The 2005 World Sustainable Building Conference,
Tokyo, 27-29 September 2005 (SB05Tokyo)

A MORE SUSTAINABLE URBAN RESIDENTIAL AREA
THE GENESIS PROJECT CASE STUDY

Marcelo Vespoli TAKAOKA[1/2]
Eneas SALATI[3]
Fabio FELDMANN[4]
Fernando Bontorim AMATO[1/2]
Joao da ROCHA LIMA Jr.[1]
Vanderley Moacyr JOHN[1]

[1] Polytechnic School, University of Sao Paulo, Av. Prof. Almeida Prado, travessa. 2, n.83 - Edificio de Engenharia Civil - Cid. Universitaria - Sao Paulo - SP 05508-900 Brazil, marcelo.takaoka@poli.usp.br, fernando.amato@poli.usp.br, rocha.lima@poli.usp.br, vanderley.john@poli.usp.br
[2] Y. Takaoka Enterprises, Alameda Mamore 989, Alphaville, Barueri, SP, 06454-040, Brazil.
[3] Brazilian Foundation for Sustainable Development (FBDS), Rua Engenheiro Álvaro Niemeyer 76, Sao Conrado, Rio de Janeiro, RJ, 22610-180, Brazil, salati@fbds.org.br
[4] Institute for Sustainability (IPSUS), Alameda Jaú 1160, Jardim Paulista, Sao Paulo, SP, 01420-001, Brazil, fabio.feldmann@uol.com.br

Keywords: sustainable, development, urban, residential, plotting, civil engineering, environment, genesis

Summary

The traditional Brazilian approach for urbanization of a land plot begins with the removal of all vegetation that is legally allowed to be removed; planted new trees usually replace a small fraction of the removed vegetation. The assumption is that the larger the area available for sale, the higher the financial return; consequently, preservation - or green areas - are deemed to be less interesting profitwise.

Such paradigm destroys the local biota, thus resulting in a built environment where the population has little contact with nature, heat islands increase thermal discomfort outdoors and increase the energy demand for air-conditioning, water becomes scarce, and storm waters periodically flood some areas of the city.

This paper presents guidelines for a more sustainable urbanization practice, based on a case study of a 3,6 million square meter private development. Among other measures, plots take only 15.9% of the total area, the total Atlantic forest green area was increased by 24,8% reaching 73,4% of the total area. At the same time, adequate financial return to the private investors was obtained.

The paper contains:

- Description of the details of the urban and financial solutions of the case study;
- Discussions on the practical difficulties and legal limitations;
- Final conclusions.

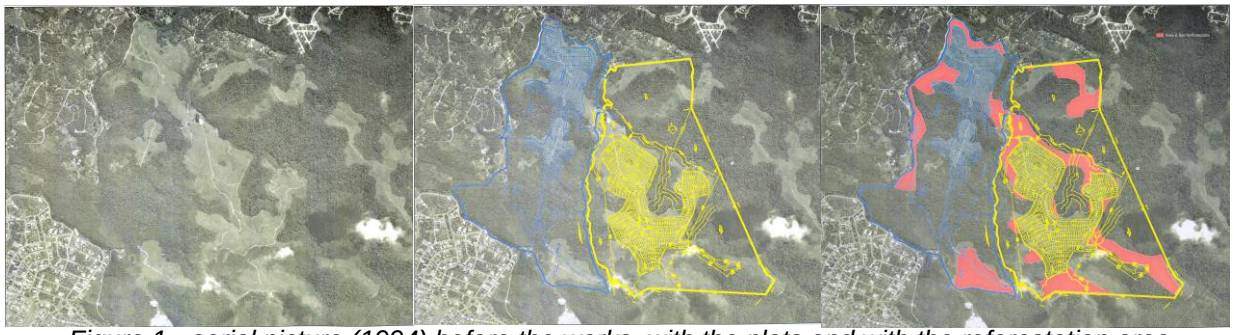

Figure 1 - aerial picture (1994) before the works, with the plots and with the reforestation area

1 Introduction

This work presents the "Genesis Project", developed by Y. Takaoka Enterprises, and the environmental and social benefits which derived from the adoption of a sustainability-based paradigm, in conceiving, planning, building and deploying urban areas for residential use, in comparison with the results from other real state projects located in the same area and focused on the same market. The project combines the social concept of housing with the concept of environmental preservation, and concomitantly, satisfies man's yearning for good dwelling, with positive economical results for venturers and suppliers, and last but not least, generates new jobs and more income for the region.

To illustrate this work the cases Genesis I and Genesis II are shown, which consider the several stages of an urban development that totals over 360ha, with 270ha destined to environmental preservation areas and only 16% for residential plots.

1.1 Brazilian Legislation

Law 6.766 of 1979 provided for the parceling out of the urban land, and was amended by Law 9.785, in 1999. Initially, its art. 4th ruled that a minimum of 35% of the total area had to be public (green areas, as well as areas for leisure systems, road systems and institutional use), thereby leaving a maximum of 65% for the residential plotting. Other legal provisions limit the maximum land declivity, among others. Nowadays, such parameters are set by the accountable public agencies upon filing a request for guidelines for the projects, meaning that they can be larger or smaller than those parameters initially set in the legislation depending on several aspects, including environmental ones.

The role of (state) governments is gradually diminishing compared to the former pollution control and prevention approach. Nevertheless, an increasingly new role of the state is to "facilitate" institutional changes. On the other hand, the role of business, consumers and the civil society is gaining more and more focus, opening "new arenas" of environmental policies. In line with the rising economic focus, the business sector is seen as an increasingly proactive player by envisaging "win-win" constellations between economy and environment. This also emphasizes the importance of changed production patterns within the context of a sustainable development: changes which are primarily up to the business actors to implement. BLEISCHWITZ & HENNICKE (2004, p. 44)

2 Characterization of the market practices

The table below shows the exclusively residential plot developments located in the region of Alphaville, in the municipalities of Barueri and Santana do Parnaíba, west of the capital city of the state of Sao Paulo, launched at a time when Law 6.766 was in force. The following percentage figures are noteworthy: plotting area in relation to the total area: near 60%; green area/total area: 15% in average; green area per plot: an average of 120 m2/plot or 30m2/inhabitant (considering 4 inhabitants/plot, in the region of Alphaville, according to figures from the IBGE – the Brazilian Institute for Geography and Statistics).

Table 1 – Plotting Developments Implemented in the Region of Alphaville when Law 6.766 was in force

	Total Area	Plotting Area	Green & Leisure	Total Plots	Average area of the plots	Plotting Area/ Total	Green Area /Plot	Green Area/ Total
	(m²)	(m²)	(m²)		(m²)	(%)	(m²)	(%)
Apr-79	1,025,437	659,740	171,323	1,758	375	64.3%	97.45	16.7%
May-81	471,920	286,954	50,423	650	441	60.8%	77.57	10.7%
May-82	477,090	307,625	48,285	705	436	64.5%	68.49	10.1%
Apr-83	189,685	90,099	49,570	106	850	47.5%	467.64	26.1%
Apr-84	643,529	381,638	82,320	871	438	59.3%	94.51	12.8%
Jan-86	759,920	492,466	105,176	695	709	64.8%	151.33	13.8%
May-89	768,782	449,586	141,631	1,016	443	58.5%	139.40	18.4%
Aug-90	453,081	231,895	107,538	404	574	51.2%	266.18	23.7%
Jun-87	527,613	326,236	58,293	489	667	61.8%	119.21	11.0%
	5,317,058	3,226,239	814,558	6,694	482	60.7%	121.68	15.3%

Source: RP Arquitetura

3 Introducing sustainability in real estate developments - Genesis Project

According to CHAFFIN, apud WILSON (1998, p. vii/ix), there is a need to seek for urban development solutions that result both in better communities for the population and [not only] in less waste of the natural resources, but also in a better accommodation of the natural systems. "Emerging psychographic, sociographic, and cultural trends indicate that the market is most receptive to products that are the result of responsible ecological stewardship." "There is a preoccupation with quality of life, with an emphasis on health over wealth, and a focus on well-being as opposed to being well-off." .... ".... people have a natural predisposition to feel better, perform better, and actually exhibit healthier physiological signs when looking at

water, green vegetables, or flowers, versus "built" structures of glass and concrete. It is ironic that we often use our human creativity to destroy that which we truly need to live healthy, satisfied lives. If the natural landscape is indeed such a tonic, then we as developers must be sensitive to a greater sense of community – the web of life that links nature and humanity."

On the other hand, NASH (1994), in his work on the Game Theory for which he was awarded the 1994 Nobel Prize in Economics, concluded that the equilibrium points in decisions involving individual and collective interests of the group are reached when all the participants maximize not only their own pay-offs but the group's as well.

3.1 The concept

Opposite to the premise of maximizing the commercial areas (housing plots) to maximize economic results, the Genesis Project is guided by the principle of making the natural resources (the amount of green area per inhabitant and the amount of water available in the region to meet the needs of urban development) compatible, to comply with the social demand for habitat, thereby aggregating value to the real estate business by increasing the environmental quality of the project.

3.2 Objective

The Genesis Project seeked to establish guidelines with a view to creating housing and working conditions, taking heed of the supporting capacity of the natural resources of the region - the fauna, the flora and the hydric resources - the maintenance of its biodiversity and to the improvement of the environment through reforestation programs and enrichment of the local fauna and flora. At the same time, not less important was the desire to offer an attractive economical frame for the investors, and last but not least, generating new jobs and more income for the region.

3.3 Environmental aspects: A key link for the project's sustainability

The main problems found in urbanized areas concerning environmental impacts, especially large metropolitan regions such as Sao Paulo and its suburbs, are as follows: (i) removal of vegetation, with total loss of regional typical flora and, consequently, related fauna; (ii) reduce the soil permeability by the increased surface flow of rainwater that causes flooding in lower areas during heavier rainfall, and reduction in groundwater recharge; (iii) production of "heat islands" from solar energy, with a rise in the air temperature causing the population heat discomfort and increasing the demand for energy due to the necessary use of air conditioning systems; (iv) contamination of surface and underground water resources by pollution, especially urban sewage and, in many cases, industrial effluents; (v) contamination of water resources by floodwaters that drag different kinds of waste from the course; (vi) shortage of surface and underground water due to removal of more natural water resources than is required to recharge existing aquifers; (vii) air pollution caused by air and land transportation systems, as well as industrial plants; (viii) visual pollution from urbanization, not always related to landscaped areas, and proliferation of slums; (ix) noise pollution from heavy traffic and car horns, and the constant hum of densely inhabited areas.

3.4 Social Aspects

The main social aspects contemplated by the Genesis Project are: (i) complying with the housing needs of man; (ii) conducting consultancy and research activities together with universities and NGO's, aiming at the perfection and replication of the project; (iii) divulging accumulated knowledge through academic, technical and entrepreneurial media, with a view to disseminating the project and its replication; (iv) upgrading the environmental and social conditions; (v) promoting environmental education among the community to make the pro-environmental and pro-social actions implemented by the developers into everlasting achievements; (vi) generating more jobs, and finally, (vii) bringing wealth to the region.

3.5 The economical and financial indicators

Compliance with the third fundamental aspect of sustainability demands that cost and income be balanced to support the project. Judicious analysis must be made to balance cost vs. environmental and social gains at the same time that consideration towards a target-population can never be disregarded. What are their aspirations? How much can they afford to pay? How do they appreciate the value of the product being sold?

Furthermore, the economic outcome must be compatible with the market parameters for remuneration of labor and invested capital. Further still, financial resources must be sufficient to support the project's investment needs as well as for its implementation. There must be economical sustainability for the entrepreneur implementing the venture and for the dweller: the latter shall upkeep the common urban spaces and the natural riches of the place.

3.6 Methodology synthesis

Based on the knowledge of the qualitative and quantitative attributes of the area and of the necessities, longings and aspirations of the target-population, one can perceive the environmental opportunities of the area and the local social characteristics, both of which can be positively aggregated into the project. On the one hand, such stance results in environmental and social gains, which on the other hand, could aggregate value into the final product.

4 Case study: The project Genesis I and II Cases

The urban residential plotting developments called Genesis I and Genesis II are located in the Municipality of Santana de Parnaíba, in the State of Sao Paulo, Brazil. Genesis II is in the urban structure implementation stage (earth works, accesses, rainwater drainage system, sewage system....) and Genesis I, with its infrastructure completely finished, was delivered to the owners in March last year. Today, about thirty houses are being built and the first residents must move in still this semester.

Besides the urban infrastructure works, a program is being established in the area for the recovery and preservation of the environment, coordinated by the Brazilian Foundation for Sustainable Development (FBDS), which encompasses a reforestation program to expand the original woodland by more than 50ha, and specific programs for the enrichment of the biodiversity – fauna and flora.

4.1 Area distribution

Over 70% of the total area is destined for environmental preservation, whereas 16% is for plotting. Also noteworthy is the fact that in Genesis I and II the forest area will be enlarged by 24.8% vis-à-vis the original green area, that is, the fauna and flora biodiversity conditions of the region shall be improved.

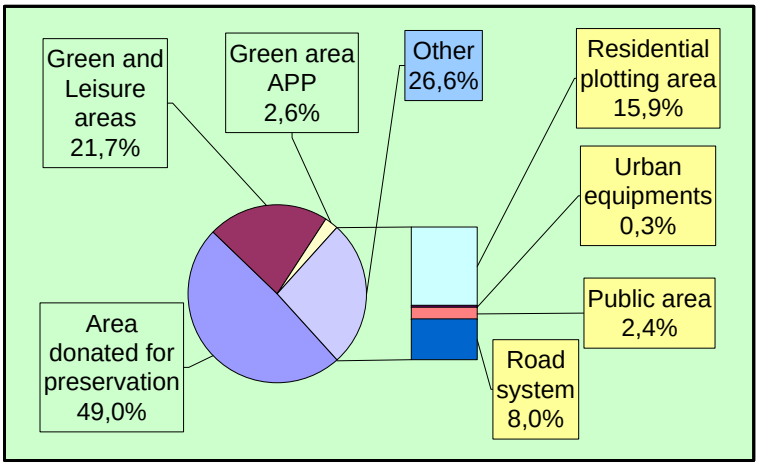

Figure 2 – Area distribution in Genesis I and II

Almost 50% of the total area was voluntarily donated to a not-for-profit organization composed by the future residents of the Genesis I and II residential condominiums. The social objectives of the association are: the protection, defense, preservation and restoration of the environment and of the regional biodiversity, and the resulting upgrading in the community's quality of life.

Table 2 – Data and Indicators of Genesis I e II Developments

		Gênesis I	Gênesis II	Sub-Total	Residential 10
Residential plots		466	598	1,064	
Green and Leisure areas	m²	1,120,909	1,438,419	2,559,328	196,631
Green and Leisure areas/plot	m²	2,405	2,405	2,405	
Residential plotting area	m²	223,798	331,083	554,881	-
Green area expansion	m²	186,035	330,515	516,549	-
Total project area, donations included	m²	1,527,603	1,960,315	3,487,917	196,631
Original green area (Sept/89)	m²	817,397	1,264,667	2,082,062	196,631
Green expansion/original green area		22.8%	26.1%	24.8%	
Green expansion/total area		12.2%	16.9%	14.8%	
Plotting area/total		14.7%	16.9%	15.9%	
Green & Leisure areas/total		73.4%	73.4%	73.4%	

4.2 Market Surveys

According to KOTLER (1999, p. 47), a survey is the starting point for marketing. Without it, a company goes blindly into the market. Good marketing involves careful research of the market opportunity and the preparation of financial estimates based on the proposed strategy, which will signal if the returns would meet the financial objectives of the company.

There is no way a company can be active in the market without knowing the necessities, desires and aspirations of the target-population, its financial capacity and the demographic growth, through market surveys conducted by well-qualified professionals. In the present case, the survey conducted in 1998 by Datafolha and Wilma Rocca indicated that 84% of the inhabitants of the region consider it important to have forest reserves, and about 70% of them considered important the existence of leisure and sport facilities, while other surveys point to the financial capacity and price perception of the product.

4.3 Watching the Environmental and Social Opportunities

After accurate reflection on the quest for transforming problems into real opportunities, the following premises have been defined, which became part of the Strategic Plan of the new enterprise:

Table 3 – Problems and opportunities

Perceived Problem	Consequence	Foreseen opportunity
Large expanses of woodland	Environ'l; Costwise	Meets the customers' longings.
Only 18% of the area made into plots for sale	Earnings reduction	Large stretches of green in the neighboring area fulfill the longings of the customers, who eventually help with the preservation.
Difficult access	Cost and Techn'l Problems	Privacy, and the possibility of reaching home through a tunnel of green.
No water from the state waterworks company ("SABESP")	Unfeasibility	Semi-artesian wells and local water springs; building a water dam.
Necessity of building up a dam to capture water	Cost	Beauty, value aggregation and help in controlling floodings downstream of the enterprise.
Sewage treatement above the required level	Cost	Acknowledgement by community; pro-environmental preservation
Tree Transplantation (not required by authorities)	Cost	Acknowledgement by community; pro-environmental preservation
Building abutment wall for wood preservation	Cost	Acknowledgement by community; pro-environmental preservation
Hiring services of pro-environmental NGO	Cost	Measure for the environmental restoration and protection; acknowledgement by community
Promised donation of green area (1,900,000 m²)	Cost	Meets the longings of the customers and helps in granting environmental preservation.
Ecosustainability of the Project	Cost	Aggregated value and environmental preservation.
Project to meet the longings of the community and of the customers	Cost	Aggregated value resulting in a great sales success at a price compatible with costs and risks.

4.4 Environmental aspects

When planning the Genesis Project, comprehensive analyses were carried out to prevent negative environmental impacts cited above (3.3) and to restore natural environment characteristics of the original Atlantic rainforest in the region.

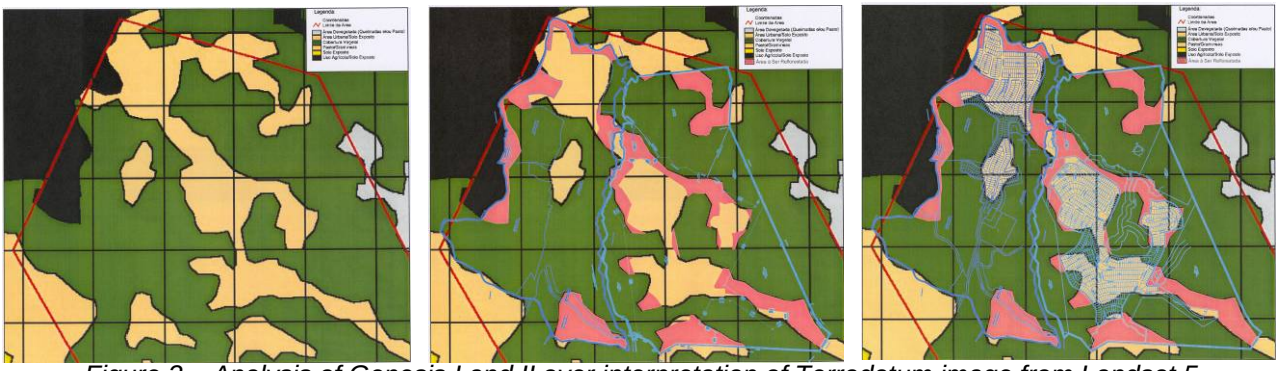

Figure 3 – Analysis of Genesis I and II over interpretation of Terradatum image from Landsat 5

The first is an image from Landsat 5 (Sept/12/88)[1] as interpreted by Terradatum, by request of FBDS, where the green areas represent the woodland, the creamy ones are pastureland and those for agricultural use are black. The second image shows the areas for reforestation in pink, and the third image shows the implementation of Genesis I and II.

4.4.1 Planning over topographical analysis, aerial photography and satellite images

The areas chosen were predominantly botanic pastureland (areas deforested long ago) to implement urbanized areas including allotments and road systems, see Figure 3, totaling only 27% of the project area; the other 73% covers green areas with tree vegetation.

[1] By the Kyoto Protocol, the image must be previous to 1989.

When some trees had to be cleared to adapt to urban spread, they were transplanted using special techniques to guarantee their survival. Mention should also be made that the maintenance and restoration of those green areas prevent the warming of the air, since most of the sunlight in the region, around 400 cal / cm2 a day, is used to evaporate water through plant transpiration. In this process, the incident heat is transformed into latent heat, thereby preventing the formation of "heat pockets" so characteristic in other urbanized areas that fail to consider environmental control.

Reforestation began with the creation of a modern nursery for seedlings. Seeds are being collected in the region to create a seed bank in order to produce seedlings with a genetic basis of Atlantic rainforest species adapted to this reforestation.

4.4.2 Biodiversity

The areas occupied by tree formations were preserved and a project of enrichment planting of tree species was developed with an expected number of at least 120 tree species per hectare, much more than the state laws stipulating a minimum of 80 tree species for the areas included in this project (resolutions SMA 21 and SMA 47). This enrichment included species characteristic of the original forests in the region.

Native fruit tree species were also selected for this tree enrichment-planting program to attract fauna, as well as tree species with phytotherapeutic properties for future use by the local population.

Special crossings were built for animals to move through the forests, and along these "corridors of biodiversity" as large an area as possible is provided for the survival and reproduction of fauna relating to the forest systems. These corridors also connect with the remaining forest fragments.

Another attention-deserving aspect that was cared for, is the priority given to the formation of extensive natural forest areas instead of the many isolated fragments of green which have resulted from the governmental guidelines in several environmentally-protected areas. The biodiversity of fauna is the major beneficiary, since preserved expanses of land are of the foremost importance for their living, feeding and procreating conditions.

4.4.3 Self-sustainable water system

The project's water resources are managed in order to meet the estimated water demand of 1,328 m3/day. Of this total, 426 m3/day come from underground aquifers and 902 m3/day from a reservoir that is recharged by the spring runoff. These flows do not hinder the average stocks of water available in the drainage sub-basin where the project is planned.

The penetration of floodwater in the soil in both the floodplains and forested areas purifies the water flowing during the rainfall. This improved water quality is obtained by means of three main mechanisms: a) mechanical action of the soil that retains particulates through direct filtration; b) physical-chemical action of clays in the soil that fix substances in solution; and c) biological action of the microorganisms in the soil that destroy the pathogen microorganisms and decompose organic matter.

In addition, infiltration of the water in the soil caused by the large forested area increases the recharge of underground aquifers, which in turn increases and controls the duration of the water in the drainage sub-basin while preventing flooding in the lower areas.

To maximize the use of water resources, the plan is also to reuse effluent water from the sewage treatment plant. To achieve this and prevent contamination of the water resources, a sewage treatment plant is planned with advanced technology and treatment to the tertiary level. After chlorination, the effluent water may be recycled to be used in various activities, especially irrigation of the grassy areas and in the forested areas to prevent fire hazards that might occur in years with long dry periods.

4.4.4 CO_2 fixation

The overall plan to use the area where the project is to be implemented for tree planting over a large area has another environmental benefit with the control of the "greenhouse effect" as a result of the transfer of carbon dioxide from the air to the biosphere where it is fixed. In the forested areas (Atlantic rainforest), CO2 fixing is around 26-37 tons/ha/year during the period of plant growth. Considering the entire area to be reforested and preserved of around 250ha, an inventory of approximately 100,000 tons of CO2 will be maintained in the long term, including the different compartments of the forest systems (living matter above the soil, living matter below the spoil, dead organic matter on the soil, and characteristic organic matter from the soil).[2]

4.5 Social aspects

According to MUNRO & HOLDGATE (1991, p. 11), "properly mandated, empowered and informed, communities can contribute to decisions that affect them and play an indispensable part in creating a securely-based sustainable society."

Therefore, once the above cited environmental improvements are implemented, it should be deemed that for the environmental system to be perennial it takes only a maintenance and surveillance program, under the

[2] Source of research: FBDS (Brazilian Foundation for Sustainable Development)

responsibility of the community itself, through a residents' association, with the objective of preserving and preventing vandalism to the environment.

4.5.1 Research and Environmental Education

Besides meeting the housing needs of man, residential projects Genesis I and II demanded extensive research, exchange of knowledge and integration of various specialized groups (engineers, environmentalists, administrators, lawyers and several market and survey consultants), that resulted in an innovative, paradigm-setting product in the Brazilian realtors' market.

The Genesis Project receives collaboration from several environmental entities, and the following stand out: (i) FBDS (Brazilian Foundation for Sustainable Development) whose main objectives are: the coordination of the environmental protection services, reforestation, forest rims, tree corridors, hydric aspects and the environmental education; (ii) The IEA (Institute for Applied Ecology), which is in charge of making technical staff available to perform the services coordinated by FBDS, especially the agronomical engineers, forest technicians and biologists; (iii) The Polytechnic School of the University of Sao Paulo–USP, for the research and disclosure of knowledge in the area of sustainability of the built environment; (iv) ARBOR, whose task is to audit the work-in-progress in the implementation of the plotting development, with a view to granting compliance with all the aspects of the legislation and of the environmental procedures.

Moreover, communication media to keep the community informed were created by the enterprising, like the *Wellness* magazine, about the objectives and goals of the new projects of the company, and children-oriented *Takinha,* in the format of a comic-book to offer environmental education for the local school-age children.

4.5.2 Green areas per plot

Having green areas, eg. in squares, parks, or woods around the urban site is very important to assist with the psychological cultural and health needs of man. The World Health Organization (WHO) recommends a minimum of 12 m2 green area per inhabitant. Today the city of Sao Paulo offers 4 m2/inhab and the city of Curitiba, State of Paraná, considered an environmental quality benchmark, offers 40 m2/inhab. The Genesis I project lavishes around 600 m2/inhab of green area, considering an average occupation of four inhabitants per plot of land.

4.5.3 Leisure

As a differential, the development features a complete leisure structure to meet the desires of the target-population as indicated in the market survey carried out by DATAFOLHA. The urban facilities provided to the plot owners are: wood trekking, a multi-sports court, a tennis court, a health club (social lounge for parties and events, a 25-meter long heated pool and two swimming lanes, heated children pool, home theater), a convenience store and business offices for the residents' work meetings.

4.5.4 Residents' Association

An association of owners and residents of Genesis I and II was created, with communitarian rules establishing criteria for the use and occupation of the ground, maintenance and security services for the common areas and the development infrastructure, thus offering conditions for the environmental preservation in the surrounding area in a sustainable fashion at the same time that it prevents trespassers and squatters and the unplanned occupation of this ecosystem.

4.5.5 Job generation

The works to implement the Genesis I Project generated nearly 200 direct jobs in average, for a 24-month period. Considering that each direct job generated four other indirect ones, there were more than 1,000 new jobs per month over the 24-month work period for each residential condominium. That is higher than a normal urban land development by 10%.

It is once again worth mentioning that the environmental processes that began at an early stage of the project will be generating jobs for many years more, even after the development is delivered, which will contribute for a better income distribution since the resources needed to carry out all the work shall come from a high income population that can afford such benefits.

4.6 Economical Aspects

For the sustainability of the Genesis Project, it is mandatory that investors be offered profit margins at a par with those yielded by similar investments in the real estate business. From the pre-launching period through the delivery of Genesis I, the inflation rate was 40%, the "CDI"s (certificates of inter-bank deposit – reference parameter for interest rates in the Brazilian Market) yielded 48%, and the plot prices were raised by 80%, according to sales.

Also, the investment quality indicators on the Genesis I Project, as per below, constitute an attractive factor for those realtor developers interested in this kind of enterprise. The quality indicators of the Genesis I enterprise are as follows: [i] 25.2% domestic return rate; [ii] 25.8% result on the sales volume; [iii] 41-month primary payback; [iv] 12 million investment in "Reais", or 13.8% VGV, which is considered low because the land was bought by the developer.

5 Conclusions

Looking at the table below one can easily make a comparative analysis of the average indicators of Table 1 and 2. It clearly shows the inversion in the use of green areas versus those destined for plotting in the other developments of the region, vis-a-vis the figures for the allotment practiced in Genesis I and II. It can be noticed that the amount of green areas in the Genesis Projects are almost five-fold superior in percentage figures and almost 20-fold larger in absolute numbers regarding the per plot green area.

Table 4 – Comparative data: Other developments vs. Genesis I e II

Development	Plotting area/Total (%)	Green area per plot (m²)	Green area/Total (%)
Others (average)	60.7%	122	15.3%
Genesis I	14.7%	2,405	73.4%
Genesis II	16.9%	2,405	73.4%
Genesis I and II (average)	15.9%		

The Genesis Project, its concepts and principles, proceeds towards a more sustainable urban development, according to the longings of man, contributing to the improvement of environmental conditions, generating more jobs and wealth in the region in an economically attractive mode, where: [i] the project was made according to the hydric resources of the region; [ii] the plotting area takes only 15.9% of the total area; [iii] 73.4% of the area was alloted for the environmental preservation of woods and animals, with a final forest area 24.8% larger than initially; [iv] considering the entire area to be reforested and preserved of around 2,500,000 m2, an inventory of approximately 100,000 tons of CO2 will be maintained in the long term, including the different compartments of the forest systems; [v] a residents' association was set up with communitarian rules giving the conditions for the sustainable preservation of the environment, thereby preventing invasions and unplanned occupation of this ecosystem.

The Genesis Project is meant to be a dynamic one. One that learns from its own mistakes and progresses along with time, from technological breakthroughs, from the ever-present hampering setbacks which come up together with new opportunities – one in seek of higher quality of life for the community and of perpetuating the ecosystem for the generations to come. It takes great creativity and emotion to make a project like this come true. Technical expertise only is not enough: it calls for real knowledge of the feelings, sensations and anxieties of the human being, to try to adjust and incorporate all these elements, in a sustainable manner, into the project.

HAWKEN et alii (2000, p. 102) state that the unexpected and extraordinary success of these real estate market design integrated projects has started to persuade developers to rethink many of their basic assumptions and to imagine new housing projects as a tool for the restoration of nature and the communities.

6 References

BLEISCHWITZ, R.; HENNICKE, P. **Eco-efficiency, regulation and sustainable business: towards a governance structure for sustainable development**. Northampton, MA: Edward Elgar Publishing Ltd, 2004. 228p.

BRAZIL. The Presidency of the Federative Republic of Brazil. **Law n° 6.766**, of Dec. 19, 1979. Provides on the parceling ouf of urban soil and other dispositions. Available at: <http://www.presidencia.gov.br/>. Accessed on February 10, 2004.

BRASIL. From the Presidency of the Federative Republic of Brazil. **Law n° 9.785**, of Jan. 29, 1999. Amends Law n° 6.766. Available in: <http://www.presidencia.gov.br/>. Accessed on: February 10, 2004.

HAWKEN, P.; LOVINS, A.; LOVINS, L. H. **Natural Capitalism: creating the next industrial revolution.** Sao Paulo: Editora Cultrix Ltda, 2000. 358p.

KOTLER, P. **Marketing for the XXI century: how to create, conquer and dominate markets**. 10th ed. Sao Paulo: Futura, 1999. 305p.

MUNRO, D. A.; HOLDGATE, M. W. (Eds.) **Caring for the earth: a strategy for a sustainable living**. Gland, Switzerland: IUCN/UNEP/WWF, 1991. 228p.

NASH, J. **The work of John Nash in game theory: Nobel seminar, December 8, 1994**. Available at: <http://www.nobel.se/economics/laureates/1994/nash-lecture.html. Accessed in May, 2004.

WILSON, A. et al. **Green development: Integrating ecology and real estate**. New York, NY: John Wiley & Sons, Inc, 1998. 522p.

7 Acknowledgments

Also thanks deserving are those who helped with the compilation of data on which the work was based, namely: Wilson Saburo Honda and Cíntia Pereira Morita; Ana Haraguchi, for the review and translation; architects Reinaldo Pestana, Carlos, Alda and his group, who expertly developed the urban project.