Sul raises Texel sheep cattle only for meat processing. This generates a waste of about 2,000 m of Texel leather and 19 tons of wool from Texel sheep per year, since they are not considered good for manufacturing and therefore are buried. Tests were made with both leather and wool that proved to be fairly useful in shoes and clothing (woolen pants and shirts) for the students. Therefore they will be used in the factories clothing.
- Waste: waste collection attends 82% of the Palmares do Sul population but all waste is sent to the landfills. 10.5% of the waste is burned [35]. A selective waste collection system was already prototyped in the town: the citizens were instructed about how to clean and separate their domestic waste in different returnable colored bags. Plastic, aluminum, iron and paper will be sold for financing the system. Glass will be used in a glass factory and used oil will be used as fuel for a public bus and/or in the oven of the glass factory. Leftovers of coffee and mate (a typical beverage similar to tea) will be used to dye the clothing in the clothing factory. Organic waste (from the

kitchen) will be used as nutrient for the perm culture. Sanitary waste will be kept in regular plastic bags (from the supermarkets) and send to the landfills. In the future, plans are that these bags are replaced by paper ones in order to favor degradability in the landfills. The residual ash from the glass factory might be added to the clay of the coal mining industry of Rio Grande do Sul to become the ceramic material for ecological toilets.

• Sanitation: In Palmares do Sul, only 1.68% of the 3,318 houses have has a regular sanitary system (general sewage or pluvial net), 80.7% has septic tanks, 10.9% has rudimentary tanks; 1.74% dumps the residuals in the river and 6.4% give other destiny [35]. The houses nearby the river that do not have a sanitation system dump the waste in the river. Because the river is polluted, fishing, one of the most important sources of employment in the town, is getting more difficult. Therefore, a simple sanitary system was proposed to stop pollution, using dry toilets with boxes to compound the waste. The recuperation of the polluted river will be done using aquatic plants (Eichhornia crassipes or aguapes). This plant grows very fast in much polluted water with high level of organic material. Therefore, it will be first used for cleaning the water and when the plant finishes its cycle as water cleaner, it will be collected to extract protein (to feed the animals, mainly the horses) and cellulose. The development of this sort of practice is especially interesting because the growing phase of clorofiled plants represents a form of carbon fixation, what is important to reduce global warming. The Eichhornia is one of the plants with higher growth by the absorption of phosphorus and nitrogen from sewers. Its growth rate is a biological indicator of degree of pollution. It is at the same time an instrument for pollution measurement and water purification. The use of aguapes also promotes the recuperation of the aquatic fauna. The uncontrolled development of this plant is generally understood as a problem, but the solution is in how the plants are handled. It is important to note that the aguape handling will represent additional income through its by-products what opens many opportunities for economic gains.

• Quantity of "green": after composting, the dry toilets' waste will be used as nutrient for trees to be planted in the town and maintenance of the parks. Palmares do Sul has parks/plazas that are not fully used and need maintenance. Besides reinvigorating the green areas of the parks, a schedule of attractions there (such as music, movies, theater etc) would promote leisure.

• Transportation: the town does not have any public transportation system, therefore some open buses (to facilitate hop in and hop off) are being planned to run in the city for free, since the citizens will be furnishing the used oil that will be the fuel. A bike system, such as the Vélib' [47] in France is also un-der consideration to be used free of charges. The citizens will have the right to use it since they are helping the town to save about U$500 a month in waste transporting and disposal.

2) Maximize Human Potential

• Economy: it is expected that 400 employments will be generated in the clothing/shoes, food and glass factories to be installed in the town. Besides, the waste collection system, the transportation and maintenance of perm culture, parks and sanitation system will also generate jobs. Another source of economic improvement is tourism. Boat tours by the river Palmares to the Casamento Lagoon already existed and can be reinitiated, thus generating employment for boatmen, guides, biologists etc. The tours can be made in the boats still being manufactured in Palmares do Sul. Natural fishing is another source of income and the handling of the river's aguapes may be another attraction as the tourists might follow the treatment process. Jobs will be created not only for biologists, but for the crew (mainly composed by the fishermen during the non-fishing season from the begging of November to the end of January) that will be responsible for the plant handling. It is a key part of the Project since the handling will employ non-specialized workers at one end of the system (plant handling) as well as specialized ones for more technical tasks at the end o the system (separation of protein and cellulose).

• Education: despite the fact that job generation ("upsizing") is mentioned in the ZERI methodology [33], there is no mention to the quality of the jobs. The most important contribution of the proposal to education is the sociotechnical model of job design in the factories and services being proposed. In this model, applied in the Swedish Volvo factories of Kalmar and Udevalla, from 1970 to 1990 [5], work was done by semi-autonomous teams responsible for a large part of the car's assembly. Workers were multifunctional and had autonomy to do the work in a pace that best suited them to achieve pre-defined goals. The same approach will be used in the factories that will operate in two shifts (morning and evening) in order to allow for more jobs in the same plant. Following universal design principles [44,45], a "barrier free" model [6] both in the physical and cognitive senses was developed for the plants' layout

and work design to accommodate people with different capabilities, including the ones with disabilities and no formal education (11.53% of the town's population is illiterate [26]). Therefore, the factories were named "Inclusion Factories". Workers will be educated and trained to perform tasks according to their capabilities, working in multifunctional teams that will be responsible for as many tasks they can deal with, i.e., with no under and/or overload.

Another contribution to the educational/social aspect of sustainability is a plan for citizen's awareness of their responsibility towards the environment, economics and health. So far, 30 citizens attended a two weeks course on environmental and sanitation issues. They are supposed to transfer the acquired knowledge to others, so, in the long run, the whole town can be engaged in the process. Some of these citizens are teachers who assumed the task to transfer the acquired knowledge to their students.

• Health: heath issues were addressed by better food from perm culture, better fishing from the elimination of the river's pollution and better sanitation as well as healthier jobs at the factories.

This proposal for a more sustainable town was discussed with the mayor and the 30 citizens that participated in the Environment/Sanitation course. They agreed with the idea and an Association was created to manage the project. The selective waste collection system was scheduled to start immediately since the only investment needed is a space to keep the recyclables until the buyer comes to get them. The segregated materials will be kept in big bags reused from the rice industry (the big bags are the urea packs that are discharged after use in the plantation). If only 250 households of the 3,318 in the town participate in the program, the system will pay itself in 47 days, after then the citizens will start to be refunded for the delivered material. The glass, food and clothing/shoes plants need investment and this is showing to be the major obstacle to implement the whole project. As happened with the electricity project in Palmares do Sul, financing is the main problem in expanding the project since Brazil's government cut most of the lines of credit for national development [1].

5. Conclusion

This article presented a literature review on sustainable cities and a proposal to turn a town in Brazil into a more sustainable one. Most of the literature on sustainable cities is from developed countries that have no serious socioeconomic problems, therefore, the highlighted issues are energy, transportation, a free car community with more amount of green. In developing countries, socioeconomic issues such as sanitation, public transportation and job opportunities are among the prior issues to be addressed. Using the first stage of the Sociotechnical Design method, a proposal was developed to attend the basic needs of the population of Palmares do Sul, RS, using residual resources as raw materials for energy, water purification, sanitation, food, clothing, transportation and parks maintenance. Food, clothing/shoes and glass will be manufactured in sustainable factories, i.e. built based both on "green" parameters, in a way that energy and water supplies are shared, as well as on universal design principles, so people with disabilities can be hired without creating "special jobs" (that often excludes the workers), the work being designed in accordance to workers capabilities and in a way to give all workers a healthy and encouraging task. Although generating jobs and, consequently, more income, this proposal amplifies the idea of upsizing as it includes the quality of the jobs to be generated and the education of people with fewer skills in order for them to be part of the Brazilian official work system.

Universal design principles are not often mentioned in the literature on sustainable cities, but in a medium/long term perspective they should be implemented in the whole town (and not only in the factories) so all people can enjoy the improvements being proposed. With the implementation of this proposal, the expectation is human, economical and environmental development for all.

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