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REPORT

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2012

THIS REPORT HAS BEEN PRODUCED WITH THE COLLABORATION OF

Global Footprint Network
Advancing the Science of Sustainability

ecossistemas

The Ecological Footprint of Campo Grande and its footprint family

Mission

WWF-Brazil is a Brazilian non-governmental organisation dedicated to Nature Conservation. Its objectives are to harmonise human activity with biodiversity conservation and foster the rational use of natural resources to the benefit of the citizens of today and future generations. WWF-Brazil, based in Brasilia, was created in 1996 and unfolds projects throughout Brazil. It is part of the WWF Network, the world's largest independent Nature Conservation organisation, active in more than 100 countries and supported by 5 million members and volunteers.

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Brasilia, March 2012

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CONTENTS

PARTNERS'MESSAGES

WWF Brasil

Situated on the edge of the Pantanal, one of Brazil's most important biomes, Campo Grande is a planned city. However like most Brazilian cities it too faces the dilemma of how to keep growing but on a more sustainable footing, while at the same time providing better living conditions for its inhabitants without putting even more pressure on already scarce natural resources. By taking up the challenge of this pioneering work to measure its own ecological footprint alongside WWF-Brasil, the city has now acquired a precious tool that will help it to overcome that challenge. Calculating the Ecological Footprint is just the first step of the work and serves as the starting point. It reveals where the greatest pressures on renewable natural resources lie, making it possible to determine the direction of possible actions to be undertaken in the sphere of public policies and on the part of companies and the citizens of Campo Grande in a bid to reduce those pressures.

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The Planet Earth has a limited capacity to provide human society with all the resources it needs for the survival and prosperity of the species. Because of its ignorance of ecological limitations, humanity has been making use of a kind of planetary 'overdraft' and the interest on it is gradually consuming the maintenance capacity of the ecosystems that support life on Earth. The Campo Grande Ecological Footprint study has clearly revealed the size of that interest payment, in other words the effective availability of natural resources in the Campo Grande region, and the actual demand being made on them to meet the populations needs. What is more important, this work indicates ways in which public administration can develop the municipality within the limits of nature; an ability that is more than necessary for any public administration being conducted in the 21st century. The moment could not be more propitious.

Global Footprint Network
Ecological assets are rapidly becoming a decisive factor of competitiveness in global affairs; those cities and countries that have a good knowledge of their ecological assets, manage them well, protect them and make use of them in a rational way are going to find themselves in much more favourable positions. As populations and wealth increase around the world, the interactions between the demands Campo Grande residents make on the biosphere and the extraordinary ecological assets that are to be found in the surrounding region are going to determine the city's future viability. The act of making available to the city's citizens and administrators a detailed register of those resources and the way they are being used will enable them to take advantage, not only of their knowledge of limitations but of the opportunities the coming years will have to offer.

NEPES – Economic and Social Science Studies and Research Nucleus at the Anhanguera University - Uniderp
The Anhanguera University –Uniderp, located in the state of Mato Grosso do Sul, is a national reference in terms of higher education, whether it be standard classroom or distance learning contexts. It fosters an inseparable combination of teaching, research and learning and adopts a contextualised vision of the human being and of the world. In harmony with models of society and of education in constant transformation, it strives to provide a plural, global, critical and reflective formation for its students. Based on what it considers to be the essential elements for organizing knowledge and information, the university stimulates its students to appropriate and to produce scientific knowledge, to exercise their citizenship and to value the principles of tolerance and sociability. Currently it has 250 distance learning centres in Brazil and three units in Mato Grosso do Sul offering courses in traditional classroom settings.

Participating Institutions

List of all those that took part in the Mobilisation for the Campo Grande Ecological Footprint

Águas Guariroba – [Water Supply Concession Holder for the State of Mato Grosso do Sul)
Ananhanguera – [University for the Development of the State and the Pantanal Region](UNIDERP)
Associação de Proprietários de RPPNs de MS (REPAMS) [Association of Private Nature Reserve Proprietors]
Blink – Rádio FM
Central de Comercialização de Economia Solidária de MS (CCES) [Economy of Solidarity Trading Centre]
Conselho Estadual de Saúde (SESAU) [State Health Council]
Conselho Municipal de Meio Ambiente (CMMA) [State Environmnet Council]
Delegacia de Crimes Ambientais (DECAT) [Environmental Crimes Precinct]
Espaço Imaginário –[Imaginary Space]
Fórum Estadual de Economia Solidário (FEES/MS) [Economy of Solidarity State Forum]
Fundação Nacional de Saúde (FUNASA) [National Health Foundation]
Instituto Brasileiro de Meio Ambiente (IBAMA) [Brazilian Environment Institute]
Instituição Grupo Cidadão [Citizens Group]
Instituto de Permacultura Cerrado/ Pantanal (IPCP) [Pantanal Cerrado Permaculture Institute]
Secretaria de Desenvolvimento Socioeconômico (SEDESC) [Department of Socio-economic Development]
Secretaria de Meio Ambiente e Desenvolvimento Urbano (SEMADUR) [Environment amd Urban Development Department]
Secretaria Municipal de Educação (SEMED) [Municipal EducationDepartment]
Sociedade INCRA/MDA [INCRA/MDA partnership]
Universidade Católica Dom Bosco (UCDB) [Dom Bosco Catholic University]
Universidade Federal de Mato Grosso do Sul (UFMS) [Federal University of Mato Grosso do Sul]

Technical Consultant for the Mobilisation Workshops
Josenildo Sousa e Silva – UNIR de Rondônia

INTRODUCTION

WWF-Brasil

With the greatest satisfaction we can now present the results of the research undertaken to establish the Ecological Footprint of the city of Campo Grande, the first Brazilian city to carry out such a calculation.

The Ecological Footprint of a country, state, city or even of a person corresponds to the amount of productive land and sea needed to produce and sustain a given style of living. It is a way of translating into hectares the territorial expanse that a person or a population or a city, state or country uses, on average, to sustain their ways of eating, dwelling, moving around, taking their leisure and consuming, among others. Today most countries already have the calculation of their ecological footprints available but it can also be done on an individual basis.[1] Currently the methodology is being applied in various cities around the world but in Brazil, Campo Grande was the first municipality to adopt the calculation.

The partnership established between WWF-Brasil and the Municipal Authority of the capital of the state of Mato Grosso do Sul, the support given by the Global Footprint Network (GFN), the ecoSISTEMAS organization and the University of Anhanguera's Economic and Social Science Studies and Research Nucleus (NEPES) have all helped to make it possible to conduct this pioneering study in Brazil, namely, the calculation of the Ecological Footprint of a city.

The choice of the capital city of the state of Mato Grosso to be the first Brazilian city to apply this methodology was based on certain factors. Campo Grande is the capital city of a Brazilian state that encompasses most of the Pantanal, a region of the greatest importance because of its fantastic environmental richness but at the same time highly threatened by the degradation in course stemming from exaggerated consumption patterns. While it is true that Campo Grande is in the environs of the Pantanal formation and not actually in it, the consumer habits of the city's residents have effects on the Pantanal just as such choices have on the environment in other parts of Brazil.

1 *For a list of countries cf: http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_for_nations/*

The capital of the state of Mato Grosso do Sul offered ideal conditions for carrying out the survey and studies because it has a profile similar to that of other Brazilian cities where it has been possible to exercise some influence on the direction of urban planning. This means that the experience could very easily serve as a model for other city authorities who might be interested in developing the same methodology for their cities thereby expanding the work and scaling it up to the regional or even national level.

However, the most important factor of all was the willingness of the municipal authority of Campo Grande to enter into this partnership arrangement without which the work could never have been carried out. The support of the Economic and Social Science Studies and Research Nucleus of the Anhanguera University and its contribution in supplying data extracted from the Family Budget Survey was absolutely fundamental to the success of this action.

It must be stressed that the aim of the footprint calculation is not to paint a negative portrait of the city. The idea is to offer the city a tool for better public administration, mobilise the general public in regard its consumer habits and encourage it to choose more sustainable products while at the same time opening up a dialogue with businessmen to encourage them to improve their production chains. Also there can be no doubt that any reduction in the consumption of natural resources can only be achieved slowly over the long term.

We would like the Ecological Footprint study to inspire consistent long term planning that manages to go beyond the normal limits of public administration and achieve continuity, irrespective of who is in power in local government at one time or another.

In that sense the work carried out with the various social actors is fundamental to ensure the success of the Ecological Footprint as a management tool because it depends on the performance of the pubic authorities, of the corporate world and of civil society and they should come together for the joint formulation of strategies designed to mitigate the Ecological Footprint.

Furthermore, we believe that this is the kind of work cannot be finalized from one day to another. It is long-term work and there are many essential stages involved. But it must start now. That is why the numbers that compose this X-ray, particularly those associated to the most critical aspects, must be analysed in order to institute an action plan agreed to by all the partners and destined, the next time the footprint is measured, to bring in more encouraging results so that Campo Grande will begin to be seen as an increasingly sustainable city.

Michael Becker
Cerrado Pantanal Programme Coordinator for WWF-Brasil

Maria Cecília Wey de Brito
Chief Executive Officer - WWF-Brasil

The Campo Grande Municipal Authority

To us, the fact that Campo Grande is the first Brazilian city to have its Ecological Footprint calculated is a great honour. This methodology, which is designed to calculate the amount of natural resources we use because of our style of life and habits, has been applied for the first time in a city and Campo Grande has taken the lead and committed itself to sustainability.

We believe that by making this diagnosis we are creating an opportunity to measure the impacts caused by the pressure of human consumption on natural resources and so be able to plan, in due course, environmental actions that will improve the quality of life of Campo Grande citizens.

This concern with sustainability is reflected in the actions that are being unfolded in the capital of Mato Grosso do Sul. Among them we can point to the production of organic food products and their inclusion in the school meals programme.

We have also set in motion a policy directed at air pollution with a system to control the pollution caused by the urban vehicle fleet as well as monitoring the quality of surface waters and the recuperation of our springs and the management and expansion of our areas of vegetation. There are incentives for practices directed at sustainability in the construction industry and above all, the management of all kinds of waste and residues generated in the municipality; all those actions are already being unfolded.

The Ecological Footprint provides indicators that are highly useful in planning such actions. Because it is linked to human consumption this methodology is capable of delineating the limits for economic and demographic growth as a function of the effectively available ecological resources.

For all those reasons the footprint calculation offers us a valuable public administration tool that will make it possible for the municipal authority to orientate its actions and projects directed at reducing the footprint more efficiently.

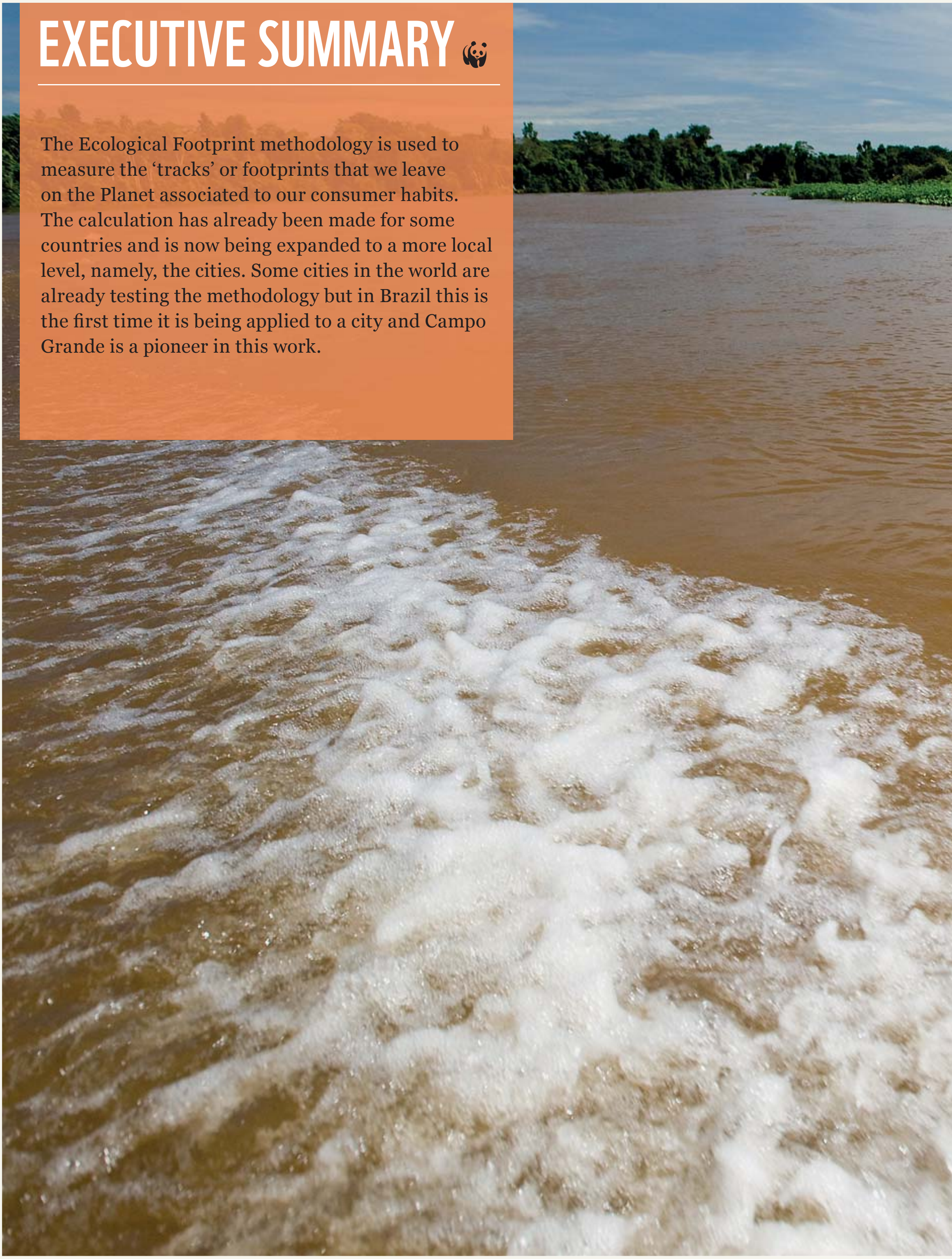
By using the footprint as a sustainability indicator we can be sure that, irrespective of who is in control of the municipal government, we will have a municipality that is heading in the right direction.

Marcos Cristaldo
Head of the Environment and Urban Development Department

Nelson Trad Filho
Mayor of the Municipality of Campo Grande

EXECUTIVE SUMMARY

The Ecological Footprint methodology is used to measure the ‘tracks’ or footprints that we leave on the Planet associated to our consumer habits. The calculation has already been made for some countries and is now being expanded to a more local level, namely, the cities. Some cities in the world are already testing the methodology but in Brazil this is the first time it is being applied to a city and Campo Grande is a pioneer in this work.



The aim of the work is not just to calculate the municipality's Ecological Footprint, but also to constitute the footprint as a valuable urban environmental management tool. The calculation is certainly a fundamental part of the process but for the indicator to have any meaning, the population must be mobilised to ensure that it understands its significance and make it possible, based on the discussions of the results, to develop mitigation strategies alongside the public and private sectors. In that way the calculation will not be restricted to the sphere of a mere environmental balance sheet, but will become a tool capable of stimulating the general public to review its consumer habits and choose more sustainable products, as well as stimulating companies to improve their production chains.

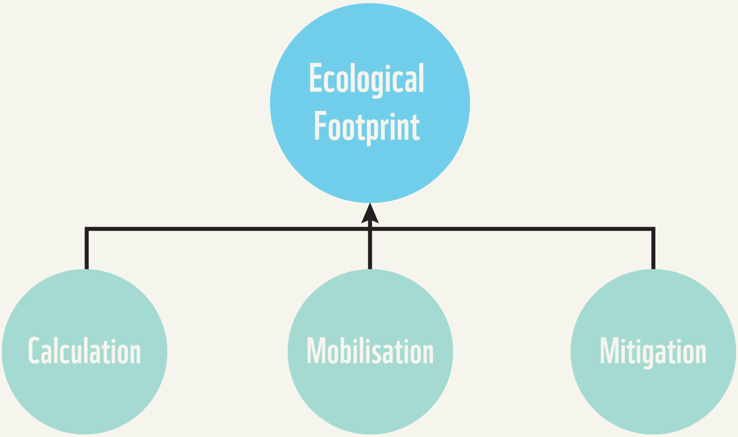


Figure 1: *Strategic Lines of Campo Grande's Ecological Footprint*

The Ecological Footprint of a country, state or city or even of a person corresponds to the amount of productive land and sea needed to produce and sustain a given style of living. It is a way of translating into hectares the territorial expanse that a person or a population or a city, state or country uses on average, to sustain their forms of eating, dwelling, mobility, dressing moving around, taking their leisure and consuming goods in general It is important to state that what is being considered for this particular calculation is the impact of consumption on renewable natural resources.

Within the set of footprints that make up the footprint family the Ecological Footprint has some features that are different from the ‘Water Footprint’ or the ‘Carbon Footprint’ – especially in regard to the outreach of its analysis. While the Ecological Footprint evaluates in a broad way, the impacts of consumption on the Biosphere, the Water Footprint portrays its impacts on water resources and on a given production chain. That kind of approach also typifies the Carbon Footprint, which analyses greenhouse gas emissions associated to a given activity or production process.

The Ecological Footprint is an environmental accounting methodology that evaluates the pressure that human populations' consumption puts on natural resources. It is expressed in global hectares (gha) and that makes it possible to compare different consumption patterns and check whether they lie within the ecological capacity of the planet. One global hectare is defined as one hectare with the global average productivity of productive lands and seas in a given year. In turn, biocapacity is the ecosystems' capacity to produce the renewable natural resources needed for human consumption and to absorb the the residues and waste generated by the population's activities. The overriding objective of the Ecological Footprint is to check whether consumption and biocapacity are in equilibrium.

That being so, the Ecological Footprint compares the biocapacity described for the various ecological resources (agriculture, pastures, forests, fisheries, built up areas, energy and areas needed to absorb Carbon Dioxide, for different categories of consumption (food, housing, mobility and transport, goods and services, government and infrastructure). The day-to-day decisions that are made in the different consumer categories generate an impact on biocapacity.

Currently the world average for the Ecological Footprint is 2.7 global hectares per person while the available biocapacity for each human being is only 1.8 global hectares. Therefore there is a capacity deficit of 0.9 global hectares. In other words humanity is currently consuming one and a half planets, exceeding the planet's capacity to regenerate by 50%. In the mid-eighties humanity began consuming more than the planet naturally has to offer and has been consuming above the necessary one-planet level ever since. Predictions for the year 2050 suggest that, if we carry on like this, we will need two planets to maintain our consumer patterns.

The Ecological Footprint for Brazil as a whole is 2.9 global hectares per inhabitant, which means that average resource consumption in Brazil is fairly close to the world Ecological Footprint.

Campo Grande's Ecological Footprint

The average Ecological Footprint of an inhabitant of the city of Campo Grande is 3.14 global hectares. That means that if everyone in the world were to consume in the same way as Campo Grande dwellers, almost two planets would be needed to keep up their style of living.

To adequately supply the 787,204 inhabitants of Campo Grande with renewable natural resources, an area corresponding to 2,471,821 global hectares would be needed.

The city's Ecological Footprint is 8% bigger than the Brazilian one, 10% higher than the footprint for the state of Mato Grosso do Sul and 14% larger than the world average. In turn, the state of Mato Grosso do Sul's footprint is 3% larger than the Brazilian average which is 2.9 global hectares per person.

On comparing ecological resources we can see that the consumption of resources in Campo Grande is similar to the overall Brazilian pattern in the its distribution average and it mainly calls for areas of pastureland , cropland and forests. There is less pressure for CO2 absorption than the global average mainly due to the low emissions associated to the energy matrix and the intensive use of biofuels in Brazil (figure 2).

***Figure 2:** Comparisons by ecological resources in gha/capita*

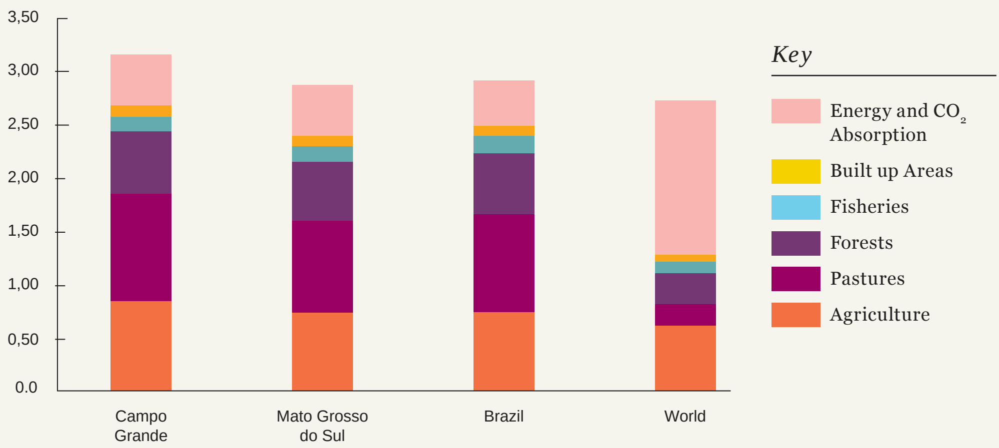
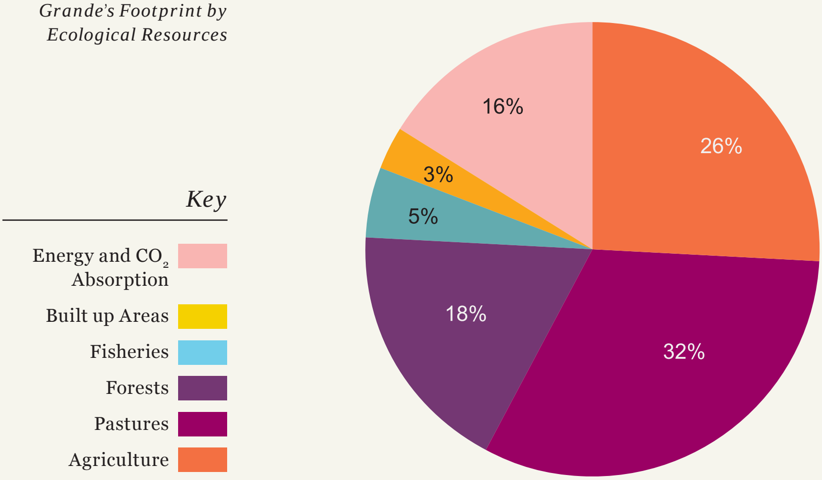


Figure 3: *Campo Grande's Footprint by Ecological Resources*



The ecological resources used by agriculture (grain and vegetable production and other plant-based food products), pastures (meat, leather, wool and fats production and other animal-based products) and forests (wood, fibres, paper, forest essences and land use conversion) represent 75% of the city's Ecological Footprint (figure 3).

This high level of resource consumption on the part of agriculture and pastures can be more readily perceived when Campo Grande's Ecological Footprint is broken down into the various consumption categories.

Most of Campo Grande population's Ecological Footprint is associated to nutrition and services, especially restaurants, which reflects on the eating habits of the citizens. A city dweller in Campo Grande spends 13% more on meat than Brazilians in general and actually shows up as one of the worlds greatest meat consumers: almost 90 kg per person per annum, more than twice the global average.[2]

Comparatively, Campo Grande's Ecological Footprint differs from the Brazilian figures according to the category of consumption analysed: Food (6% more), Housing (53% more), Services (42% more), Mobility and Transport (10% more), Goods (13% less). (Figure 4).

2 *http://earthtrends.wri.org*

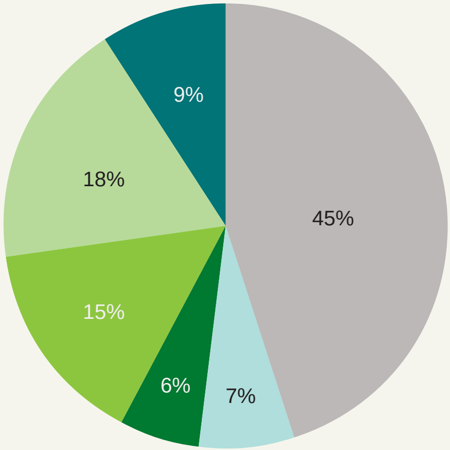


***Figure 4:** Campo Grande's Footprint by Consumption Categories*

Key

Food
Housing
Mobility and Transport
Goods
Services
Government and Infrastructure

Nevertheless, an analysis of Ecological Footprint-related data only makes any sense when we consider the cultural and socio-economic contexts and seek in that way to find sustainable ways of using renewable natural resources. Aggregating value to beef production by allying it the conservation of the Pantanal is one way of reducing the overall impacts the activity generates and of bringing in benefits to the beef producer and that is an example being set by the Brazilian Organic Livestock Association (ABPO).

The choice of the capital of the state of Mato Grosso do Sul to be the first Brazilian city to undertake the application of this methodology was based on two aspects: Campo Grande is the capital of the Brazilian state in which lies the greater part of the Pantanal, a region of enormous environmental wealth but at the same time highly threatened with degradation caused by certain unsustainable consumption patterns. While it is true that Campo Grande is on the edge of the Pantanal and not inside the region, the impacts caused by the patterns of city dwellers' consumer choices as well as those of consumers in other parts of Brazil and the world at large have strong effects on the Pantanal floodplain.

Campo Grande offered ideal conditions for undertaking the research because it has a similar profile to many other Brazilian cities where there still exists some possibility of determining the direction urban development takes. It means that the pioneer experience here may provide a model that can be applied by other municipal authorities that are also interested in carrying in applying this methodology and so it will be possible to scale up the work to the regional or even national sphere.

It must be borne in mind that over 80% of the Brazilian population lives in urban settings (IBGE, 2010). Metropolitan agglomerations and the 49 Brazilian cities with over 350 thousand inhabitants are home to more than half the country's urban population and responsible for approximately 65% of the Brazilian GNP. Furthermore, the consumption patterns of the Brazilian population have been changing. According to a report produced by the Data Popular organisation entitled 'Differences and Similarities among the Brazilian Regions', spending on eating out and beverages in the Northeast macro-region has increased by 525.6% over the last eight years[3].

The Ecological Footprint is an important tool for urban environmental management and can help to orientate economic flows in developing centres and lead managers to establish sustainable strategies for determining the way they make use of natural resources.

Furthermore the Ecological Footprint takes into account the limitations of existing natural assets and that means that it is not sufficient merely to improve efficiency in resource use, especially if the ricochet effect on economies is taken into account[4]. What is needed is to think in terms of qualitative growth of the economies and their interactions with the environment, remembering that the extraction of renewable environmental resources also influences land use and settlement in the territories around us.

In 2050 the planet's population will hit the nine billion mark and the Ecological Footprint offers us an excellent chance to question our consumer patterns and habits especially in the urban context. It will be necessary to establish agreements among different regions and countries to guarantee supplies of ecological resources to urban centres. Production chains will have to be re-thought in terms of the real needs of the inhabitants and consumer habits will have to change.

Ecological Footprint calculations make societies stop to think about the adaptations needed to ensure access to the ecological resources that sustain life on earth but that are limited and finite.

The pioneering experience in Campo Grande is a considerable contribution towards that process. It is hoped that other Brazilian cities will follow this example and include the Ecological Footprint as an environmental indicator in their management strategies and urban planning in the bid to establish a network of sustainable cities.

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3 Taken from the March 9 2010 issue of Valor Econômico.

4 The ricochet effect postulates that any savings of natural resources achieved through the introduction of new technologies is rapidly neutralised by the overall increase in resource use.

THE ECOLOGICAL FOOTPRINT AS A SUSTAINABILITY INDICATOR

We must reflect in order to measure; not measure in order to reflect.
Gaston Bachelard

WWF's 2010 biennial report basically revealed that globally there has been a 30% loss of biodiversity: "humanity is no longer living off the interest of its natural capital, it is using up the capital itself" and "at this level of ecological deficit, the final exhaustion of ecological assets and the massive collapse of the ecosystems seem to be increasingly probable", the report declares.

Currently humanity is consuming renewable resources a faster rate than the rate ecosystems are capable of regenerating them, and it continues to liberate more carbon dioxide (CO2) then the ecosystems are capable of absorbing.

The Meadows et al. report (1972), entitled The Limits to Growth[5] already announced back then a time limit for the expansion of the current model for world development: "If present day tendencies in population growth, industrialization, pollution, food production and the exhaustion of natural resources are not changed, the limits to growth on this planet will be arrived at some time in the coming 100 years. The most likely result will be a sudden uncontrollable decline in the population and in industrial capacity".

Beside portraying that scenario however, the Meadows report also set out the key formula for achieving sustainable development: "It is possible to change those growth tendencies and establish a situation of economic stability that will be sustainable over the long term". Later, in 1983, the Brundtland Commission Report[6] 'Our Common Future' produced by the United Nations World Commission on Environment and Development (WCED) was to reinforce the human side of the sustainable development concept. In addition to warning about the set of problems involving the environment the Brundtland Report underscores the connection between "the deterioration of the human condition" and extreme poverty and inequality in the world.

5 Meadows, Donella, J. Randers and D. Meadows (1972). Limits to Growth.New York: Universe Books.

6 WCED (1987): Our Common Future. World Commission on Environment and Development, Oxford.

In 1992, the evolution of sustainable development thinking was boosted by the contributions of 1,600 scientists from 72 countries – among them 102 Nobel Prize winners –, who began to call more attention to the intrinsic connection of the 'enviroment- social – economic' triad to the concept of sustainable development.

The United Nations Conference on Environment and Development – Rio 92, was held in Rio de Janeiro and elaborated the document 'World Scientists Warning to Humanity' which shocked public opinion with the following statement: "Human beings and the Natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. Fundamental changes are urgent if we are to avoid the collision our present course will bring about". According to the scientists it is necessary to create sustainable development indicators capable of orientating decision making processes and contributing to the sustainability of systems integrated to the environment.

New Indicators for Sustainability

Creating sustainability indicators means elaborating a statistical base in order to measure the effects of social, environmental policies and economic development policies. Education and family values, the people's culture, respect for nature and sustainable exploitation of its resources are some of the many key aspects of development that the classical development indicators like the GNP totally fail to capture.

In the view of many economists[7], in addition to financial resources, an indicator needs to include natural wealth and assets, and the social and intellectual capital of the peoples. The GNP for example does not monitor the planet's environmental degradation or even the living conditions of its populations. In that light, indicators that take into account peoples' well being are more efficient and helpful to making decisions on the progress of a sustainable society.

Chapter 40 of the Agenda 21 also stresses that the indicators usually used to measure economic development do not give any accurate indications about sustainability because the evaluation methods employed are imperfect or inadequately applied. In essence, the indicators of sustainable development should be able

7 Redefining Wealth and Progress (1990): New Ways to Measure Economic, Social, and Environmental Change: The Caracas Report on Alternative Development Indicators. Knowledge Systems Inc.

to provide decision makers with a solid basis that attempts to integrate the aspects, of economic development, environmental sustainability and social equilibrium. The indicators to be developed must go beyond merely reflecting growth and be capable of indicating efficiency, sufficiency, equality, and the quality of life[8].

In analysing sustainable development, the definition or measurement of a country's wealth needs to take into account the environmental, social and economic aspects. In the process of transformation, governments, companies, organisations and individuals must search for indicators they can use to guide their decisions, and elaborate policies and strategies in view of the scarcity of natural resources and the unsustainable nature of the current development model.

The Human Development Index (HDI) elaborated by the UN Environment and Development Programme is a well-known indicator for measuring social development. The HDI is obtained by combining three basic indicators: life expectancy, income and schooling level. Even so it fails to take into account the collateral effects of progress such as uncontrolled urban growth, unemployment, increase in the crime rate, new health demands, pollution, the erosion of the family unit, and inequality. Nevertheless it is still an important indicator that comes close to, and tries to capture the social aspect of sustainability. The social aspect of sustainable development calls for engagement and confrontation actions directed at natural resource users in an effort to form a new kind of citizen with an understanding of current environmental problems that is so essential to the full exercise of citizenship.

The Ecological Footprint is the other sustainability indicator that has a strong environmental dimension underlying its concept. It calls for changes in societies' consumer and production habits and such changes can only be achieved if there is strong engagement of civil society, local governments and the private sector. To redress negative indexes obtained in Ecological Footprint measurements, stimulating responsible consumption and total re-cycling, and the implementation of social technologies with low impacts are among some of the actions that need to be taken.

If there is to be change then it is essential that all sectors of society should feel themselves responsible for making it happen.

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8 Meadows, D. (1998): Indicators and Information Systems for Sustainable development. A report of the Balton Group.The sustainability Institute, Hartland Four Corners.

THE DEFINITION OF A COUNTRY AND ITS PEOPLES' WEALTH MUST CONSIDER THE TRIAD ENVIRONMENT – SOCIETY – ECONOMY

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O WHAT IS THE ECOLOGICAL FOOTSTEP?

Developed in 1993 by a team headed by Mathis Wackernagel and William Rees at the University of British Columbia, the accounting method known as the Ecological Footprint is coordinated nowadays by the Global Footprint Network, founded in 2003, and its 50 partner organisations.

The Ecological Footprint is an accounting methodology that accompanies humanity's concurrent demands on the biosphere by making a comparison between human demands and the plant's regenerative capacity. It is achieved by adding up the areas needed to supply the renewable resources people use with the areas needed to absorb all the residues (figure 5). The balance sheets currently being used for National Ecological Footprint accompanies the use of resource materials that include grains, fish for food and other uses, wood and pastureland for cattle but on the residue side the only one being measured at the moment is CO_2 emissions.

Because people consume resources from many parts of the world, the Ecological Footprint being presented here calculates the areas irrespective of where they are located on the Earth's surface.

To discover whether the human demand for renewable resources and need for CO_2 absorption is compatible with the planets regenerative capacity, that is, with its biocapacity, both the Ecological Footprint (which represents the demand for renewable resources) and the biocapacity (which represents the availability of renewable resources) are expressed in units known as global hectares. A global hectare represents the productive capacity of one hectare of land considering the world average productivity figures.

In the calculation we take into account many of the uses and resources that can be measured in terms of the area needed to maintain biological productivity. There are some resources and residues, however, that are not susceptible to being measured in this fashion and they are excluded from the footprint calculation. Solid residues and water do not enter, as such, in the Ecological Footprint calculation.

That fact, however, in no way invalidates the Ecological Footprint calculation; we just need to remember that the calculation itself systematically underestimates **all** the impacts on the environment. It only detects the use of renewable natural resources, but that in itself is an excellent parameter to measure our progress on the road to a more sustainable life.

Figure 5: *All human activity makes use of biologically productive land and/or fishery resources*

The ecological footprint is the sum of that area wherever it may lie on the planet

Footprint component definitions

SEQUESTERED CARBON FOOTPRINT	Calculated as the quantity of forest land needed to absorb CO_2 emissions from fossil fuel use, land use changes, and chemical processes except for the part absorbed by the oceans. These emissions are the only residual product included in the Ecological Footprint
PASTURES FOOTPRINT	Calculated as the area used to raise beef and dairy cattle and for production of leather and wool products
FOREST FOOTPRINT	Calculation based on a country's consumption, sawn wood, wood and cellulose products and firewood
FISHERY FOOTPRINT	Calculation based on an estimate of the primary production needed to sustain shellfish and fish catches based on catch data covering 1,439 different marine species and 268 freshwater species
ARABLE LAND FOOTPRINT	Calculation based on the area used to produce foodstuffs and fibres for human consumption, feed for cattle, vegetable oils and rubber
BUILT UP AREAS FOOTPRINT	Calculation based on the area of land covered by human infrastructure including transport, housing, industrial installations and hydroelectric dam reservoirs

WHAT IS BIOCAPACITY?

Biocapacity or biological capacity, is the capacity of ecosystems to produce useful biological materials and to absorb the residues generated by human beings under current methods of management and extraction technology. Useful biological materials are defined as whatever materials human economies effectively demanded in a given year.

Biocapacity embraces:

- Arable land used for the production of food, fibres, bio-fuels;
- Pastures for the production of animal origin products like beef, milk leather, wool;
- Continental and marine fisheries;
- Forests, that not only supply wood but also absorb CO_2.

Biocapacity takes into account the available land and its productivity measured by the crops or trees growing on each hectare.

Cropland in countries with a dry climate or a cold one, for example, may be less productive than cropland in countries with warm or humid climate. If the land and sea of a given nation are highly productive, the country's biocapacity might be represented by more global hectares than the actual number of hectares of its land area.

Similarly, any increase in productivity of crops may be reflected as in increase in biocapacity. The areas of land used for the predominant crops like the cereals have remained relatively stable since 1961 but the amount produced per hectare has almost doubled.

Biocapacity is a measurement that enables direct comparisons to be made. Biocapacity is also drawn on by other species that consume available natural resources for their survival. Thus it is important to realise that the services provided by the natural ecosystems need to be shared with the planet's other living beings.

Both biocapacity and the Ecological Footprint are expressed in global hectares (gha) that represent productivity.

THE ECOLOGICAL OVERLOAD IS INCREASING

During the 1980s, humanity as a whole passed the point of equilibrium where the annual Ecological Footprint corresponded to the Earth's annual biocapacity. In other words, the planet's human population began to consume renewable resources faster than the ecosystems were capable of replenishing and emit more CO_2 than the ecosystems were capable of absorbing. That situation is described as 'ecological overload' or 'overshoot', and it has persisted ever since. In 2007, humanity's footprint amounted to 18 billion gha or 2.7 gha *per capita*. The Earth's biocapacity however, only amounted to 11.9 billion gha or 1.8 gha per person (figure 6 and GFN 2010a). That corresponds to an ecological overload of 50%, which means that the earth would take 1.5 years to regenerate the renewable resources that people used in 2007 and the same time to absorb all the CO_2 for that year. In other words, people used 1.5 planets in the course of their activities (see chart 'What does the overload really mean?').

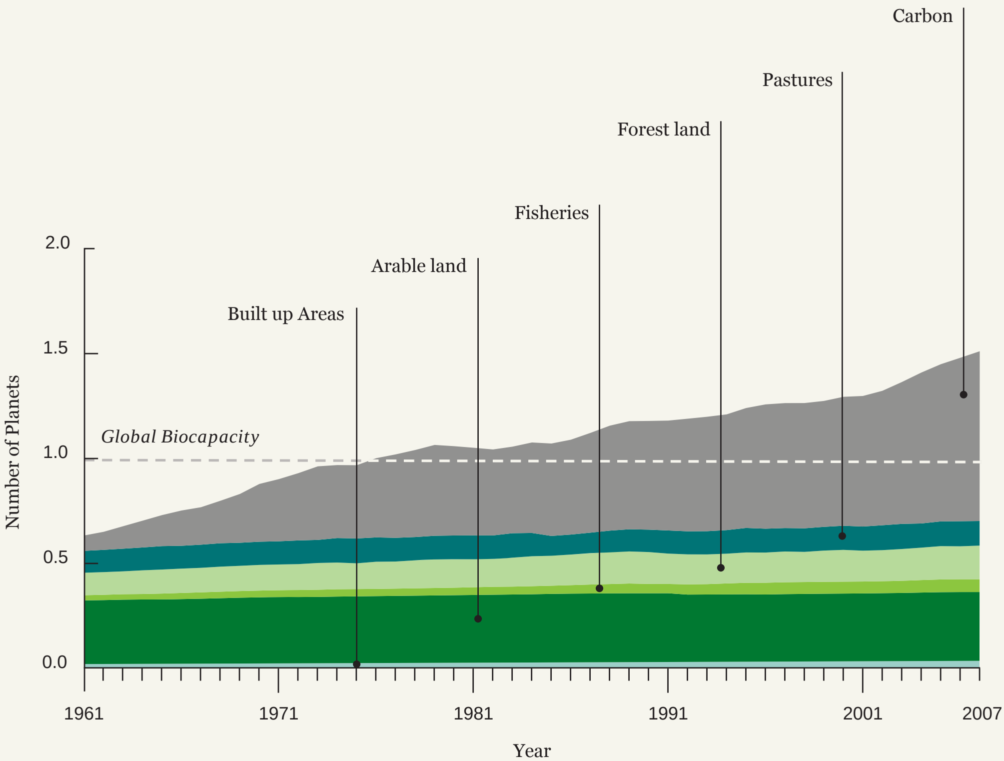


Figure 6: Ecological Footprint by Components, 1961–2006

The Footprint is expressed as a number of planets . The total biocapacity (white dotted line) is always the equivalent of one Planet Earth although the planet's productivity varies from year to year. Hydroelectric energy generation is included under 'built up areas' and firewood under 'forests' (Global Footprint Network, 2010)

What does the overload really mean?

How can people be using up 1.5 Earth's when in fact only one planet exists? In the same way that we can withdraw more money from a bank deposit than just the interest it yields, it is also possible to use up renewable resources at a faster rate than they are generated. For example, wood can be taken out of a forest at a faster rate than it manages to grow back, fish can be removed from their habitat in greater quantities than their populations can replace each year and so on. That, however, cannot be done indefinitely because, eventually, the resources will be exhausted.

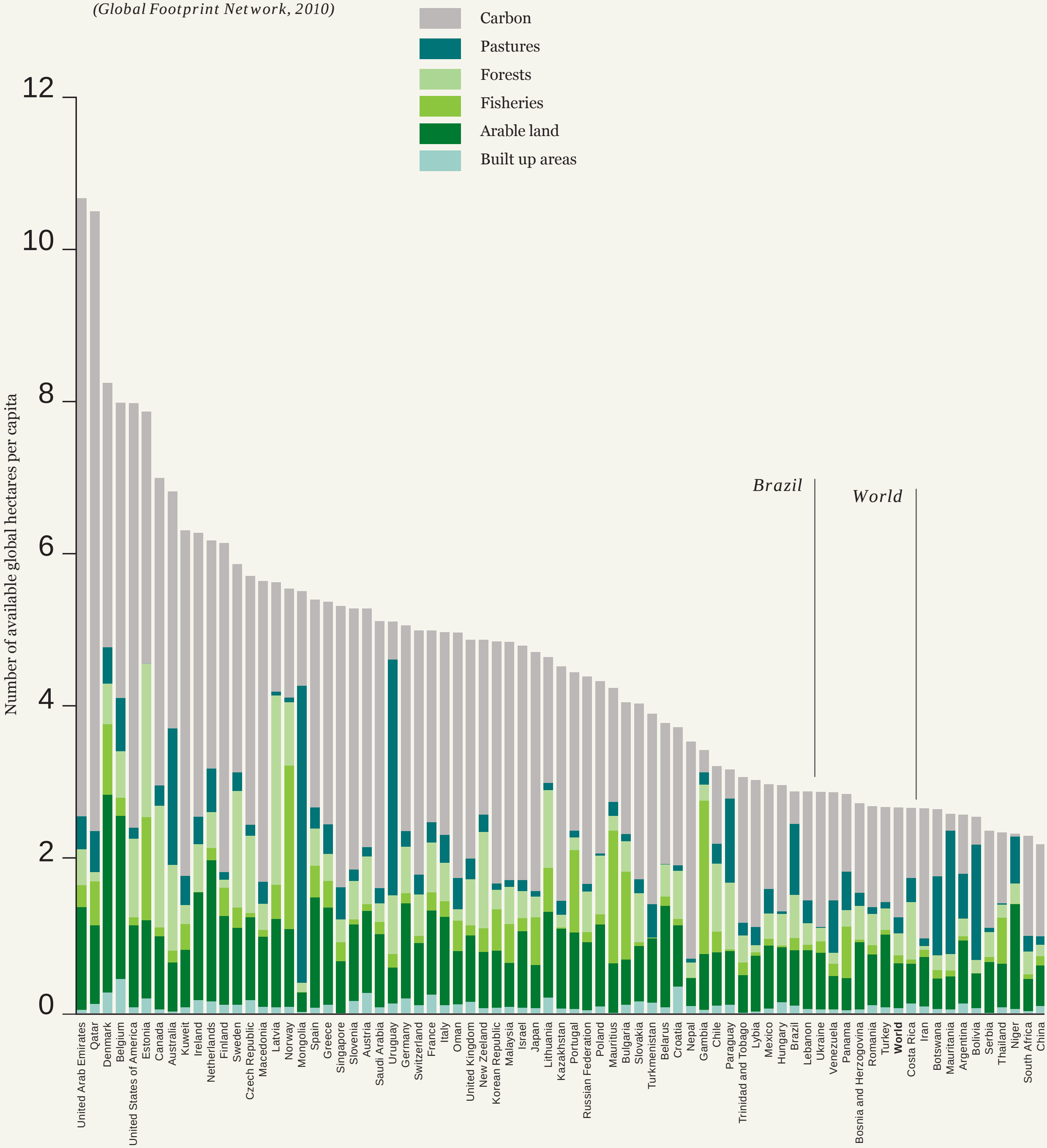
In the same way the CO_2 emissions may exceed the rhythm at which the forests and other ecosystems can absorb them, which means that additional lands will be necessary to fully sequester the emissions.

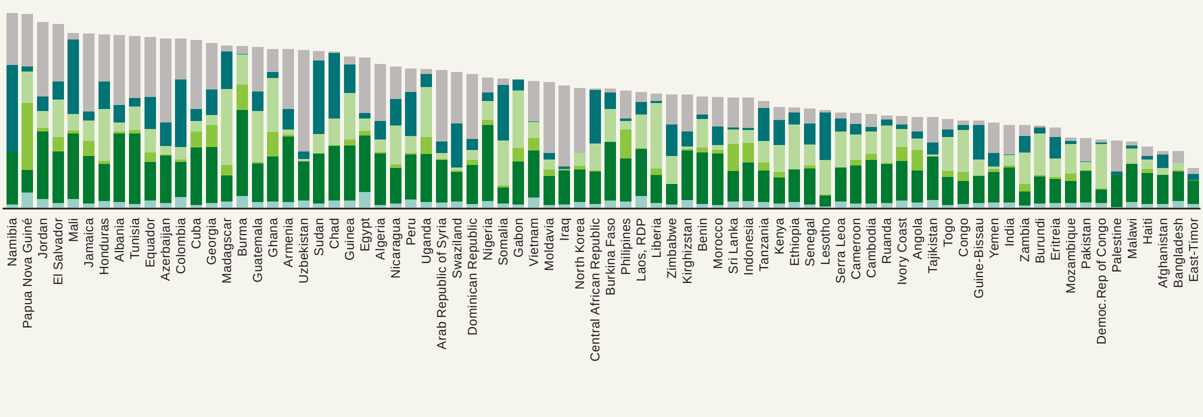
The exhaustion of natural resources has already ocurred in some places. One example is the collapse of the cod stocks in Icelandic fisheries that took place in the 1980s. What usually happens in such cases is that humanity seeks out other areas or other species that are still common, to exploit. The same phenomenon can be observed in regard to forest resources.

At current levels of consumption, however, sooner or later those other resources are going to run out as well and also, some ecosystems will collapse even before their resources have been completely exhausted.

There is also the question of the evident excess of greenhouse gases that the vegetation has been incapable of absorbing. Increased CO_2 concentrations in the atmosphere lead to a rise in global temperatures and climate change. They also cause a process of acidification of the oceans. All of that represents greater pressures on the biodiversity and on the ecosystems.

Figure 7: *Ecological Footprint by countries and per capita, 2007 (Global Footprint Network, 2010)*





Namibia
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El Salvador
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Madagscar
Burma
Guatemala
Ghana
Armenia
Uzbekistan
Sudan
Chad
Guinea
Egypt
Algeria
Nicaragua
Peru
Uganda
Arab Republic of Syria
Swaziland
Dominican Republic
Nigeria
Somalia
Gabon
Vietnam
Moldavia
Iraq
North Korea
Central African Republic
Burkina Faso
Philipines
Laos, RDP
Liberia
Zimbabwe
Kirghizstan
Benin
Morocco
Sri Lanka
Indonesia
Tanzania
Kenya
Ethiopia
Senegal
Lesotho
Serra Leoa
Cameroon
Cambodia
Ruanda
Ivory Coast
Angola
Tajikistan
Togo
Congo
Guine-Bissau
Yemen
India
Zambia
Burundi
Eritreia
Mozambique
Pakistan
Democ.Rep of Congo
Palestine
Malawi
Haiti
Afghanistan
Bangladesh
East-Timor

THE FOOTPRINT FAMILY AND THE ENVIRONMENTAL PRESSURES THEY REPRESENT

The three indicators – Ecological Footprint, Carbon Footprint and Water Footprint – make it possible to represent various facets of the consequences and impacts on natural capital stemming from human activities.

Insofar as it reveals the bio-productive area that people demand because of their resource consumption and CO_2 emissions, the Ecological Footprint can be used to obtain an idea of their impact on the *biosphere*. By quantifying the effect of resource use on the climate, the Carbon Footprint describes the impacts that humanity has on the *atmosphere*. By monitoring the real and hidden flows of water, the Water Footprint can be used to obtain information about humanity's impacts on the *Hydrosphere*.

The Footprint Family can best be described as a set of indicators associated to consumption capable of monitoring human pressures on the planet in terms of appropriating ecological assets, greenhouse gas emissions and fresh water consumption and pollution. They monitor three key ecosystem compartments: the biosphere, the atmosphere and the hydrosphere.

The three indicators can be considered as complementary to the discussion on sustainability and as tools capable of monitoring different aspects of human pressures on various compartments that provide support for life on Earth.

THREE KEY ECOSYSTEM COMPARTMENTS ARE MONITORED: THE BIOSPHERE, THE ATMOSPHERE AND THE HYDROSPHERE

Ecological Footprint (EF)

Scientific Question

Considering the amount of available resources (biocapacity) on the local and global scales, and the biosphere's capacity to regenerate them, what amount of resources can human beings consume directly or indirectly?

Principal message

Foster recognition of ecological limitations, safeguard the ecosystems' pre-conditions (healthy forests, clean water, clean air, fertile soils, biological diversity, and others) and guarantee the functionality of ecosystem services thereby permitting the biosphere to provide long-term support for human life.

Data and sources

The Ecological Footprint makes use of:

- Data on local production, imports, exports of agricultural, forestry and fishery products (FAOSTAT, UN, Comtrade, and others);
- Land use and settlement data (FAOSTAT, and others);
- Incorporated CO_2 data (local and traded – IEA, and others);
- Data on land productivity (FAOSTAT) and potential productivity of crops (FAO-GAEZ model) – all those data are needed to be able to express the results in terms of global hectares.

Unit of measurement

The unit of measurement for the Ecological Footprint is the global hectare (gha) of bio-productive land. Gha is not just a measure of area, but a unit of ecological production associated to an area. Results can also be expressed in simple hectares.

Indicator Coverage

Aspects of the Ecological Footprint:

- It is a multi-dimensional indicator that is explicit for a given time that can be applied to products, cities, regions, nations and the entire biosphere. In the period 1961–2006, more than 200 countries had their Ecological Footprints calculated (cf. Ewing *et al*., 2009a);

- It documents human society's direct and indirect demands on the capacity of sources (resource production) and 'wells' (that sequester carbon);

- It informs the dimensions of the demands on natural resources as well as the supply of those resources by the biosphere;

- It is the only aggregating ecological benchmark;

- It fosters recognition of ecological limitations, the protection of ecosystems and the maintenance of their services.

Usefulness in policy formulation

With the use of the Ecological Footprint it is possible to:

- Evaluate the planet's limitations and identify ecosystems that are under society-induced pressure;

- Monitor society's progress towards developing minimum sustainability criteria (demand ≤ supply);

- Monitor the efficiency of resource use policies in general and current levels of resource use;

- Analyse the consequences of using renewable forms of energy as alternatives;

- Provide the general public with information on the environmental impacts of differing life styles;

- Accompany the pressures on biodiversity;

- Demonstrate the unequal distribution of natural resource use and the need to implement international policies that work towards establishing an equilibrium on the use made of natural resources by the countries of the world;

- Implement international policies directed at reducing natural resource consumption.

Positive Aspects

The Ecological Footprint makes it possible to compare human demands on nature with the offer of natural resources and in that light establish clearly defined goals. It establishes an assessment of the multiple anthropogenic pressures on renewable natural resources. It is a tool that is easy to understand and communicate and brings with it a strong conservationist message.

Negative Aspects

The Ecological Footprint is unable to cover all aspects of sustainability or address all areas of environmental concern especially those areas where there is no regenerative capacity. It reveals the pressures that are leading to degradation of natural assets (like the impoverishment of soils, the reduction of biodiversity) but it is incapable of predicting future impacts.

Another feature the footprint lacks is the ability to make a better definition of the impact in a specific geographic region.

Water Footprint

Scientific Question

Considering the natural capital/assets in terms of the fresh water (blue, green and grey)[9] needed for human consumption, the main question that the water footprint attempts to answer is: what volume of water does an individual, community or business need to produce or consume goods and services?

Principal Message

The primary aim of the Water Footprint is to demonstrate the hidden connections between human consumption and the use of water and the hidden connections between global trade and water resource management. In the first situation the footprint is not limited to the water that an individual community or business consumes directly but also considers how much water is used in the production of goods and services, the water that is embedded in economic activities. To that end it defines the concept of virtual water, which is the water that is actually part of world trade, embedded in the products that are negotiated in world trade.

9 *Blue Water*, is fresh water coming from surface or underground springs. *Green water* refers to rain falling directly on the soil without running off or penetrating to replenish water tables. *Grey water* refers to the volume of fresh water needed to assimilate the pollutant load stemming from anthropic processes based on quality standards in effect.

Data and sources

The Water Footprint is calculated on the basis of:

- Demographic data (World Bank);
- Data on the areas of arable land in the world (FAO) and on total renewable water resources and total water extraction (FAO);
- Data on international agricultural trading (PC-TAS) and industrial products (WTO);
- Local data on various aspects such as climate, farming patterns, irrigations, soils, the quality of percolated water, pesticide and fertilizer use indexes and others.

Unit of Measurement

The unit of measurement is usually a volume of water per time unit (m^3/year for example). When production processes are being evaluated the Water Footprint may be expressed as the total volume of water used in production divided by the weight of the products produced and therefore expressed as m^3/ton or litres/kg). It must be stressed that water footprint can also be expressed for a given area as a function of a time unit. That is usually the case with the water footprint calculations for river basins or countries.

Indicator Coverage

The Water Footprint:

- Is a geographically explicit multi-dimensional indicator. It can be calculated for products, public organizations, economic sectors, individuals, cities and nations. In the period 1997-2001, 140 nations were analysed using this indicator (cf. Chapagain and Hoekstra, 2004);
- Documents direct and indirect use of water resources as a source (demand for blue water and green water) and as a 'well' (grey water for pollution dilution));
- Only measures the demand side in terms of fresh water consumed (according to sources) and polluted (according to pollution type) by human activities;
- Seeks to analyse the consumption of water resources by economic processes, production, trade and services.

Usefulness in policy formulation

The Water Footprint:

- Endows water resource management and governance with a new global dimension;
- Enables nations to gain a better understanding of their dependence on water resources beyond their own frontiers;
- Offers river basin management authorities more precise information on scarce water resources that are being allocated for products being exported with low financial value;
- Suggests to companies ways they can monitor their dependence on scarce water resources along the length of their supply chains and in their production processes;
- Demonstrates the unequal distribution of water resource use and the need to implant international policies stimulating equilibrium in water resource use among the different countries.
- Promotes a discussion of the need to for international policies directed at reducing water resource consumption.

Positive Aspects

The Water Footprint presents a spatial distribution chart of a country's water resource demands. It expands traditional analyses restricted to 'water extraction' by including the categories of green and grey water. It visualises the connections between local consumption and the global appropriation of fresh water. It also integrates water use and water pollution as elements of the production chain.

Negative Aspects

The Water Footprint only analyses human demands for water and not the demands of the ecosystems as a whole. It depends on local data that is often unavailable or difficult to collect. It is liable to truncation errors in the calculations. No studies have been done regarding data uncertainties although they are known to be significant. Calculations of 'grey' water rely heavily on estimates and suppositions.

Carbon Footprint

Scientific Question

What is the total amount of Greenhouse Gases–(CO_2, CH_4, N_2O, HFC, PFC and SF_6) emitted directly or indirectly as a result of human activities or accumulated along the life cycle of products?

Principal Message

The Carbon Footprint[10] is mainly based on the consumption of goods and services and the greenhouse gases generated by that consumption. Thus it serves as complement to the inventories made by the Kyoto Protocol that calculate the greenhouse gas balance sheets associated to production only.

Data and sources

The Carbon Footprint makes use of:

- Economic data from national accounts (Materials–Products matrixes, Supply, utilization and others);
- International trade statistics (UN, OECD, GTAP, and others);
- Environmental Accounts data on GG emissions (IEA, GTAP, and others).

Unit of Measurement

The Carbon Footprint may measure total carbon or carbon equivalent (CO_2e[11]) that is emitted directly or indirectly by a given human activity or accumulated during the useful life of a product. The unit used to express it is the Kg of CO_2 when only carbon dioxide is being considered, or Kg of carbon equivalent when other greenhouse gases are being taken into account as well. To avoid suppositions and introducing uncertainties, there is no conversion to express it in terms of area. Often however it is expressed in units *per capita*.

10 Carbon Footprint is used here to determine emissions associated to human production activities, which means that its significance is different from that of the GG emissions Inventory.

11 11 Carbon equivalent – defines the equivalence of other gases in relation to CO2.

THE CARBON FOOTPRINT ALLOWS FOR A CLEAR ASSESSMENT OF THE HUMAN CONTRIBUTION TO CLIMATE CHANGE

Indicator Coverage

The Carbon Footprint:

- Is a multi-dimensional indicator that can be applied to products, processes, companies, industries, governments, populations and so on. Up until 2001, 73 nations and 14 regions had been analysed using this calculation (cf. Hertwich e Peters, 2009);
- Documents all direct and indirect GG emissions stemming from the use of resources and products (sources);
- Only measures the aspect of demand in terms of Greenhouse Gases emitted;
- Does not offer any benchmarking possibilities.
- Has no defined limits established.
- Seeks to analyse the carbon emissions associated to economic processes, to production trade and services.
- Can only measure the demand side of the emissions related to the production of a product or a service.

Usefulness in policy formulation

The Carbon Footprint offers:

- An alternative point of view for an international policy on climate change insofar as it complements the regional and territorial approach of the UNFCCC;
- A better understanding of each country's responsibility thereby facilitating international cooperation and partnerships between developed and developing countries;
- A contribution towards the conception of a harmonised international price for GG emissions;
- A more precise charting of the unequal distribution of natural resource use and the need to implement international policies promoting equilibrium in resource use among the different countries;
- Supporting information for the discussions on the need for international policies directed at reducing natural resource consumption.

Positive Aspects

The Carbon Footprint makes it possible to obtain a clear assessment of human contributions to climate change and it is consistent with economic and environmental accounting standards. In fact the data on which the Carbon Footprint calculation is based are relatively more consistent than those of the other Footprints.

Negative Aspects

The Carbon Footprint is not capable of accompanying the whole range of human demands on the environment. Additional studies are essential for any analysis of the impacts of climate change in the national and sub-national scales. Efforts need to be made to construct tables similar to the MRIO (Multi-regional Input Output) tables and related environmental extensions. There is also no limit set for the Carbon Footprint. We do have a limit in regard to global emissions but that does not mean that it has been incorporated into the Carbon Footprint calculations.

Complementary quality

The three indicators that form the footprint family are mutually complementary in regard to any evaluation being made of human pressures on the planet.

Adopting a form of measurement based on consumption makes it feasible to evaluate direct and indirect demands that human beings are making of the natural capital and to obtain a clear understanding of the 'invisible' or hidden' sources of human pressure. We need to be aware that not all dimensions of the worth and value of natural resources are captured by the indicators described above[12].

There are values attached both to use and to non use of natural resources. Among the use values that the indicators capture it is only possible to map situations of direct use of natural resources. We cannot capture the indirect forms of use that nature offers like ecosystem services or the values associated to the future uses of natural resources.

So it must be explained that it has only been possible to capture a part of the all the values constituted by natural resources – as can be seen from Figure 8 below.

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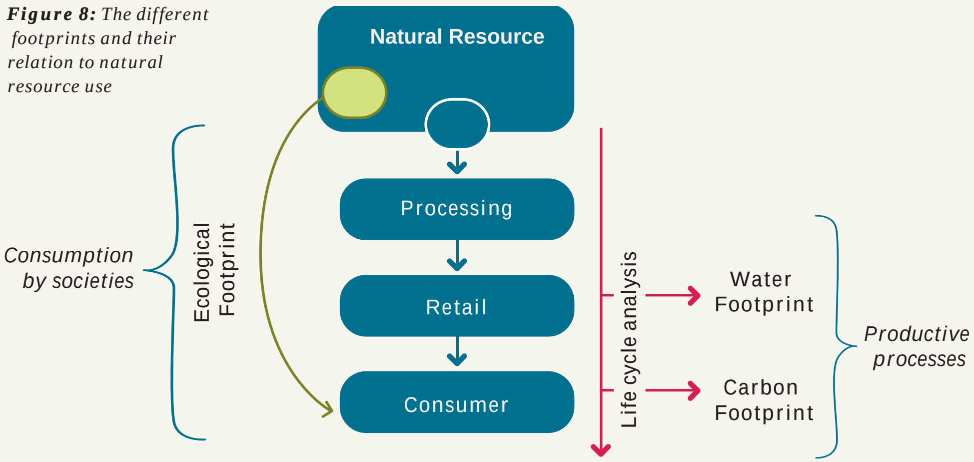
12 Pearce, D.W.T.K (1990): The Economics of Natural Resource and the Environment. HarvesterWheatsheaf, New York.

All three footprints are aimed at capturing the different forms of pressure being put on natural resources by human consumption. The consumption itself is associated to a process that transforms raw materials along complex chains of custody involving a variety of agents and represented in a simplified manner in the illustration.

Figure 8: *The different footprints and their relation to natural resource use*



Once the biocapacity has been delineated the Ecological Footprint establishes a direct link between the renewable natural resources effectively available and their consumption in the form of goods and services, without considering certain aspects more strictly associated to the production chains such as processing and distribution. These aspects are much more related to analyses of product life cycles, which evaluates their useful lives, passing through all the stage and processes involved until the product is placed on the market, or depending on the scope of the analysis, until the disposal of its residues has been completed. In the latter case, each stage of production can be analysed separately.

The Carbon Footprint and the Water Footprint are much more closely related to analyses pof product life-cycles or processes than the Ecological Footprint. That is one of the main differences between these sustainability indicators.

However, only the Ecological Footprint and the Water Footprint are capable of accounts that include an evaluation of the planet's capacity as a source (resource production) and also its capacity as a ‘sink’ (residue assimilation). In the case of the Carbon Footprint, all it does is to analyse the GG emissions that generate impacts on the biosphere. Of the three, the Ecological Footprint is the only indicator capable of establishing an ecological benchmark (biocapacity) demonstrating human pressure on the planet. Anthropic GG emissions are tracked as much by the Ecological Footprint as by the Carbon Footprint, but the underling intention of the Ecological Footprint in regard to carbon, is to measure the volume of ecosystem services needed to absorb those residues.

Furthermore, the Ecological Footprint is based on the premise that we are making use of natural assets that are finite and that means that it is not sufficient merely to improve efficiency in resource use especially when the ricochet effect of economies is considered.[13] There is an urgent need to think in terms of the qualitative growth of the economies and their interactions with the environment given that the extraction of renewable natural resources is also influential in determining land settlement patterns.

The three indicators reveal the unequal distribution of resource use among the inhabitants of the world’s different regions. Based on such data it is possible to provide support for development policies and endorse concepts such as contraction and convergence, environmental justice and fair sharing.

ECOLOGICAL FOOTPRINT AND WATER FOOTPRINT PROVIDE ACCOUNTS OF THE PLANET’S CAPACITY AS A SOURCE (RESOURCE PRODUCTION)

13

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THE ECOLOGICAL FOOTPRINT

Forecasts for the year 2050 suggest that if we carry on with present day patterns we will be needing more than two planets to keep up or consumption level. A global effort to revert that tendency is urgently needed so that people can go back to living within limits of the planet's biocapacity.

The average global Ecological Footprint today is 2.7 global hectares per person but the available biocapacity is only 1.8 global hectares per person. That means the global population is running up n a serious ecological deficit. Right now humanity needs 1.5 planets to maintain its current consumption patterns and that is putting planetary biocapacity at great risk.

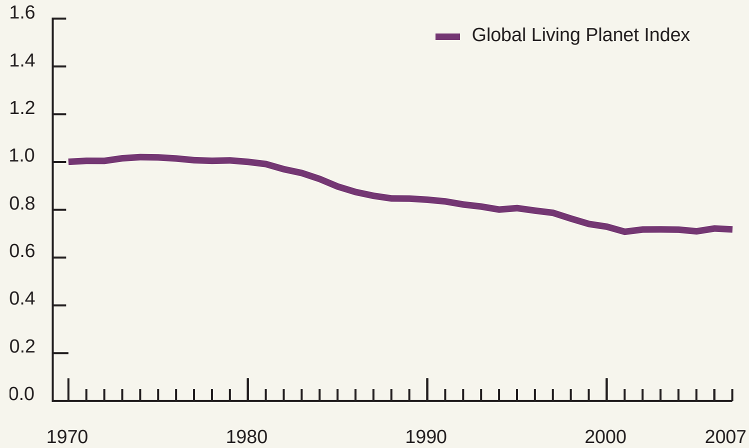


Figure 9: Living Planet Index

The global index shows that vertebrate species populations were reduced by almost 30% between 1970 and 2007 (WWF/ZSL, 2010)

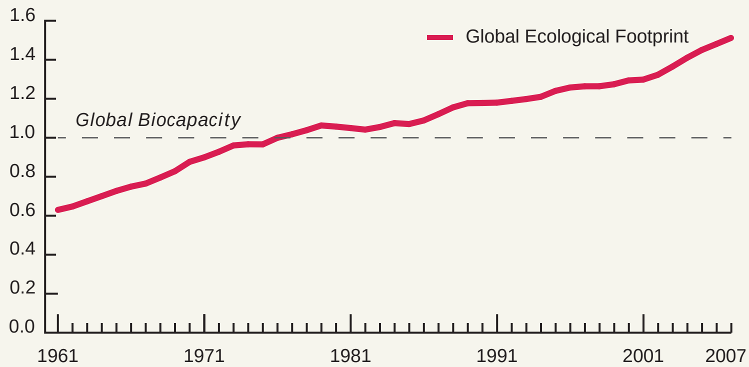


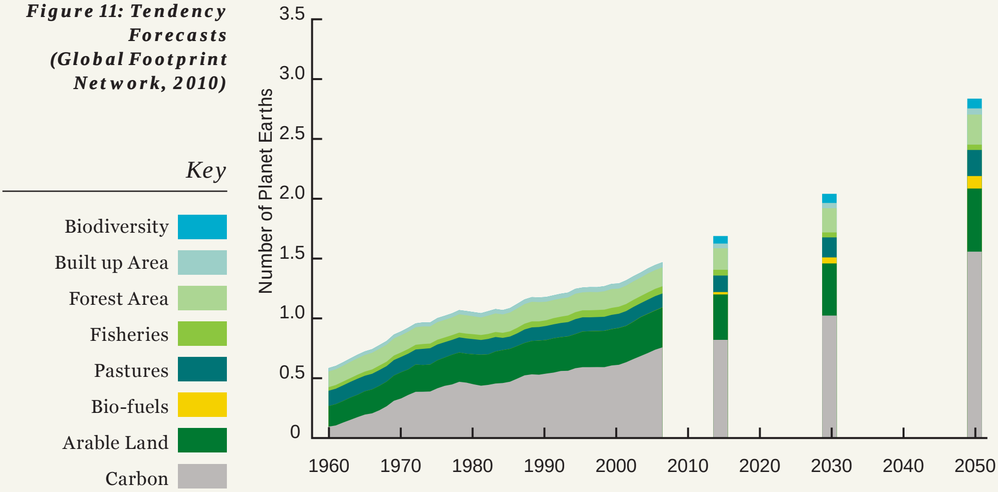
Figure 10: Global Ecological Footprint Index

Human demands on the biosphere more than doubled from 1961 to 2007 (Global Footprint Network, 2010)

By consuming more resources than are actually available we start to exhaust the supply of them and undermine their capacity to regenerate and continue sustaining our populations.

Since the end of the 1960s humanity has been consuming over and above the possibilities of resource regeneration and that has gone on right down to the present day. Forecasts for the year 2050 suggest that if we carry on with present day patterns we will be needing more than two planets to keep up our consumption level. A global effort to revert that tendency is urgently needed so that people can go back to living within limits of the planet's biocapacity.

Figure 11: Tendency Forecasts (Global Footprint Network, 2010)



Brazil's Ecological Footprint

The Brazilian Ecological Footprint is 2.9 global hectares per inhabitant, showing that the average consumption of ecological resources by a Brazilian person is close to the global Ecological Footprint average per inhabitant of 2.7 global hectares.

An examination of the Brazilian footprint in a temporal series shows only a small tendency to increase up until 2005 indicating a relative stability in consumer patterns over that period.

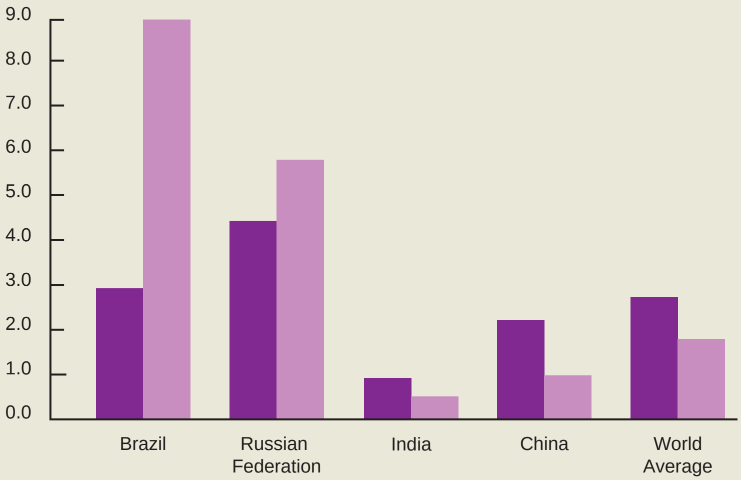


Figure 12: Comparison of Brazilian ecological Footprint and Biocapacity with BRIC countries (Taken from: Results from National Footprint Accounts 2010 edition, GFN)

Key

Ecological Footprint
Biocapacity

On the other hand, however, Brazilian biocapacity has been showing a strong decline over the years due to the impoverishment of ecological services and the degradation of the ecosystems (figure 13).

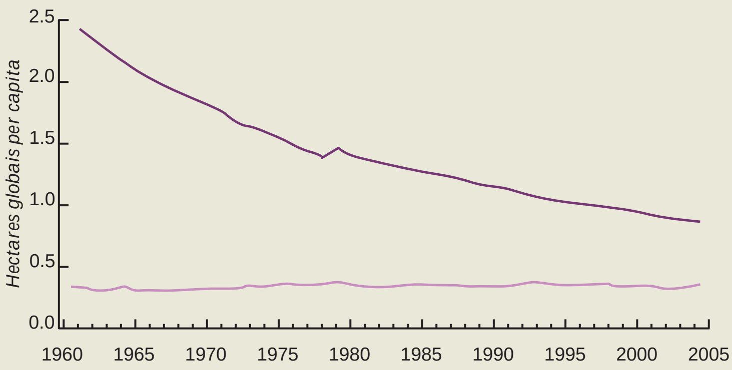


Figura 13: Consumption Categories x Ecological Resources

Key

Ecological Footprint
Biocapacity

Even so Brazil occupies an important position on the world scene as one of the planet's greatest ecological creditors and is well situated in the context of the new green economy. To continue to occupy the position of ecological creditor, Brazil must revert this decline in its biocapacity by unfolding conservation actions and actions to make production more eco-efficient in a bid to diminish the Ecological Footprint of its population by adopting more conscientious consumer habits and maintaining demographic stability.

CAMPO GRANDE'S ECOLOGICAL FOOTPRINT

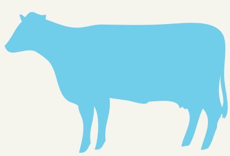
In order to calculate the Ecological Footprint of the population of the City of Campo Grande, the ecological resources that the population is putting pressure on must first be identified and the way they are being consumed must be verified. To that end, ecological resources were classified into six categories and the consumer patterns were also organised in six categories that embrace the various items that the population acquires.

By cross-referencing the information collected on consumption with those collected on ecological resources demanded by the Campo Grande populace, we obtain a matrix of consumption and land use patterns associated to the capital's inhabitants. In turn the matrix makes it possible to identify where Campo Grande's is putting most pressure not only in terms of the demand on resources but also identified by the specific categories of consumption it is associated to.

To provide a better understanding of the allocation of resources on the one hand versus consumption on the other we will now present the different types of ecological resource considered and the categories of consumption.

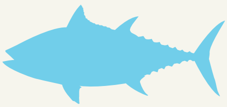
Ecological Resources

Agriculture – this refers to the areas of arable land the population needs to produce the vegetable foods, drinks produced on the basis of agricultural products (coffee, teas, beers, etc.) fibres of vegetable origin (cotton, flax, etc.) vegetable oils and other products stemming from agricultural activities. In the context of the Ecological Footprint, agriculture is considered to be a renewable biological resource insofar as production depends on arable land, which although it may be finite in size, generates resources on a regular basis. The loss of arable areas through erosion, exhaustion of the soils, desertification, salinization or being paved over leads to a decline in the biocapacity of this resource (agriculture).



Pastures – are areas covered by natural vegetation or cultivated but destined for feeding domestic animals to produce meat, dairy products, wool, animal fats and other products of animal origin. Just like agriculture, the pastures are finite areas for resource generation but they are also considered as a planetary biocapacity resource.

Forests – in the Ecological Footprint context, they are areas covered by natural or cultivated arboreal vegetation dedicated to the production of woods and fibres for human use. The forests too have finite sizes and resource generating capacities and they are considered to be one of the planet's ecological resources.



Fisheries – in terms of the Ecological Footprint, these are marine or river areas for the production of fish and other aquatic organisms for human consumption. Fish stocks in the rivers lakes and oceans are renewable but their regenerative capacity is directly affected by the intensity and volume of catches so that it is one of the planet's measurable ecological resources. Severe over fishing of fishery resources has led to a decline in the biocapacity of the fisheries as an ecological resource.

Built up areas – are considered in Ecological Footprint calculations as being an indirect resource. The built up areas were once biologically productive areas and so they are included in the populations Ecological Footprint account. Urbanisation and construction patterns show that built up areas are mostly situated on arable land and so they have an influence on the footprint similar to agriculture.

Energy and CO_2 Absorption – fossil fuels are not classified as ecological resources because there is no biological renovation of them and their eventual renewal would be on a time scale where it would be irrelevant for humans. However, the residues generated by their combustion, among them CO2 ne$_e$d to be absorbed by the ecosystems in order to keep the planet's temperature stable. Thus the use of these fossil resources is measured indirectly by the quantities of residues that need to be processed. When we analyse the question of greenhouse gases in Ecological Footprint accounting, we calculate the areas of preserved forests needed to sequester those gases. That means that they are not measured in CO_2 equivalents as is the case in climate change calculations, but instead, in the number of global hectares required to absorb them. Under the heading 'energy and CO_2 absorption' the areas that need to be inundated by hydroelectric dams to produce electricity are also considered.

Consumption Categories

Nutrition – food and alcoholic and non alcoholic drinks consumed in homes. Meals and drinks in restaurants and bars appear under the heading services.

Housing – considers expenses related to housing, payment of rent, occasional repairs, home maintenance, heating or cooling and electricity and fuel consumption associated to homes.

Mobility – refers to the populace's spending on transport, vehicle purchase, collective transport and fuel.

Goods – consists of all the goods items for the home and items for personal use purchased by the population such as shoes and clothing, furniture and electronic equipment, leisure equipment, magazines and books, personal care items and others.

Services – congregates all the population's consumption in terms of water supply and other domestic services, health and hospital services, postal and communication services, cultural and recreational services, education, personal care and others.

Government – refers to services provided by the public authorities in the federal, state and municipal spheres.

Consumption Categories X Ecological Resources

This report was elaborated in a different way from the classical Ecological Footprint studies where the information presented only refers to ecological resources. It was decided to present the data classified not only by ecological resources but also by consumption category which imbues this publication with additional theoretical and practical value insofar as it does not limit itself to an analysis of the aggregated Ecological Footprint alone.

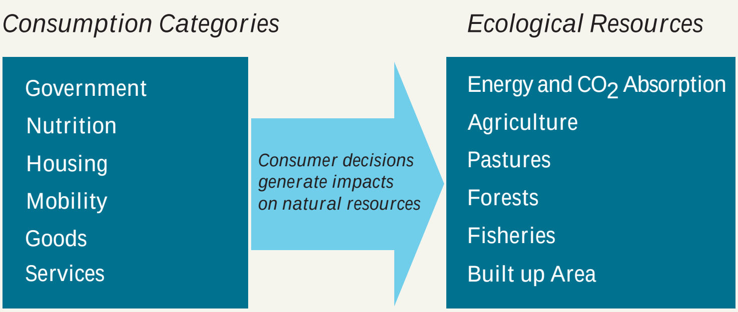


Figure 14: Consumption Categories x Ecological Resources

Consumer decisions generate impacts on natural resources

By distinguishing the pressures that the separate consumption categories (Nutrition, Housing, Mobility, Goods, Services, and Government) put on the planet's ecological resources (Agriculture, Pastures, Forests, Fisheries, Built up areas, Energy and CO2 absorption), we provide a tool to be used in the quest for more sustainable cities. We hope that by confronting the population of

Campo Grande with this evidence, it will, by means of its civil society organisations, class associations, government, companies and individuals, - manage to identify which activities and actions lead to degradation and consequently be more thoughtful in its consumer choices, either by reducing the volumes consumed or by preferring products and services that have lesser impacts (figure 14).

In the coming chapters we will set out the Ecological Footprint of the Campo Grande population in detail, identifying the consumption categories and indicating the ecological resources that are under the greatest pressure.

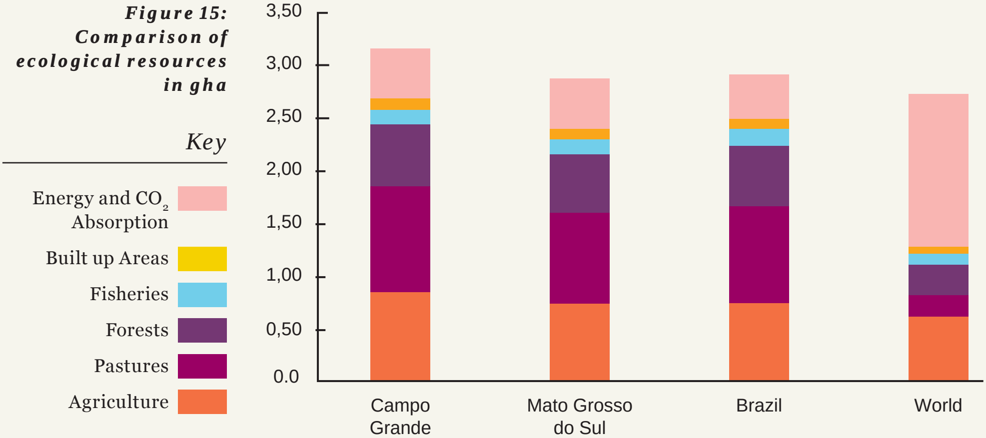
Campo Grande's Ecological Footprint

Campo Grande is the capital of one of the states that make up Brazil's Middle-west macro-region, Mato Grosso do Sul. There is archaeological evidence of human settlements in the region that date back to prehistoric times, but the first official records of the presence of modern civilization date back to 1872 and later in 1899 with the official registration of Campo Grande's existence as a municipality.

With its current population standing at 787,204 inhabitants[15], and its area of 8,093 Km² Campo Grande is home to 32% of the entire population of the state of Mato Grosso do Sul and 0.4% of the Brazilian population as a whole. Of that total population, 98.6% lives within the urban perimeter of the capital in 283,017 private households.

Figure 15: Comparison of ecological resources in gha

Key



15 IBGE cidades 2010: http://www.ibge.gov.br/cidadesat/topwindow.htm?1 consulted in March, 2011

Campo Grande's Ecological Footprint is to the order of 3.14 global hectares, which means that the populace makes use of 2,471,821 global hectares altogether which in turn amounts to 35% of the Ecological Footprint of the whole state and 0.46% of Brazil's Ecological Footprint.

Campo Grande's Ecological Footprint is 8% bigger than the Brazilian national Ecological Footprint, 10% bigger than the state of Mato Grosso do Sul's Footprint and 14% bigger than the global average Footprint (figure 15). The state of Mato Grosso do Sul, in turn, has an Ecological Footprint that is 3% bigger than the average footprint for Brazil as a whole.

Based on that data it can be stated that if everyone in the world were to achieve the same patterns of consumption as the citizens of Campo Grande then 1.7 planets the same as planet Earth would be needed to sustain humanity as a whole. Currently, in global terms we are consuming 1.5 planet Earths to sustain the world population.

When we compare the Ecological Footprint broken down into ecological resources, we can see that resource consumption in Campo Grande, albeit on a different scale, is very similar to the average Brazilian consumption in the way it is distributed among the categories and that its strongest demands are made on areas of pastures, arable land and forests (figure 16).

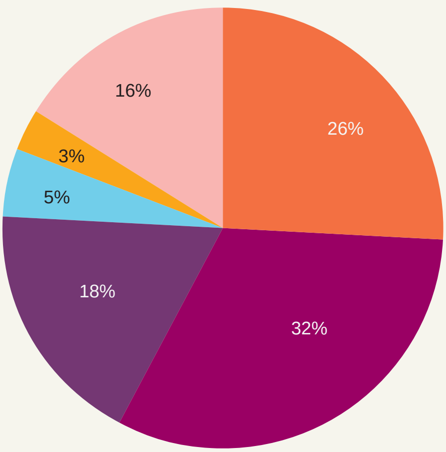


Figure 16: Ecological resources in gha/capita

Key

- Energy and CO_2 Absorption
- Built up Areas
- Fisheries
- Forests
- Pastures
- Agriculture

In regard to CO2 absorption we can detect a lesser pressure than the global average mainly due to the low level of GG emissions associated to the Brazilian energy matrix and the intensive use of biofuels in Brazil.

The resources represented by agriculture (grains, vegetables and plant products), pastures (meat production, leather, wool, animal fats and other animal-based products) and (wood, paper, fibres, essences, and land use conversion) represent 75% of the Campo Grande population's Ecological Footprint.

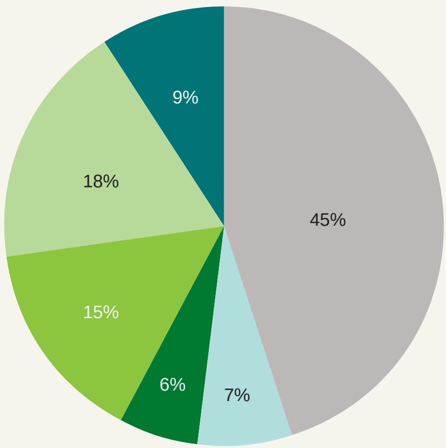
Such intense consumption of agricultural and pastoral resources becomes even more glaringly evident if we examine Campo Grande's Ecological Footprint broken down by consumption categories.

By consumption categories, Campo Grande's Ecological Footprint differs from the Brazilian national footprint in the following aspects: nutrition (6% more), housing (53% more), services (42% more), mobility and transport (10% more), goods (13% less). (Figure 17).

Figure 17: Campo Grande's ecological Footprint by consumption categories

Key

Nutrition
Housing
Mobility and Transport
Goods
Services
Government and Infrastructure



Converting Global Hectares into simple hectares

Although the unit of measurement used for the Ecological Footprint is the global hectare, to facilitate comparisons of the Ecological Footprints regardless of the actual productivities of their respective lands, we can re-convert global hectares back into regular hectares so that the Ecological Footprint becomes more understandable in terms of the demand for land areas.

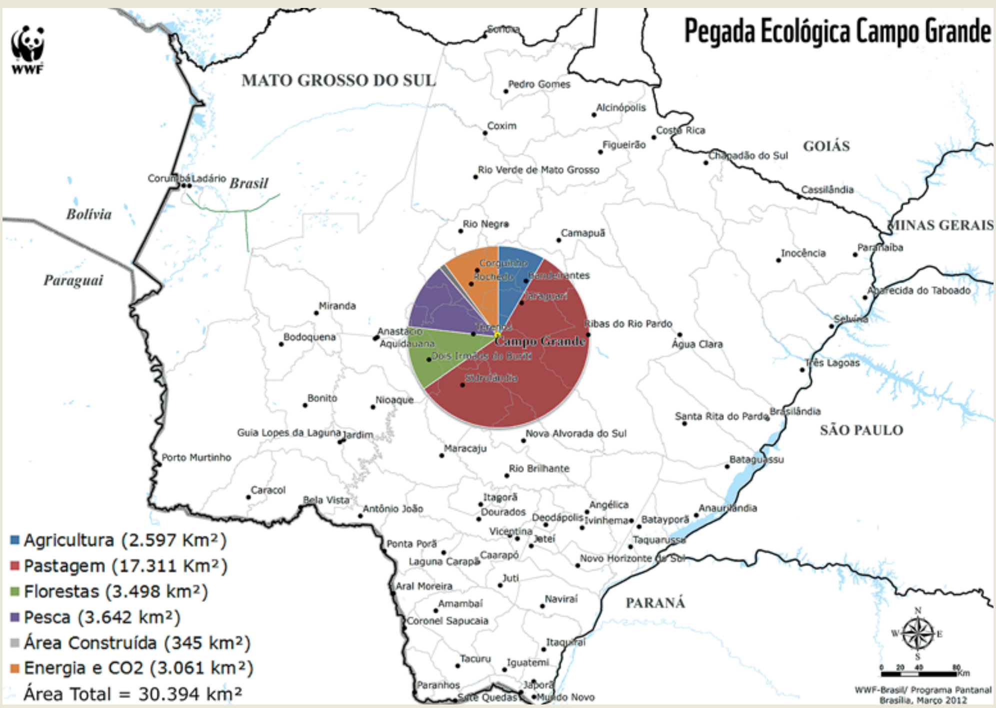
To undertake that conversion, we decided to use world average production figures to calculate Campo Grande's Ecological Footprint in global hectares, given that we had no way of knowing for certain whether all the ecological resources consumed by the population and represented by its Ecological Footprint have their origins within Brazilian territory.

As an example, it is known that, on average, Brazilian forests are almost 170% more efficient in terms of CO2 absorption than the global average, but how can we be sure that the CO2 emitted in Campo Grande is totally absorbed within Brazilian territorial limits? So we decided to convert the results obtained into world average values and not Brazilian ones. See chapter on Harmonising Bio-productive Areas – from hectares to global hectares – page 96.

In the case of Campo Grande we obtain the equivalent of a map that can be interpreted as showing the area that the population of Campo Grande needs to produce all the goods and services based on the use of renewable natural resources that it consumes as well as the areas that would be needed to absorb all the CO2 emissions generated by the city of Campo Grande which in this case amount to 30,400 Km^2 (see the map below) for the city to become self-sufficient. Thus, current consumption requires an area 4 times greater than the entire area of the municipality.

Obviously we have made certain suppositions but the map illustrates very well the relations between the consumption concentrated in the cities and the area that is theoretically needed to sustain that same consumption.

In the following text each consumption category for the city of Campo Grande will be analysed individually in regard to the ecological resources

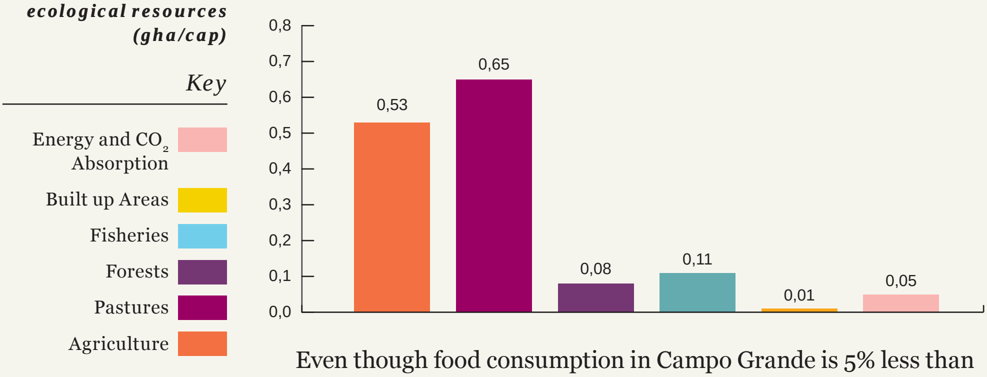


that are needed to supply the respective renewable resource consumption category. If we examine this kind of data it becomes so much easier to develop mitigation strategies or derive other strategies to foster good public management.

Nutrition

We can see that 45% of Campo Grande citizens' Ecological Footprint lies in the category 'nutrition' and the impact of that category on ecological resources can be seen in the figure below (figure 18).

Figure 18:* *Distribution of the consumption category nutrition among ecological resources (gha/cap)



Even though food consumption in Campo Grande is 5% less than the Brazilian average, its meat consumption is 13% higher. The Campo Grande citizen also consumes 10% more in alcoholic and non alcoholic beverages than the average Brazilian and if the analysis is restricted to alcoholic beverages, 30% more, mainly related to the consumption of Chopps (unpasteurised beer) and beer.

Meat

Almost a third of the Campo Grande's Ecological Footprint is in the area of pastures which amount to 795,076 global hectares, the equivalent of 1,728,426 ordinary hectares, more than twice the area of the entire municipality in areas of pasture alone to supply the meat and animal product needs.

On average the Campo Grande inhabitant consumes 13.5% more meat than the average Brazilian and is actually one of the worlds greatest meat consumers at a rate of almost 90 kg per person per annum, more than double the world average figure.[16] In comparison, Germany has a per capita consumption of 88.2 kg

16 Food and Agriculture Organization of the United Nations (FAO), FAOSTAT on-line statistical service (FAO, Rome, 2004).Available online at: http://apps.fao.org.

(2009)[17], and that figure includes red meat, pork, poultry and goat meat. It must be stressed that the figures refer to the consumption of various kinds of meat and not just beef.

Agriculture

Agriculture's Ecological Footprint in Campo Grande is the equivalent of 638,479 global hectares, and corresponds to a little over a quarter of the population's entire footprint. Among the most relevant elements making up the Agricultural Footprint are foodstuffs of vegetable origin answering for 67% of the total calculation for this category

It is interesting to observe that the Ecological Footprint associated to those foodstuffs are largely imported from other places. According to the Mato Grosso do Sul Ceasa, 82% of the foodstuffs distributed in 2008 originated from other states[18]. Programmes stimulating local organic production of foodstuffs such as greens, vegetables and fruits could reduce the CO_2 emissions associated to the transportation of such items as well as improving their quality and lowering prices.

Changing habits in Campo Grande

One hundred and thirty institutions in the government schools network already have organic beef on their school meals menus. The meat comes from certified organic livestock ranches in the Pantanal associated to the Brazilian Organic Livestock Association which is part of a WWF-Brasil supported project.

That novel fact is the result of a public procurement by tendering process run by the municipal government at the beginning of this year for the acquisition of food supplies for school meals. Among the selection criteria was the requirement that the products should be organic. The government consumes 11 thousand kilos of meat a month in providing school meals to 70 thousand students in government schools. This initiative is not only an example of responsible purchasing by a public authority but it is also in harmony with the directives of the National School Meals Programme (PNAE), which specifically favours products from responsible farming that employs most rural workers and is based on practices that favour nutritional diversity and protection of the environment.

For further information:
http://www.wwf.org.br/informacoes/sala_de_imprensa/?25480/Merenda-das¬escolas-de-Campo-Grande-MS-tem-carne-orgnica

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17 WWF-Germany (2011): Fleischfrisst Land, Report on meat consumption and the implications on land settlement for the production of raw materials.

18 Ceasa-MS http://www.ceasa.ms.gov.br/empresa.htm / consulted in February 2011

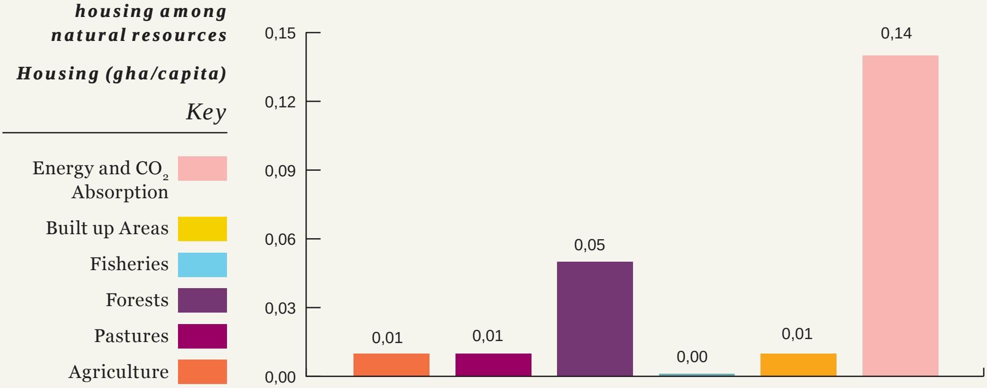
Housing

The housing sector is responsible for 7% of Campo Grande's Ecological Footprint in global hectares, which is 53% more than the national average figure. The main factors making that difference are: electricity consumption, household maintenance services and air conditioning. The housing consumption category has a strong influence on energy and CO_2 absorption as the graph below clearly illustrates.

Figure 19: Distribution of the consumption category housing among natural resources

Housing (gha/capita)

Key



Housing

The principle of sustainable housing is not achieved merely by using recycled materials or materials with low environmental impacts. Sustainable buildings need to be energy-efficient and to that end they must embody engineering and architectural principles that maximize the use of natural light the free circulation of air, thermal insulation, and rationalized use of water throughout the useful life of the building.

It is important to reiterate that the Ecological Footprint does not include non-renewable natural resources in its accounts. As an example, the iron used to produce the steel elements used in construction is not accounted for, considering that it is a material that cannot be regenerated on the time scale associated to human life spans. However, the charcoal that is used in the steelworks furnaces that produce the steel that goes into construction is accounted for in the category of forest-based ecological resources.

Air conditioning

Air conditioners and air coolers may have a significant impact on the environment that goes beyond the amount of electricity they consume when they are working. Conventional air conditioning units make use of refrigerating gases known as CHFs and if those gases are released into the atmosphere their effect in global warming is 11,700 times worse than that of CO_2[19].

Furthermore many of the older models still being sold in Brazil make use of a refrigerating gas called R-22, which not only contributes to global warming but reacts with the ozone in the atmosphere. For that reason the Montreal Protocol recommended that its use should stopped[20].

Mobility and Transport

This category answers for 6% of the municipality's Ecological Footprint. Urban mobility in Campo Grande has an impact 10% lower than the Brazilian average as can be seen in the figure below (figure 20).

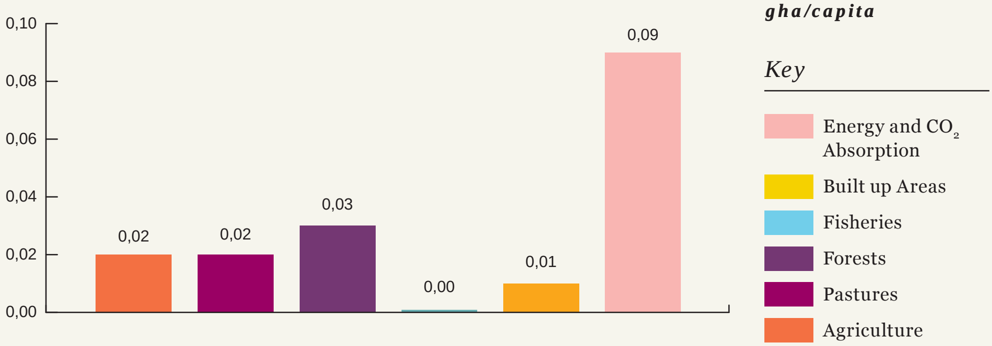


Figure 20: Distribution of the category mobility among natural resources in gha/capita

While it is true that the average Campo Grande citizen spends more on private vehicle purchasing than Brazilians in general, fuel consumption and the consumption of other forms of transport are lower. More in-depth studies of mobility in Campo Grande could identify ways to maintain this good indicator but from the present study we can conclude that Campo Grande's inhabitants travel less and spend less time in transit than those in the rest of the country.

19 http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/3_6_PFC_HFC_NF3_SF6_Semiconductor_Manufacturing.pdf

20 http://www.protocolodemontreal.org.br/001/00101001.asp?ttCD_CHAVE=1221&btOperacao=

How to maintain the good level of this indicator

Campo Grande's road network enables its citizens to get around rapidly and efficiently but it also stimulates the consumer option for a private vehicle as the only means of transport. The table below shows the growth of the municipal vehicle fleet and the evolution of its population over the same period.

The city's flat relief is good for cyclists and extending the network of cycle ways could be one way of encouraging the population to use that means of transport in a safe environment.

Furthermore, increased investment in public transport to provide fast, comfortable locomotion accessible to the public at large a would be stimulus for the population to make more use of collective transport and relegate private vehicles to second place.

In short, investments should be made in diversifying transportation options available to the public so that this indicator maintains the good level, impacts on the environment are reduced and better quality is aggregated to the lives of the populace. Incentives for the diversification of means of transport could contribute to maintaining the low level of impacts stemming from urban mobility.

Goods

Consumer goods represent 15% of Campo Grande's Ecological Footprint and the level of this indicator of the city's impacts is good because it shows that consumer goods impacts 13% less than the Brazilian average.

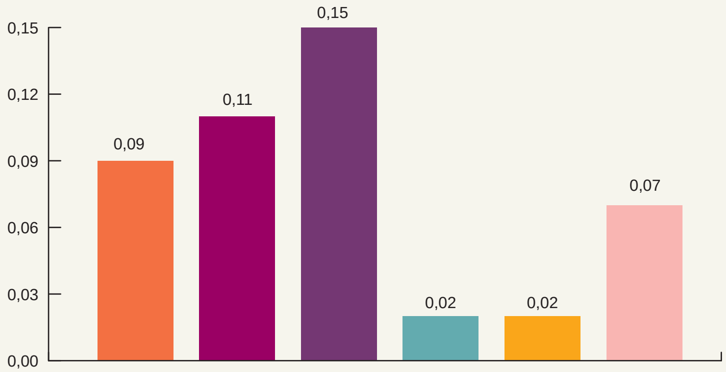


Figure 21:

Distribution of the category goods among natural resources

Goods (gha/capita)

Key

Energy and CO_2 Absorption
Built up Areas
Fisheries
Forests
Pastures
Agriculture

How to maintain the good level of this indicator

Generally speaking the Campo Grande residents have a lower level of consumer goods consumption than the Brazilian average. The same is true for the population of the state of Mato Grosso do Sul as a whole so that this indicator is currently at a good level.

However like the Brazilian population at large, the people of Campo Grande are currently expanding their purchasing power in relation to material goods. With the advent of easier access to credit, a noticeable increase in consumer goods consumption is in progress. Campaigns directed at consumers stimulating responsible use of credit could help to keep this indicator at a good level as well as avoiding the population's getting embroiled in debt.

The study revealed that the consumer goods items that place the greatest pressure on the environment are clothing which is responsible for 12% of the part of the footprint generated by this category, leisure and gardening equipment and pets generating 17% of the this category's footprint and most of all tobacco which contributes 27% of consumption in this category.

Thank you for not smoking!

Tobacco has a considerable impact on the Brazilian Ecological Footprint and similarly on the footprint of Campo Grande. Tobacco consumption alone is responsible for almost 4% of the municipality's total Ecological Footprint. The information gathered in this study does not allow us to state categorically that there are fewer smokers among Campo Grande residents or that they smoke less than the rest of the Brazilian population, but we can state that they spend less on tobacco so it is reasonable to assume that those two affirmations are true.

On average, Brazilians spend 3.52 Brazilian reals a month on tobacco while people in Campo Grande spend only 2.43 reals.

Municipal campaigns of prevention against the smoking habit and assistance for those that want to free themselves from addiction to tobacco could bring with them added benefits by easing the pressure on the environment and improving the population's health.

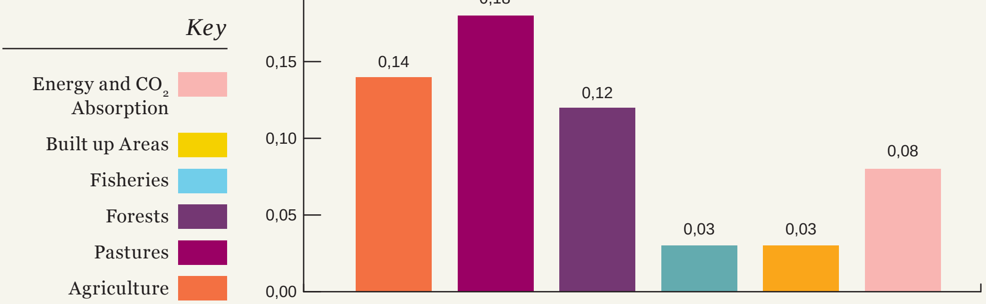
It is interesting to note that the study of consumer patterns as part of the Ecological Footprint calculations makes it possible not only to identify impacts on the environment but also potential public health problems, peoples habits and routines, and other aspects that are useful for the municipality's administration. In that sense the Ecological Footprint shows itself to be a cross-cutting tool that can contribute towards sustainable development, and assist government administration, management and planning.

Services

Services answer for 18 % of Campo Grande's Ecological Footprint, which is 42% higher than the national average. The following graph gives a clear idea of the profile of services consumption:

Figure 22: Distribution of the category services among natural resources

Services (gha/capita)



Pastures, Agriculture and Forests

The ecological resources of pastures, agriculture and forests are under the greatest pressure from services and they are largely consumed under the heading Restaurants. Consumption in restaurants generates 50 % of the total footprint that services are responsible for. The services footprint in Campo Grande is two and a half times the size of the Brazilian average, the item recreational and cultural services contributes slightly less than the national average and the consumption of private hospital services is only half the national average.

The category services seems to have an impact pattern that is a miniature version of the total footprint pattern for Campo Grande and attention needs to be paid to the consumption of meat and foodstuffs of vegetable origin.

Another point that needs to be highlighted is the consumption of forests by the Services category. Rational use and re-cycling of paper, firewood, and charcoal contribute towards reducing the Services footprint.

Government

Another important category of consumption considered in the Ecological Footprint studies is government consumption of ecological resources and its accounting is undertaken by examining the figures showing the taxes paid by the population. This category considers the federal, state and municipal spheres of government, and embraces its administrative services and infrastructure.

Given the outreach of this category, the footprint reflects the pattern of the national footprint except that Campo Grande's total Ecological Footprint is bigger than that of Brazil as a whole.

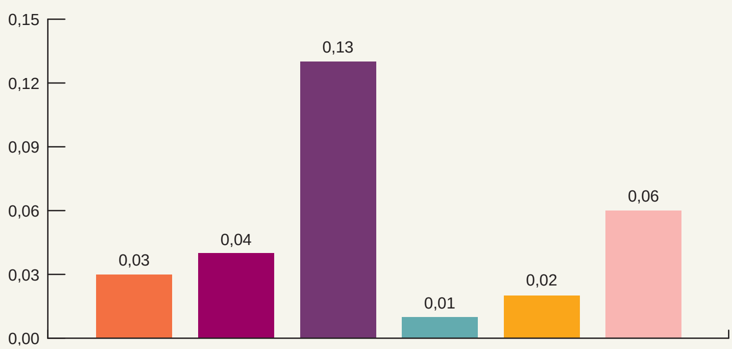


Figure 23: Distribution of the category government among natural resources

Government (gha/capita)

Key

- Energy and CO_2 Absorption
- Built up Areas
- Fisheries
- Forests
- Pastures
- Agriculture

Forests

The consumer category 'government' was found to be an intense consumer of forest resources and 43% of its total resource demands are for resources originating from forests.

It must be made clear that this study was not in a position to identify the origins of all the wood consumed in Campo Grande. The forests that the wood comes from may well be biomes of great conservation interest like the Pantanal and the Amazon.

If the public authority were to establish a programme to ensure that it only purchased paper and wood with certified origins and at the same time intensified re-use and re-cycling of materials in those sectors then it would considerably reduce the negative impact it is having on forests and the size of its footprint for that category.

Mobilisation and next steps

Calculating the Ecological Footprint was just the first stage of a process. At the workshop held with partners in Campo Grande, projects and actions already underway in the city were inventoried. The aim was to examine the possibilities of integrating and enhancing their contribution to reducing the size of the city's footprint. There now follows a list of projects that could be stimulated to help in the Ecological Footprint work. All of them are now being discussed by the Campo Grande's Ecological Footprint management group and are liable to alteration.

Clean streams, living city

Objective:

Diagnose the quality of watercourses and bodies of water in the municipality and implement measures to recuperate and preserve them.

Project Start Date:

On March 16, 2009 the Campo Grande city hall, in the person of the head of the Municipal Environment and Urban Planning Department started a programme entitled 'Clean streams, living city' to monitor the quality of surface waters in the municipality.

Link to the Footprint:

Classification of surface waters is highly important in the control and prevention of water resource pollution.

Specific Objective:
De-pollute all the municipalities 33 streams and one river.
Description:
The 'Clean stream, living city' programme involves: implanting a monitoring network for streams and the river within the limits of the urban perimeter of Campo Grande; an inspection and surveillance programme, and educational activities to arouse public awareness on the issue. First the areas were divided up into micro-basins and each one analysed according to its own peculiarities. The monitoring points were selected and duly geo-referenced. The selection of those points took into account the presence of installations that were liable to produce effluents draining into the streams and others were points of convergence of streams and springs. Samples are taken at those points every three months and subjected to laboratory analysis. This monitoring is a permanent activity with no scheduled end date. The results are reproduced succinctly and displayed on placards placed near to the monitoring points. The unabridged results are published on the municipality's internet site (*www.capital.ms.gov.br/meioambiente*).

Urban Tree Planting Master Plan – PDAU

Objective:
Diagnose the needs and establish directives for tree planting in Campo Grande, defining technical criteria to be applied in expanding and managing the areas with trees.
Project start date:
March 2009
Link to the Footprint:
Greater GG absorption.
Specific Objective:
Plant 250 thousand trees in Areas of Permanent Protection, along avenues in institutional areas and public access areas by 2012.
Description:
The Urban Tree Planting Master Plan has diagnosed the situation in regard to trees lining roads and avenues in the city and that has enabled the Campo Grande Municipal Authority to draw up guidelines for the administration and management of the urban tree planting process. Qualitative and quantitative information was gathered on existing trees in the streets and avenues and with the support of the legal framework in the municipal legislation it intends to carry out and manage the municipal

tree planting process The Urban Tree Planting Programme is the operational form of the Master Plan and it has seven lines of action: 1-Protecting urban water courses and springs; 2-planting trees in open spaces; 3- Planting trees down the middle of wide avenues, 4-Planting Trees in the City's parks; 5-Planting Trees in instructional areas; 6- Providing Environmental Education; 7-Protecting existing trees.

On September 21, 2010, the Environment and Urban Planning Department inaugurated its nursery garden with a production capacity of one million tree seedlings a year and in that same year it launched its Via Verde (Green Way) Project with a Specific Objective of 10 thousand trees planted in public parks by the end of 2011.

Municipal Solid Waste Policy

Objective:

Promote the integrated administration and management of solid waste including hazardous waste, defining responsibilities of those that generate it and of the government authorities.

Project start date:

The first actions of a pilot project of selective waste collection began in 2006 in collaboration with companies, supermarkets, re-cycling entities like the waste pickers cooperative, the institution of the Municipal Committee for monitoring the Recycling Programme for selectively collected waste.

In 2010, two eco-points for selective collection were implanted and selective collection was introduced in municipal schools.

In 2011 the process was begun of elaborating directives of the Municipal Solid Waste Policy.

Link to the Footprint:

reduction of areas used to dump solid waste, improved quality of life for residents.

Specific Objectives:

- By 2012: three more eco-points implanted; 30 voluntary delivery points implanted; selective collection implanted in 30 schools;

- By 2013: door to door selective collection implanted in 60% of the municipal area.

Description:
Constructed in a participative manner, the selective collection of household waste in the city of Campo Grande is based on the pre-selection of recyclable materials done by residents and the reception of those materials by companies that work with re-cycling and commercialisation of recyclable materials.

The Programme for the Collection and Re-cycling of used vegetable oils was implanted to give a final destination for oils used and discarded by companies in the food business, homes, condominiums and public and private institutions. In Campo Grande there are two collection point, one in the Municipal Market and the other in the Central Market.

The eco-points are collecting places where people can voluntarily leave their waste. They have simple infrastructure limited to receiving compressing storing and trading recyclable materials. There are two such points in the city, one in Bálsamo and the other in São Conrado.

The voluntary delivery places are public or private institutions that receive small volumes of dry recyclables and participate voluntarily in the Selective Waste Collection Programme. Among them are schools, companies and associations.

Living Springs Programme

Objective:
Execute services in collaboration with residents in rural areas with a view to protecting watercourses in the basin of the Guariroba River, which is the main source of Campo Grande's water supply.
Project start date:
Janeiro/2010
Link to the Footprint:
Increase the useful life of the main source of Campo Grande's Water Supply System.
Specific Objectives:
Implement terracing and contour curves to contain erosion processes in the Guariroba Area of Environmental Protection;

- Fencing off and replanting of Areas of Permanent Protection within the Guariroba Area of Environmental Protection;

- Recuperation of roads inside the Guariroba Area of Environmental Protection;

- Guaranteeing the quality of water supplied to approximately 350 thousand people.

Description:
Implantation of the Water Producer Programme

Ecological Tax

Objective:
Foster measures for the protection preservation and recuperation of the environment by offering fiscal benefits to tax payers.
Link to the Footprint:
Rational use of natural resources (constructions using sustainable materials, recycling construction industry residues; capture and re-use of rain waters; re-use of residual waters in buildings originating from the buildings themselves after suitable treatment; use of sustainable energy for water heating and solar electrical heating.
Specific Objectives:
Reduction of energy consumption through the use of solar energy for heating water reduction of water consumption through the collection and re-use of rainwater; re-use of residual waters after suitable treatment for activities that do not require potable water; Use of materials that attenuate environmental impacts (sustainable materials).
Description:
The ecological tax proposes the concession of a reduction in the annual urban housing tax and the tax on services of any kind favouring those individuals or legally constituted entities that own residential or commercial buildings and adopt measures to protect, preserve or recuperate the environment. To demonstrate the positive effects of the ecological tax proposal (rational use of natural resources, re-use of water, collection and re-use of rainwater; Use of sustainable material and use of renewable energy) two pilot projects were implanted: 'Sustainable Home' aimed at showing the possibilities of using various sustainable techniques and products in construction work and 'Reágua' (Re-water) aimed at promoting the capture and re-use of rainwater, which should be stored for use at a later date in activities that do not require the use of potable water supplied by the public water supply system , such as: discharge water for toilets, irrigation for lawns and ornamental plants, washing vehicles and paved areas, decorative ponds and for industrial purposes.

The Reágua and Sustainable Homes projects are still only at the pilot project stage and will become consolidated and effective through the Ecological Tax policy. The programme was officially instituted by Complementary Law nº 150, dated January 20, 2010. It is currently being regulated and there is no end date set for it.

Integrated Management of Construction Residues Plan

Objective:
Regulate and manage all the waste materials stemming from building activities in the municipality.
Project start date:
Diagnosis was in 2009 and the Law was published in July 2010
Link to the Footprint:
Reduction in the quantities of residues and availability of areas formerly used to deposit them.
Specific Objectives (com data):
By 2012, implant ten points for the reception of small volumes of construction residues with a view to receiving at least 70% of the small volumes of residues that are currently disposed of irregularly;

Implementation of residue management plans on large-scale construction ventures and works;

By 2012, implantation of at least two areas of Trans-shipment and Screening for the reception of large volumes of residues;

By 2012, implantation of a recycling plant for construction residues.
Description:
The Integrated Management Plan defined responsibilities attributed to large scale producers of residues and instituted the Municipal Construction Residues Management Programme to handle the destiny of small volumes of such residues. It also regulates issues affecting transporters of the material.

Environmental Education Centre

Objective:
Promote and provide support for the environmental education process in Campo Grande; unfold educational actions addressing environmental education;

Ensure that the Centre is used as a space for the discussion of environmental education and putting it into practice;

Discuss and stimulate transforming actions and the construction of new values.

Project start date:
April/2011
Link to the Footprint:
Constructs new environmental values.
Specific Objectives:

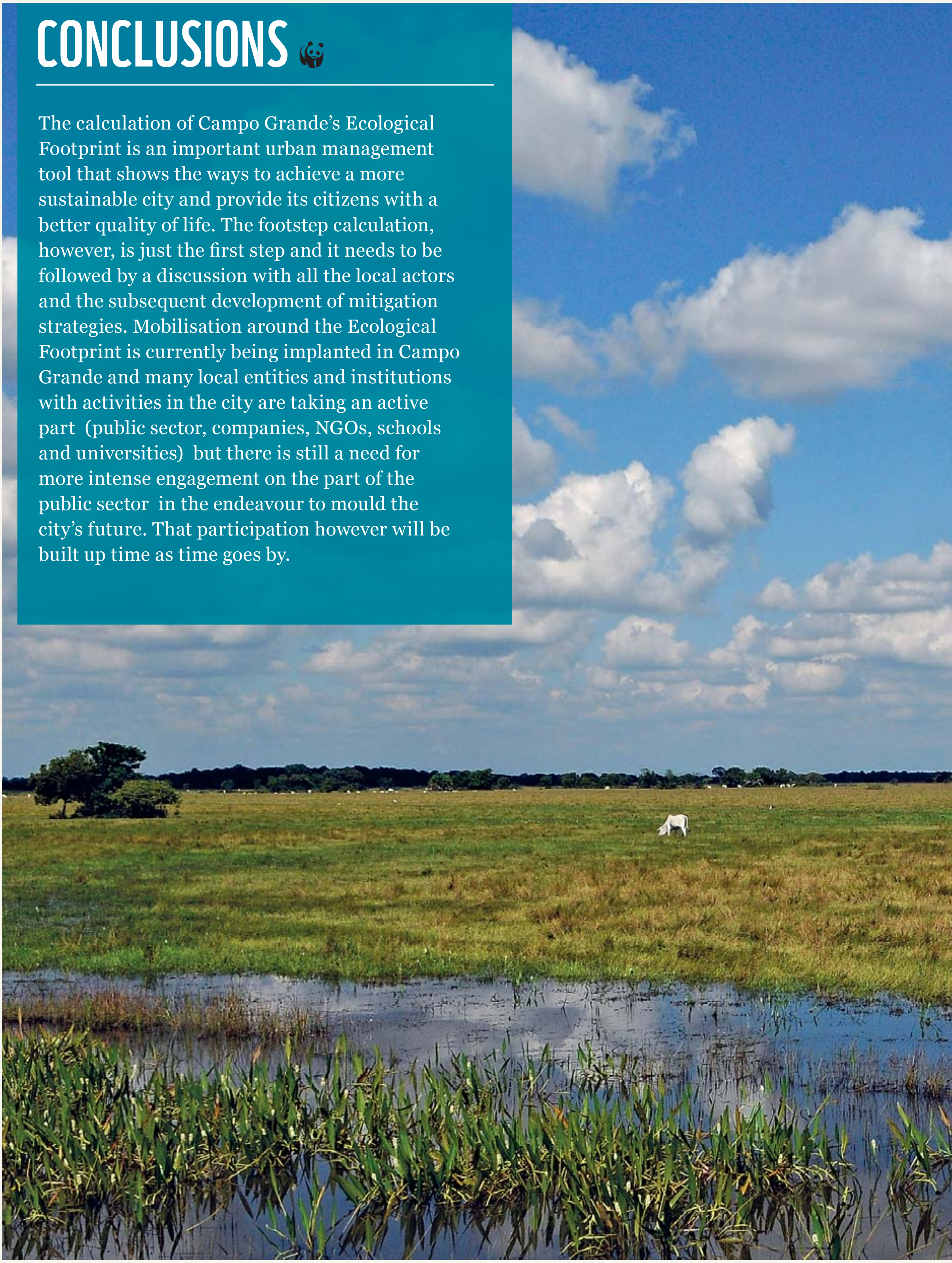
- Promote workshops, lectures, training for multiplying agents and other educational activities;
- Visitation by at least one school per week according to a the school year calendar and receive at least 3,000 students by the year 2012;
- Hold at least 4 workshops per month for multipliers.

Description:
The Environmental Education Centres will do the following: qualify children in primary and lower and higher secondary education by providing field classes, showing films, giving lectures, running workshop and play learning activities; qualify community environmental educators for each of the municipality's micro-regions (presidents of residents associations, members of the school community, members of religious communities etc.) involving at least four live sessions and at least one group per month will be qualified; provide capacity building for teachers in municipal schools preparing them in turn to provide environmental education in their classes; train Autonomous Transportation providers (with carts and wheelbarrows) and qualify them for removing and correctly disposing of small volumes of building work residues, qualifying at least one group every month; provide capacity building for small local organizations enabling them to elaborate unfold and monitor environmental education projects holding at least four workshops a year for that purpose.

The Centre will also be the site of the following projects: Mini Municipal Nursery Garden for the team that will be carrying out the landscaping and maintenance of the central flower beds in the avenues; the first Sustainable Home, open for visitation and built using the sustainable building techniques and building materials that are notably sustainable in a model building project.

CONCLUSIONS

The calculation of Campo Grande's Ecological Footprint is an important urban management tool that shows the ways to achieve a more sustainable city and provide its citizens with a better quality of life. The footstep calculation, however, is just the first step and it needs to be followed by a discussion with all the local actors and the subsequent development of mitigation strategies. Mobilisation around the Ecological Footprint is currently being implanted in Campo Grande and many local entities and institutions with activities in the city are taking an active part (public sector, companies, NGOs, schools and universities) but there is still a need for more intense engagement on the part of the public sector in the endeavour to mould the city's future. That participation however will be built up time as time goes by.



The Ecological Footprint is a cross-cutting tool, an important instrument to support urban planning policy insofar is it provides elements that help the public authorities to re-think and plan the future of the city that Campo Grande's people want to live in. It also serves as a parameter for examining production chains of all that the population consumes in the categories of food, goods and services.

There is a whole series of issues that can be addressed using this tool such as evaluating how natural resources are being used in agriculture and livestock production to meet the needs of the Campo Grande residents. In regard to transportation, it helps the analysis of emissions stemming from the city's vehicle fleet and stimulates greater use of collective transport.

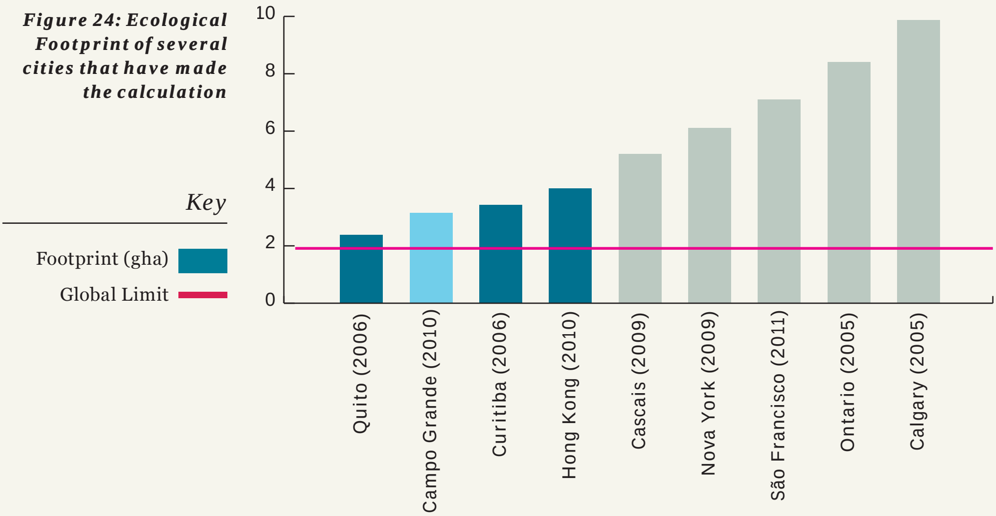
By studying the consumption patterns revealed by the Ecological Footprint calculation, it is possible to identify natural resource use by the population, potential health problems, habits and routines and other aspects of great relevance for municipal management. In that sense the Ecological Footprint is not only an incisive tool but also contributes towards sustainable development and provides important support for urban planning and administration.

It enables the city hall to make more sustainable purchasing choices when acquiring products for the various areas of public service. A good example of that is the purchase of organic beef for school meals, which has just been implanted by the Campo Grande Education Department. In addition to environmental aspects, the tool can also help in health planning by evaluating, for example, the population's alcohol consumption and the way it is reflected in the health of the Campo Grande population.

It must be stressed that the aim of the footprint calculation is not to paint a negative portrait of the city. The idea is to offer the city a tool for better public administration, mobilise the general public in regard to its consumer habits and encourage it to choose more sustainable products, while at the same time opening up a dialogue with businessmen to encourage them to improve their production chains. Also there can be no doubt that any reduction in the consumption of natural resources can only be achieved slowly over the long term.

The Ecological Footprint offers decision makers the possibility of addressing questions related to the structure and functioning of local and national economies and it is an important tool in the discussions on sustainable production and consumption, energy and climate. It not only serves the public administrator well but it is also useful to private company administrators enabling them to become more aware of the impacts caused by their production chains and useful to ordinary citizens that wish to press for improvements in the quality of life in their city.

Figure 24: Ecological Footprint of several cities that have made the calculation



As we can see from the chart (figure 24) other cities have undertaken the Ecological Footprint calculation and are now developing long-term mitigation plans designed to reduce their consumption of renewable natural resources. Now it will be up to the administrators of those cities to point the way in which the development of their municipalities needs to head.

Does Campo Grande want to draw closer to the those cities with even larger footprints, or would it prefer to maintain a smaller footprint and seek ways to achieve forms of development with lower environmental costs? It would definitely not be desirable to get closer to the situations of cities like Calgary or San Francisco and much better to make the effort to keep the footprint small. There is still a good chance for Campo Grande to get its footprint down to the size that all cities need to try for in the long term namely: 1. 8 gha – the global limit for our Ecological Footprint.

The Ecological Footprint basically points to the problems, it does not come up with immediate solutions for them.

We are well aware that there still some points that need to be improved so that we can make the calculations even more accurate.

The data sources can definitely be improved and the main constants introduced into the calculations need to be gradually revised[21].

Even so, we cannot expect this environmental indicator to solve all the problems that need to be solved to bring about the transformation and changes towards becoming a more sustainable society. The Ecological Footprint is an excellent tool in helping us to change the perspective in which we view development and stimulating us to find solutions that will tailor our economic and social growth to be appropriate to the Earth's capacity to support them.

What we hope is that this Ecological Footprint study will inspire consistent long term planning that goes beyond the bounds of public administration and that it will be maintained and continued regardless of which government is in power.

We are fully aware too that this is not the kind of work that can be done from one day to another. It is essentially long-term work and there are many stages to be gone through. Nevertheless, it must be begun immediately and to that end it is important to verify what the numbers that are set out in this x-ray reveal, analyse the most critical points and implement an action plan in harmony and agreement with all the partners, so that when the next measurement of Campo Grande's impacts is made, they will have diminished and the city will have become more sustainable, offering a better quality of life to its inhabitants.

21 Kitzes, J.,Galli, A., Bagliani, M., Barrett, J., Dige, G., Ede, S., Erb, K-H., Giljum, S., Haberl, H., Hails, C., Jungwirth, S., Lenzen, M., Lewis, K., Loh, J., Marchettini, N., Messinger, H., Milne, K., Moles, R., Monfreda, C., Moran, D., Nakano, K., Pyhälä, A., Rees, W., Simmons, C., Wackernagel, M., Wada, Y., Walsh, C., Wiedmann, T. (2009). A research agenda for improving national ecological footprint accounts. Ecological Economics 68(7), 1991-2007.

BIBLIOGRAPHIC REFERENCES AND RECOMMENDED READING

DG Environment. Potential of the Ecological Footprint for monitoring environmental impact from natural resource use. http://ec.europa.eu/environment/natres/studies.htm.

Ewing B., A. Reed, S.M. Rizk, A. Galli, M. Wackernagel, and J. Kitzes. 2008. Calculation Methodology for the national Footprint Accounts, 2008 Edition. Oakland: Global Footprint Network, www.footprintnetwork.org/atlas.

Ewing B., D. Moore, S. Goldfinger, A. Oursler, A. Reed, M. Wackernagel. 2010. The Ecological Footprint. Atlas 2010. Oakland: Global Footprint Network. www.footprintnetwork.org/atlas.

FAO 2000a. Forest Resource Assessment 2000. Rome, Food and Agriculture Organization (accessed February 2010).

FAO. 2000b. Technical Conversion Factors for Agricultural Commodities. http://www.fao.org/es/ess/tcf.asp. (accessed February 2010).

FAO and International Institute for Applied Systems Analysis Global Agro-Ecological Zones. 2000. http://www.fao.org/ag/agl/agll/gaez/index.htm (accessed February 2010).

FAO. 1998. Global Fiber Supply Model. ftp://ftp.fao.org/docrep/fao/006/X0105E/X0105E.pdf (accessed February 2010).

Food and Agriculture Organization of the United Nations (FAO) Statistical Databases. http://faostat.fao.org/site/291/default.aspx (accessed February 2010).

Galli, A., J. Kitzes, P. Wermer, M. Wackernagel, V. Niccolucci& E. Tiezzi, 2007. An Exploration of the Mathematics behind the Ecological Footprint. International Journal of Ecodynamics. 2(4), 250-257.

Global Footprint Network 2010. National Footprint Accounts, 2010 Edition. Available at www.footprintnetwork.org.

Gulland, J.A. 1971. The Fish Resources of the Ocean. West Byfleet, Surrey, United Kingdom: Fishing News.

Haberl, H., K.H. Erb, F. Krausmann, V. Gaube, A. Bondeau, C. Plutzar, S. Gingrich, W. Lucht and M. and Fischer-Kowalski. 2007. Quantifying and mapping the human appropriation of net primary production in earth's terrestrial ecosystems. Proc. Natl. Acad. Sci. 104: 12942-12947.

Hammond, G.P. and C.I. Jones. 2008. 'Embodied energy and carbon in construction materials', Proc. Instn Civil. Engrs: Energy, in press.

Hertwich e Peters. Carbon Footprint of Nations: A Global, Trade-Linked Analysis, Environ. Sci. Technol., 2009, 43 (16), pp 6414–6420

Hoekstra, A. Y., Chapagain, A. K., Aldaya, M. M. and Mekonnen, M. M. (2009a) Water Footprint Manual: State of the Art 2009, Water Footprint Network, Enschede, the Netherlands, www.waterfootprint.org/downloads/WaterFootprintManual2009.pdf

IBGE (2010): Atlas Nacional do Brasil Milton Santo, IBGE Rio de Janeiro, Rio de Janeiro.

IEA Statistics and Balances. http://data.iea.org/ieastore/statslisting.asp (accessed February 2010).

Interfacultaire Vakgroep Energie en Milieukunde Energy Analysis Program, Research Report no. 98, Groningen, 1999.

Intergovernmental Panel on Climate Change. 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4: Agriculture Forestry and Other Land Use. http://www.ipccnggip.iges.or.jp/public/2006gl/vol4.html (accessed February 2010).

IPCC 2007. Climate Change 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. CambridgeUniversity Press, Cambridge, United Kingdom and New York, NY, USA.

Kitzes, J., A. Galli, A. Reed, S. Rizk, B. Ewing, and M. Wackernagel. 2010. Guidebook to the NationalFootprint Accounts: 2010 Edition. Oakland: Global Footprint Network.www.footprintnetwork.org/methodology.

Kitzes, J.,Galli, A., Bagliani, M., Barrett, J., Dige, G., Ede, S., Erb, K-H., Giljum, S., Haberl, H., Hails, C., Jungwirth, S., Lenzen, M., Lewis, K., Loh, J., Marchettini, N., Messinger, H., Milne, K., Moles, R., Monfreda, C., Moran, D., Nakano, K., Pyhälä, A., Rees, W., Simmons, C., Wackernagel, M., Wada, Y., Walsh, C., Wiedmann, T., 2009. A research agenda for improving national ecological footprint accounts. Ecological Economics 68(7), 1991-2007.

Kitzes, J., A. Peller, S. Goldfinger, and M. Wackernagel. 2007. Current Methods for Calculating National Ecological Footprint Accounts. Science for Environment & Sustainable Society (ResearchCenter for Sustainability and Environment, ShigaUniversity), 4(1) 1-9.

Meadows, Donella, J. Randers and D. Meadows. Limits to Growth. New York: Universe Books, 1972

Monfreda, C., Wackernagel, M., Deumling, D., 2004. Establishing national natural capital accounts based on detailed ecological footprint and biocapacity assessments. Land Use Policy 21, 231–246.

Pauly, D. and V. Christensen. 1995. Primary production required to sustain global fisheries. Nature 374, 255-257.

Rees, W.E., 1992. Ecological footprints and appropriated carrying capacity: What urban economics leaves out. Environment and Urbanization, 4, 121-130.

Stiglitz, J.E., Sen, A. and Fitoussi, J-P. 2009. Report by the Commission on the Measurement of Economic Performance and Social Progress. http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

Thormark, C. 2002. "A low energy building in a life cycle—its embodied energy, energy need for operation and recycling potential", Building and Environment 37, pg. 429 – 435.

UN Commodity Trade Statistics Database. 2010. http://comtrade.un.org (accessed February 2010).

UN European Commission, International Monetary Fund, Organization for Economic Co-operation and Development and World Bank. 2003. Handbook of National Accounting – Integrated Environmental and Economic Accounting 2003.

UNEP (United Nations Environment Programme), 2007. GEO4 Global Environment Outlook: environment for development. Progress Press Ltd, Malta.

Venetoulis, J., Talberth, J., 2008. Refining the ecological footprint. Environment, Development and Sustainability 10(4), 441-469.

Wackernagel, M., L. Onisto, A. C. Linares, I. S. L. Falfán, J. M. García, A. I. S. Guerrero, Ma. G. S. Guerrero. 1997. Ecological Footprints of Nations: How Much Nature Do They Use? How Much Nature Do They Have? Commissioned by the Earth Council for the Rio+5 Forum. Distributed by the International Council for Local Environmental Initiatives, Toronto.

Wackernagel, M., L. Onisto, P. Bello, Al. C. Linares, I. S. L. Falfán, J. M. García, A. I. S. Guerrero, Ma. G. S. Guerrero. 1999a. National natural capital accounting with the ecological footprint concept, Ecological Economics. 29, 375-390.

Wackernagel, M., Lewan, L. and Hansson, C.B., 1999b. Evaluating the use of natural capital with theecological footprint. Ambio 28, 604–612.

Wackernagel, M., B. Schulz, D. Deumling, A. Callejas Linares, M. Jenkins, V. Kapos, C. Monfreda, J. Loh, N. Myers, R. Norgaard and J. Randers. 2002. Tracking the ecological overshoot of the human economy, Proc. Natl. Acad. Sci. 99(14), 9266-9271.

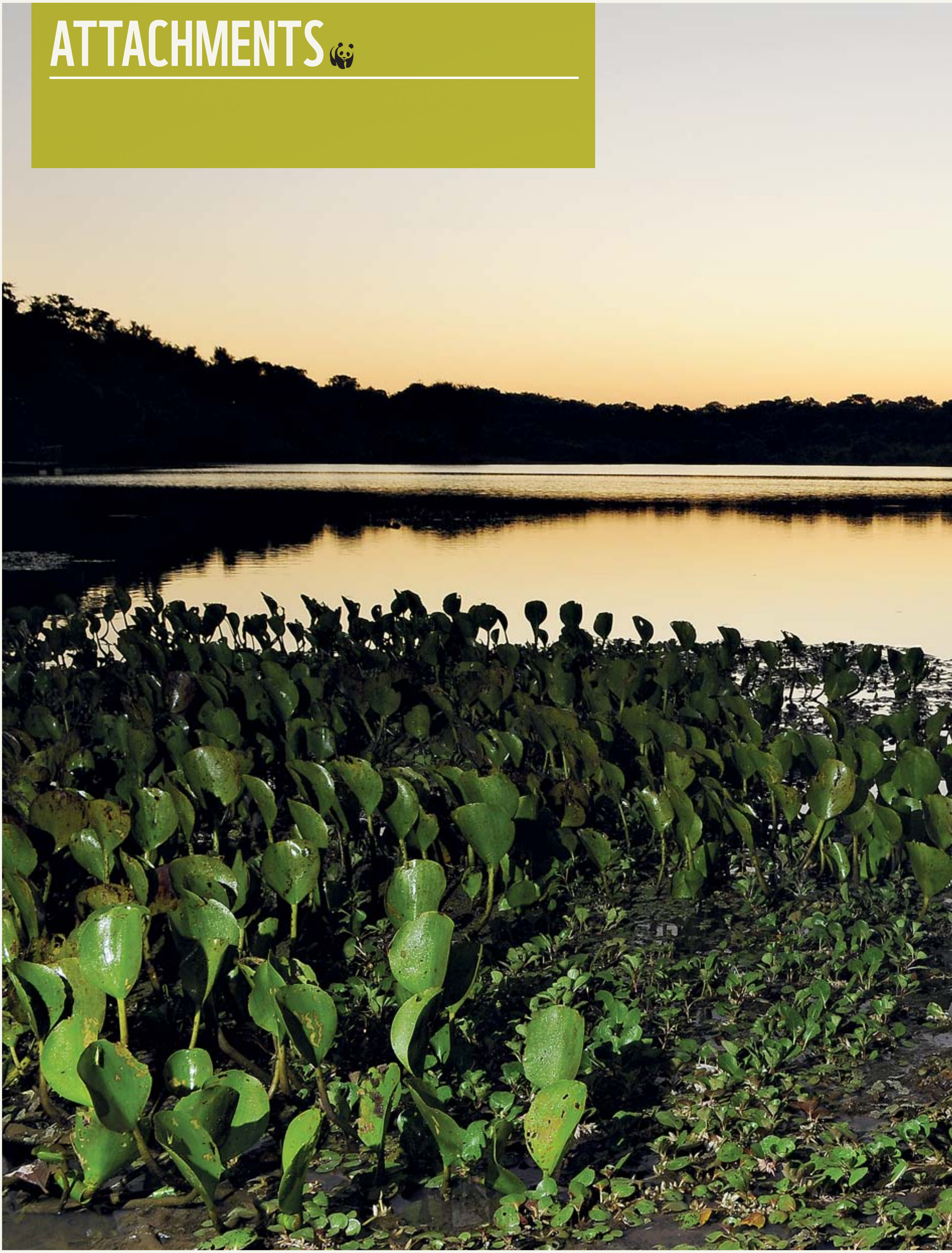
Wackernagel, M. and Rees, W.E. 1996. Our Ecological Footprint: Reducing Human Impact on the Earth. New Society Publishers, Gabriola Island, BC. - 18 -- 19 –

Wackernagel, M., C. Monfreda, D. Moran, P. Wermer, S. Goldfinger, D. Deumling, and M. Murray. 2005. National Footprint and Biocapacity Accounts 2005: The underlying calculation method. Oakland: Global Footprint Network. www.footprintnetwork.org.

WCED. 1987. Our Common Future. World Commission on Environment and Development , Oxford.

Wiedmann, T. and Barrett, J. 2010. A Review of the Ecological Footprint Indicator - Perceptions and Methods. Sustainability, 2, 1645-169

ATTACHMENTS



ECOLOGICAL FOOTPRINT: FREQUENTLY ASKED QUESTIONS

How is the Ecological Footprint calculated?

The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb the waste it generates, given prevailing technology and resource management. This area is expressed in global hectares (hectares with world-average biological productivity). Footprint calculations use yield factors to normalize countries' biological productivity to world averages (e.g. comparing tonnes of wheat per UK hectare versus per world average hectare) and equivalence factors to take into account differences in world average productivity among land types (e.g. world average forest versus world average cropland).

Footprint and biocapacity results for countries are calculated annually by Global Footprint Network. Collaborations with national governments are invited, and serve to improve the data and methodology used for the National Footprint Accounts. To date, Switzerland has completed a review, and Belgium, Ecuador, Finland, Germany, Ireland, Japan and the UAE have partially reviewed or are reviewing their accounts. The continuing methodological development of the National Footprint Accounts is overseen by a formal review committee. A detailed methods paper and copies of sample calculation sheets can be obtained from www.footprintnetwork.org

Footprint analyses can be conducted on any scale. There is growing recognition of the need to standardize sub-national Footprint applications in order to increase comparability across studies and longitudinally. Methods and approaches for calculating the Footprint of municipalities, organizations and products are currently being aligned through a global Ecological Footprint standards initiative. For more information on Ecological Footprint standards see www.footprintstandards.org

What is included in the Ecological Footprint? What is excluded?

To avoid exaggerating human demand on nature, the Ecological Footprint includes only those aspects of resource consumption and

Appendixwaste production for which the Earth has regenerative capacity, and where data exist that allow this demand to be expressed in terms of productive area. For example, toxic releases are not accounted for in Ecological Footprint accounts. Nor are freshwater withdrawals, although the energy used to pump or treat water is included.

Ecological Footprint accounts provide snapshots of past resource demand and availability. They do not predict the future. Thus, while the Footprint does not estimate future losses caused by current degradation of ecosystems, if this degradation persists it may be refected in future accounts as a reduction in biocapacity.

Footprint accounts also do not indicate the intensity with which a biologically productive area is being used. Being a biophysical measure, it also does not evaluate the essential social and economic dimensions of sustainability.

How is international trade taken into account?

The National Footprint Accounts calculate the Ecological Footprint associated with each country's total consumption by summing the Footprint of its imports and its production, and subtracting the Footprint of its exports. This means that the resource use and emissions associated with producing a car that is manufactured in Japan but sold and used in India will contribute to India's rather than Japan's consumption Footprint.

National consumption footprints can be distorted when the resources used and waste generated in making products for export are not fully documented for every country. Inaccuracies in reported trade can signifcantly affect the Footprint estimates for countries where trade fows are large relative to total consumption. However, this does not affect the total global Footprint.

How does the Ecological Footprint account for the use of fossil fuels?

Fossil fuels such as coal, oil and natural gas are extracted from the Earth's crust and are not renewable in ecological time spans. When these fuels burn, carbon dioxide (CO_2) is emitted into the atmosphere. There are two ways in which this CO_2 can be stored: human technological sequestration of these emissions, such as deep-well injection, or natural sequestration. Natural sequestration occurs when ecosystems absorb CO_2 and store it either in standing biomass such as trees or in soil.

The carbon footprint is calculated by estimating how much natural sequestration would be necessary to maintain a constant concentration of CO_2 in the atmosphere. After subtracting the amount of CO_2 absorbed by the oceans, Ecological Footprint accounts calculate the area required to absorb and retain the remaining carbon based on the average sequestration rate of the world's forests. CO_2 sequestered by artifcial means would also be subtracted from the Ecological Footprint total, but at present this quantity is negligible. In 2007, one global hectare could absorb the CO_2 released by burning approximately 1,450 litres of gasoline.

Expressing CO_2 emissions in terms of an equivalent bioproductive area does not imply that carbon sequestration in biomass is the key to resolving global climate change. On the contrary, it shows that the biosphere has insuffcient capacity to offset current rates of anthropogenic CO_2 emissions. The contribution of CO_2 emissions to the total Ecological Footprint is based on an estimate of world average forest yields. This sequestration capacity may change over time. As forests mature, their CO_2 sequestration rates tend to decline. If these forests are degraded or cleared, they may become net emitters of CO_2.

Carbon emissions from some sources other than fossil fuel combustion are incorporated in the National Footprint Accounts at the global level. These include fugitive emissions from the faring of gas in oil and natural gas production, carbon released by chemical reactions in cement production and emissions from tropical forest fres.

Does the Ecological Footprint take into account other species?

The Ecological Footprint compares human demand on nature with nature's capacity to meet this demand. It thus serves as an indicator of human pressure on local and global ecosystems. In 2007, humanity's demand exceeded the biosphere's regeneration rate by more than 50 per cent. This overshoot may result in depletion of ecosystems and fll-up of waste sinks. This ecosystem stress may negatively impact biodiversity. However, the Footprint does not measure this latter impact directly, nor does it specify how much overshoot must be reduced by if negative impacts are to be avoided.

Does the Ecological Footprint say what is a “fair” or “equitable” use of resources?
The Footprint documents what has happened in the past. It can quantitatively describe the ecological resources used by an individual or a population, but it does not prescribe what they should be using. Resource allocation is a policy issue, based on societal beliefs about what is or is not equitable. While Footprint accounting can determine the average biocapacity that is available per person, it does not stipulate how this biocapacity should be allocated among individuals or countries. However, it does provide a context for such discussions.

How relevant is the Ecological Footprint if the supply of renewable resources can be increased and advances in technology can slow the depletion of non-renewable resources?
The Ecological Footprint measures the current state of resource use and waste generation. It asks: in a given year, did human demands on ecosystems exceed the ability of ecosystems to meet these demands? Footprint analysis refects both increases in the productivity of renewable resources and technological innovation (for example, if the paper industry doubles the overall effciency of paper production, the Footprint per tonne of paper will halve). Ecological Footprint accounts capture these changes once they occur and can determine the extent to which these innovations have succeeded in bringing human demand within the capacity of the planet’s ecosystems. If there is a suffcient increase in ecological supply and a reduction in human demand due to technological advances or other factors, Footprint accounts will show this as the elimination of global overshoot.

For additional information about current Ecological Footprint methodology, data sources, assumptions and results, please visit: www.footprintnetwork.org/atlas

For more information on the Ecological Footprint at a global level, please see: Butchart, S.H.M. et al., 2010; GFN, 2010b; GTZ, 2010; Kitzes, J.,2008; Wackernagel, M. et al., 2008; at a regional and national level please see: Ewing, B. et al., 2009; GFN, 2008; WWF, 2007; 2008c; for further information on the methodology used to calculate the Ecological Footprint, please see: Ewing B. et al., 2009; Galli, A. et al., 2007.

GLOSSARY

Biocapacity	The capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. Biocapacity is measured in global hectares (GFN 2012).
Biocapacity per person	This is calculated by dividing the number of productive global hectares available by the number of people living on the planet in that year.
Biodiversity	Shorthand for biological diversity. Variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD and UNEP)
Biome	A major portion of the living environment of a particular region characterized by its distinctive vegetation and maintained by local climatic conditions
Carbon Footprint	When used in Ecological Footprint studies, this term is synonymous with demand on carbon uptake land. NOTE: The phrase “Carbon Footprint” or “carbon footprint” has been picked up in the climate change debate. There are several calculators that use the phrase “Carbon Footprint”, but many Just calculate tonnes of carbon, or tonnes of carbon per euro, rather than demand on bioproductive area.
Carbon uptake land	The demand on biocapacity required to sequester (through photosynthesis) the carbon dioxide (CO_2) emissions from fossil fuel combustion. Although fossil fuels are extracted from the Earth’s crust and are not regenerated in human time scales, their use demands ecological services if the resultant CO_2 is not to accumulate in the atmosphere. The Ecological Footprint therefore includes the biocapacity, typically that of unharvested forests, needed to absorb that fraction of fossil CO_2 that is not absorbed by the ocean (GFN 2012).
Ecological Footprint	A measure of how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates using prevailing technology and resource management practices. The Ecological Footprint is usually measured in global hectares. Because trade is global, an individual or country’s Footprint includes land or sea from all over the world. Ecological Footprint is often referred to in short form as Footprint and is calculated for a given year. (GFN 2012).

Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Ecosystem services	The Millennium Ecosystem Assessment distinguished supporting, provisioning, regulating and cultural services that contribute to human wellbeing (Millennium Ecosystem Assessment, 2005a, b). These services are defined as:
Provisioning services	Goods obtained directly from ecosystems (e.g. food, medicine, timber, fibre, biofuel)
Regulating services	Benefits obtained from the regulation of natural processes (e.g. water filtration, waste decomposition, climate regulation, crop pollination, regulation of some human diseases)
Supporting services	Regulation of basic ecological functions and processes that are necessary for the provision of all other ecosystem services (e.g. nutrient cycling, photosynthesis and soil formation).
Cultural services	Psychological and emotional benefits gained from human relations with ecosystems (e.g. enriching recreational, aesthetic and spiritual experiences).
Global hectare (gha)	A productivity weighted area used to report both the biocapacity of the earth, and the demand on biocapacity (the Ecological Footprint). The global hectare is normalized to the area-weighted average productivity of biologically productive land and water in a given year. Because different land types have different productivity, a global hectare of, for example, cropland, would occupy a smaller physical area than the much less biologically productive pasture land, as more pasture would be needed to provide the same biocapacity as one hectare of cropland. Because world bioproductivity varies slightly from year to year, the value of a gha may change slightly from year to year (GFN 2012).
Human Development	Human development is a process of enlarging people's choices. Enlarging people's choices is achieved by expanding human capabilities and functioning. At all levels of development the three essential capabilities for human development are for people to lead long and healthy lives, to be knowledgeable and to have a decent standard of living. If these basic capabilities are not achieved, many choices are simply not available and many opportunities remain inaccessible. But the realm of human development goes further: essential areas of choice, highly valued by people, range from political, economic and social opportunities for being creative and productive to enjoying self-respect, empowerment and a sense of belonging to a community. The concept of human development is a holistic one putting people at the centre of all aspects of the development process. It has often been misconstrued and confused with the following concepts and approaches to development This definition is taken from the Human Development Report webpage and the latest report can be found here.

Human Development Index (HDI)	The HDI – human development index – is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, knowledge, and a decent standard of living. The HDI contains three components: 1) Health: life expectancy at birth (The number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same throughout the child's life). 2) Knowledge: a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio; 3) Standard of living: GDP per capita (PPP US$). This definition is taken from the Human Development Report webpage and the latest report can be found here.
Inequality adjusted Human Development Index (IHDI)	The IHDI is a measure of the level of human development of people in a society that accounts for inequality. Under perfect equality the IHDI is equal to the HDI, but falls below the HDI when inequality rises. In this sense, the IHDI is the actual level of human development (taking into account inequality), while the HDI can be viewed as an index of the potential human development that could be achieved if there is no inequality. The IHDI accounts for inequality in HDI dimensions by "discounting" each dimension's average value according to its level of inequality. The average loss in the HDI due to inequality is about 23 percent—that is, adjusted for inequality, the global HDI of 0.682 in 2011 would fall to 0.525. Countries with less human development tend to have greater inequality in more dimensions—and thus larger losses in human development. This new version of the HDI was developed or the 2011 Human Development report (UNDP, 2011) and at the time of publication, the adjustment has been applied to 134 countries. For this definition and more information see the IHDI homepage.
National Accounts Committee	Global Footprint Network's of scientific advisors who develop and endorse recommendations for methodological changes to the Ecological Footprint accounts (GFN 2012).
National Footprint Accounts	The central data set that calculates the Footprints and biocapacities of the world and roughly 150 nations from 1961 to the present (generally with a three year lag due to data availability). The ongoing development, maintenance and upgrades of the National Footprint Accounts are coordinated by Global Footprint Network and its 70 plus partners (GFN 2012).
Natural capital	Natural capital can be defined as all of the raw materials and natural cycles on Earth. Footprint analysis considers one key component, life supporting natural capital, or ecological capital for short. This capital is defined as the stock of living ecological assets that yield goods and services on a continuous basis. Main functions include resource production (such as fish, timber or cereals), waste assimilation (such as CO_2 absorption or sewage decomposition) and life support services (such as UV protection, biodiversity, water cleansing or climate stability).

Overshoot	Global overshoot occurs when humanity's demand on nature exceeds the biosphere's supply, or regenerative capacity. Such overshoot leads to a depletion of Earth's life supporting natural capital and a build up of waste. At the global level, ecological deficit and overshoot are the same, since there is no net-import of resources to the planet. Local overshoot occurs when a local ecosystem is exploited more rapidly than it can renew itself (GFN 2012).
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Virtual water	The 'virtual water content' of a product is the same as its 'water footprint' .he water footprint of a product (a commodity, good or service) is the volume of freshwater used to produce the product, measured at the place where the product was actually produced. It refers to the sum of the water use in the various steps of the production chain.
Water Footprint	The water footprint of an individual, community or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by the individual or community or produced by the business. The Water footprint of a nation is defined as the total amount of water that is used to produce the goods and services consumed by the inhabitants of the nation.

ATTACHMENT A: METHODOLOGY – ECOLOGICAL FOOTPRINT AND BIOCAPACITY

This section has been taken from the 2010 edition of the Calculation Methodology for the National Footprint Accounts, 2010 Edition[22].

Footprint and Biocapacity Calculations

The Ecological Footprint measures appropriated biocapacity and biocapacity represents the availability of bio-productive areas. For any type of land use the Ecological Footprint of a country, expressed in global hectares is given by:

$$EF = \frac{P}{Y_N} \cdot YF \cdot EQF$$

Equation 1a

Where P is the amount of a product harvested or Carbon Dioxide emitted, YN é is the national average yield for P and YF and EQF are the yield factor and the equivalence factor respectively for the land use type in question.

A country's biocapacity (BC) for any land use type, is calculated as follows:

$$BC = A \cdot YF \cdot EQF$$

Equation 2

Where A is the area available for a given land use type.

Derived Products

Summing the footprints of all the primary products and the ecosystems capacity to absorb residues we obtain the total footprint of a country's national production. In some cases however it is necessary to know the Ecological Footprints of products derived from the flows of primary goods from the ecosystems. Primary and derived goods are related by product specific extraction rates.

22 Ewing B., A. Reed, A. Galli, J. Kitzes, and M. Wackernagel. 2010. Calculation Methodology for the National Footprint Accounts, 2010 Edition. Oakland: Global Footprint Network. Available at http://www.footprintnetwork.org/images/uploads/National_Footprint_Accounts_Method_Paper_2010.pdf

The extraction rate of a derived product $EXTR_D$, é is used to calculate its effective yield in the following way:

$$Y_D = Y_P \cdot EXTR_D \qquad \text{Equation 3a}$$

Where Y_D and Y_P are the yields for the primary product and the effective yields for the derived product respectively.

Normally, $EXTR_D$ is simply the mass ratio of derived product to primary input required. This ratio is known as the technical conversion factor for the derived product and is denoted by TCF_D below. There are a few cases where multiple products are derived simultaneously from the same primary product. Soybean oil and soybean cake are both extracted simultaneously from the same primary product, in this case soybean. Summing the primary product equivalent of the derived products would lead to double counting so the primary product footprint must be shared between the simultaneously derived goods. The general formula for the extraction rate for a derived good (D) is:

$$EXTR_D = \frac{TCF_D}{FAF_D} \qquad \text{Equation 3b}$$

Where FAF_D is the Footprint allocation factor. This allocates the Footprint of the primary product between the simultaneously derived goods according to the TCF-weighted prices. The prices of derived goods represent their relative contributions to the incentive for the harvest of the primary product. The equation for the Footprint allocation factor of a derived product is:

$$FAF_D = \frac{TCF_D V_D}{\sum TCF_i V_i} \qquad \text{Equation 3c}$$

Where V_i is the market price of each simultaneously derived product. For a production chain with only one derived product then, FAF_D is 1 and the extraction rate is equal to the technical conversion factor.

Normalising bio-productive areas from hectares to global hectares

Average bio-productivity differs between various land use types as well as between countries for any given land use type. For comparability across countries and land use types, Ecological Footprint and Biocapacity are usually expressed in units of world-average bio-productive areas. Expressing Footprint in world-average hectares also facilitates tracking the embodied bio-productivity in international trade flows.

Yield Factors

Yield factors account for countries' differing levels of productivity for particular land-use types. Yield factors provides comparability of the Ecological Footprint and biocapacities of various countries. Each year each country may have a different yield factor for cropland, pastures, forests and fisheries. Usually Yield factors for built-up areas are assumed to be the same as cropland given that urban areas tend to be built on or near productive agricultural lands. Natural factors such as differences in rainfall or soil quality or even management practices all determine different levels of productivity.

The weight of productivity factors in the different areas of the earth vary according to their relative productivities. For example the average hectare of pasture in New Zeeland produces more grass than a world average grazing land hectare and is potentially capable of supporting more meat production.

The table below shows the yield factors calculated for various countries as it appeared in the Global Footprint Network's 2010 edition of the National Footprint Accounts.

	Agriculture	Forests	Pastures	Fisheries
World Average Yields	1.0	1.0	1.0	1.0
Algeria	0.3	0.4	0.7	0.9
Guatemala	0.9	1.1	2.9	1.1
Hungary	1.1	2.6	1.9	1.0
Japan	1.3	1.4	2.2	0.8
Jordan	1.1	1.5	0.4	1.0
New Zeeland	0.8	2.0	2.5	1.0
Zambia	0.2	0.2	1.5	1.0

The yield factor is the ratio of national average to world average yields . It is calculated in terms of annual availability of usable products. For any given land use type *L*, .a country's yield factor YF_L is given by:

$$YF_L = \frac{\sum_{i \in U} A_{W,i}}{\sum_{i \in U} A_{N,i}} \qquad \text{Equation 4a}$$

Where U is the set of all useable primary products that a given land use type yields and Aw,i Aand An,i are the areas necessary to furnish that country's annual available amounts of products *i* at world and national yields respectively. Those areas are calculated as follows:

$$A_{N,i} = \frac{P_i}{Y_N} \qquad \text{Equation 5a} \qquad A_{W,i} = \frac{P_i}{Y_W} \qquad \text{Equation 56}$$

Where Pi is the total national annual growth of product i and YN and YW are national and world yields respectively. Thus, ANi is always the area that produces i within a given country while AW,i gives the equivalent of world-average land yielding i.

Most land use types included in Footprint accounts provide only a single primary product such as wood from forest land or grass from grazing land. For these land use types the equation simplifies to:

$$YF_L = \frac{Y_N}{Y_W} \qquad \text{Equation 4b}$$

For those types of land use with a single product, by combining equations 4b and 1a we obtain a simplified formula for Ecological Footprint calculation in global hectares:

$$EF = \frac{P}{Y_W} \cdot EQF \qquad \text{Equation 1b}$$

In practice cultivated arable land is the only land use type where the extended version of the calculation is actually applied.

Equivalence Factors

In order to combine the Ecological Footprints or biocapacities of different land use types a second coefficient is necessary. Equivalence factors convert real areas of different land use types in hectares into their equivalent in global hectares. Equivalence factors and Yield factors are used in both footprint and biocapacity calculations to provide consistent results expressed in comparable units.

Equivalence factors translate the area supplied or demanded for a given type of land use (world average for cropland, grazing land, forest, fisheries and land for carbon absorption or built-up land) into average world measurements of biologically productive area, namely, global hectares.

The equivalence factor for built-up land is set equal to that for cropland while that of carbon uptake land is set equal to that of forest land. That is based on the suppositions that infrastructure tends to be built on or near productive agricultural land and that carbon absorption occurs in forest areas. The equivalence factor for hydroelectric reservoir area is set equal to one reflecting the assumption that hydroelectric reservoirs flood world average land The equivalence factor for marine area is calculated such that a single global hectare of pasture will produce an amount of calories of beef equal to the amount of calories that can be produced by a global area of fisheries in fish. The equivalence factor for waterways is equal to the equivalence factor for marine areas.

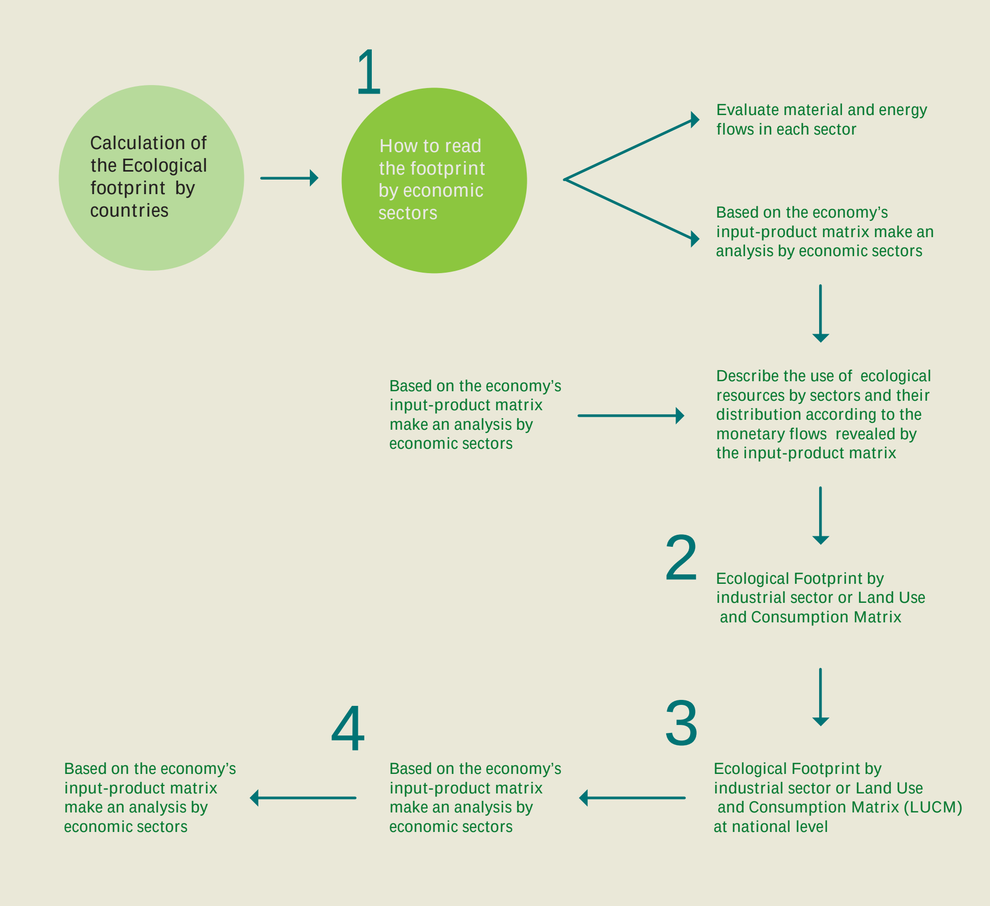
In 2005, for example, the equivalence factor for cultivated agricultural areas was 2.64 showing that the average productivity of cultivated land in the world was more than double the average productivity of all land types considered together. For that same year the equivalence factor for grazing land was 0.40 showing that the pastures were, on average 40% of the productivity of a global hectare. Equivalency factors are calculated every year and for a given year they are the same for all countries.

Area Type	Equivalence Factor gha/hectare
Agriculture	2.51
Forests	1.26
Grazing land	0.46
Marine and Inland water	0.37
Built-up land	2.51

Equivalency factors are calculated using suitability indexes from the Global Agro-ecological Zones model combined with data on the actual areas of cropland, forest land and grazing land area from FAOSTAT (FAO and IIASA Global Agro-Ecological Zones 2000 FAO Resource STATStatistical Database 2007). The GAEZ model divides all land globally into five categories based on calculated potential crop productivity. All land is assigned a quantitative suitability index that varies from 0.9 (very suitable) top 0.1 (Not suitable).

The calculation of the equivalence factors assumes that the most suitable land available will be used for the for the most productive form of land use. The equivalence factors are calculated as the ratio of the world average suitability index for a given land use type to the average suitability index for all land use types.

ATTACHMENT B: IDENTIFICATION OF CONSUMPTION PATTERNS IN CAMPO GRANDE



Certain steps need to be taken in order to calculate the Ecological Footprint of a municipality.

First we have on hand the Ecological Footprint of a country and to interpret that footprint and develop strategies to mitigate its impact, it is essential gain an understanding of its distribution among the various economic sectors. There are two ways of obtaining that understanding (point 1).

The first is to analyse the flows of materials and energy involved in each product and service in the economy. That will lead us to make an analysis of the life cycle for each goods item consumed and the aggregate effect of the various goods associated to the impact of a given human activity. We will then be able to add up the footprint incorporated in all food products so that we obtain the overall footprint for food consumption.

Another way is to analyse the economic flows based on the input-product matrix and then make use of the money flows to define the consumption of natural resources for each economic sector. By using economic flows per sector we can gain a picture of how the Ecological Footprint permeates the economic sectors.

For various reasons set out in the respective literature[23], the GFN opted for the second method in the venture to obtain Campo Grande's Ecological Footprint.

With the Ecological Footprint grouped by Natural Resources and the inputs-product matrix in hand, the next step is to describe the use of natural resources by sectors and its distribution according to the monetary flows revealed by the inputs-product matrix (point 2).

The intermediate result of this process is that the Ecological Footprint provides an understanding of the final demand per economic sector. Thus the global impact of the consumption of the family and governmental consuming is identified for each economic sector in the input-product chart.

The final result of the input-product approach when working with Ecological Footprint is a Land Use and Consumption Matrix which distributes the Footprint according to types of land use (crops, pastures, forests, fisheries, carbon uptake land and built up areas), and does so, specified by consumption category.

23 Kitzes, J., Galli, A., Bagliani, M., Barrett, J., Dige, G., Ede, S., Erb, K-H., Giljum, S., Haberl, H., Hails, C., Jungwirth, S., Lenzen, M., Lewis, K., Loh, J., Marchettini, N., Messinger, H., Milne, K., Moles, R., Monfreda, C., Moran, D., Nakano, K., Pyhälä, A., Rees, W., Simmons, C., Wackernagel, M., Wada, Y., Walsh, C., Wiedmann, T., 2009. A research agenda for improving national ecological footprint accounts. Ecological Economics 68(7), 1991-20

The family consumption categories that are currently used in the LUCM are in alignment with United Nations classification system for consumption, COICO, which makes it feasible to create a standardised LUCM for various nations. This adjustment needs to be made so that we can align the national categories with the international ones [point 3].

The Ecological Footprint that is the point of entry for the LUCM process is the Ecological Footprint of consumptions, a value that takes into account the Ecological Footprint of the entire national production adding to it the Footprint of imported goods and subtracting the value corresponding to exported goods. That means that the total LUCM is an illustration of per capita consumption of goods and services whether they be from national or international sources. It also means that the LUCM cannot be used to estimate the impacts of family consumption on the biocapacity of a given sub-national region because the aggregated consumption has its origins in various different bio-regions around the world.

It must be understood that the Ecological Footprint quantifies the planetary impacts of local consumption which makes it an excellent indicator for orientating responsible consumption with awareness. For Campo Grande's LUCM it is presumed that the goods and services production chains are identical to those of the country as a whole.

To identify consumption patterns of the average citizen in Campo Grande we made use of the Household Budget Survey. Fortunately such surveys have been conducted for Campo Grande and it is made use of by the Economic and Social Science Studies and Research Nucleus (NEPES) at the Anhanguera University (Uniderp) in the work of determining the Consumer Price Index. It was necessary to update the 2004 survey to meet the standards of the 2008 survey run by a NEPES technical team in order to harmonise it with the IBGE 2008 survey. Under NEPES guidance we adopted as the standard for average expenses patterns in Campo Grande, the same value determined by the IBGE's HBS for the State of Mato Grosso as a whole. That was the last step (point 4) for us to arrive at Campo Grande's Ecological Footprint. There now follow some details of sources and the structure of the tables so that the more technical reader can obtain a clearer idea of what the steps described above actually meant in terms of adapting the data.

Adjusting the HBS of Campo Grande

According to Souza e Reis Neto (2003), the HBS that was elaborated for Campo Grande in 1999 and updated in 2002 by the Economic Research Institute FIPE consists of the following main groups:

- NUTRITION – Cereals, meats, fats, sugars and sweets, beverages, fruits, greens and vegetables, condiments, eating out and other;
- HOUSING – Rent, repairs and overhauls, taxes, cleaning products etc.;
- CLOTHING – Men and women's clothing, footwear (adult and juvenile) etc.;
- TRANSPORT – Fuel, fares, (urban and inter-city), vehicles, parts, maintenance etc.;
- PERSONAL EXPENSES - Beauty parlour, domestic utilities etc.;
- HEALTH – Medial, Dental and Pharmaceutical care and assistance;
- EDUCATION – School fees, stationary etc.

To bring that survey up to date and align it with the data of the 2008-2009 survey conducted by the Brazilian Geography and Statistics Institute two more Groups were added to be taken into consideration: OTHER CURRENT EXPENSES – Taxes, labour contributions banking services, pensions, monthly allowances private social security etc, and ASSETS AND DEBTS – increases in assets and decreases in debts

Hierarchic levels considered for the Campo Grand HBS

The hierarchy of the weighting structure consists of Group, Item and sub-item as shown in Figure 1.

The updated version of the Personal expenses Group is formed by five groups brought in from the IBGE HBS, namely: Hygiene and personal care, Recreation and culture, Tobacco, Personal services, and Miscellaneous Expenses.

The weight attributed to the Personal Expenses group is the sum of the five weights attributed in the IBGE survey (BRAZIL, 2010).

The distribution of the Groups, Items and sub-items in the updated HBS are the same as those of the IBGE with some slight differences deriving from the proportional distribution of the relative weights to the sub-items which happened to show in the IBGE HBS but for which it proved impossible to determine compatible sub-items for the group in question (BRAZIL, 2010).

Those sub-items with zero weighting in the IBGE HBS were not considered in the process of adjusting and updating the Campo Grande HBS.

Adjusted Version of the Household Budget Survey for the State of Mato Grosso do Sul

Type of expenditure	Total	Type of Expenditure	Total
Total expenditure	100.0	Education	2.0
Current expenditure	90.6	Regular courses	0.5
Consumption expenditure	79.2	Higher education courses	0.6
Food	15.0	Other courses and activities	0.5
Housing	28.6	Educational books and technical reviews	0.1
Rent	12.1	School material	0.2
Monetary rental	2.0	Others	0.1
Non monetary rental	10.1	Recreation and culture	1.3
Condominium	0.3	Toys and games	0.2
Services and taxes	8.1	Mobile phone & accessories	0.4
Electricity	2.7	Non instructional Periodicals, books and magazines	0.1
Fixed phone	0.9	Recreation and sports	0.3
Mobile phone	1.3	Others	0.3
Telephone, TV and Internet package	0.6	Tobacco	0.3
Household gas	1.0	Personal services	0.8
Water and sewage	1.1	Hairdresser	0.5
Others	0.4	Manicuro e pedicuro	0.2

Table 1 *represents the Household Budget Survey (HBS) of the State of Mato Grosso do Sul State undertaken by the IBGE for the years 2008-2009 which was used to adjust the HBS values for Campo Grande.*

Type of expenditure	Total	Type of Expenditure	Total
Home maintenance	3.2	Repair of personal items	0.0
Cleaning products	0.7	Others	0.1
Furniture and household items	1.7	Miscellaneous expenses	2.4
Household appliances	2.2	Gambling and betting	0.1
Repairs for household items	0.3	Communication	0.1
Clothing	4.4	Ceremonies and celebration	0.4
Men's wear	1.0	Professional services	1.0
Women's wear	1.2	Properties for occasional use	0.2
Children's wear	0.6	Others	0.6
Shoes and accessories	1.4	Other current expenses	11.5
Costume and real jewellery	0.2	Taxes	4.5
Cloth and haberdashery	0.0	Labour contributions	3.3
Transport	16.5	Banking services	0.4
Urban	1.2	Pensions, allowances & donations	1.6
Gasoline – own vehicle	3.0	Private social security	0.1
Alcohol – own vehicle	0.2	Others	1.6
Maintenance and accessories	2.1	Increased assets	6.2
Vehicle acquisition	8.0	Real estate (acquisition)	4.1
Sporadic trips	1.1	Property (refurbishing)	2.2
Others	0.9	Other investments	0.0
Hygiene and personal care for personal use	2.1	Debt reduction	3.1
Health assistance	0.8	Loan	2.7
Medicines	0.2	Property instalments	0.4
Toilet soap	0.1		
Instruments and products	1.0		
Health assistance	5.7		
Medicines	2.8		
Health Plan/Insurance	1.7		
Dental consultation and treatment	0.3		
Medical consultation	0.2		
Medical and outpatient treatment	0.0		
Surgical service	0.1		
Hospital admission	0.1		
Miscellaneous examinations	0.2		
Treatment material	0.3		
Others	0.1		

The IBGE dismembered the Food/Nutrition Group in a single table due to its importance and great variety (TABLE 2).

***Table 2** – family monetary expenditure on food by total income brackets and family assets variation/month, classified by types of expenditure with an indication of the number and average size of families – Mato Grosso do Sul- period- 2008-2009*

Type and average size of family spending on food	Monthly average monetary and non monetary family expenditure on food (R$)
	Total
Expenditure on food	368,15
Eating at home	272,98
Cereals, vegetables and oil plants	23,14
Rice	15,03
Beans	6,17
Organics	0,07
Others	1,88
Meals, starches and pastas	10,59
Macaroni	3,14
Flour	2,39
Manioc meal (Cassava)	0,44
Others	4,64
Tubercles and roots	5,09
Potato	1,38
Carrots	0,81
Manioc	1,34
Outros	1,56
Sugar and derivates	13,92
Refined sugar	0,18
Crystal sugar	2,91
Light and diet	0,25
Others	10,58
Greens and vegetables	11,62
Tomato	4,32
Onion	1,26
Lettuce	1,58
Others	4,46
Fruits	12,05
Banana	2,80
Oranges	1,83
Apple	1,35
Other fruits	6,07
Meats, viscera and fish	66,13
Top quality beef	19,72
Regular beef	16,19
Pork	1,72
Industrialised meat and fish	10,50
Fresh fish	2,20
Others	15,81
Poultry and eggs	14,38
Chicken	10,83
Chicken	3,15
Organics	-
Others	0,40

Milk and dairy products	29,12
Cows milk	14,32
Powdered milk	1,34
Cheeses	5,20
Light and diet	0,22
Organics	0,15
Others	7,89
Bakery products	21,20
Bread rolls	9,82
Biscuits	5,64
Light and diet	0,16
Other bakery products	5,58
Fats and Oils	7,28
Soy oil	5,65
Olive oil	0,65
Others	0,97
Beverages and infusions	27,44
Ground coffee	5,46
Soft drinks	9,25
Non alcoholic drinks light & diet	0,28
Beers and chopps	6,57
Other alcoholic drinks	1,12
Other	4,76
Tinned food and preserves	2,59
Salt and condiments	8,10
Tomato paste	1,86
Mayonaise	0,75
Refined salt	0,57
Others	4,91
Ready made food	8,37
Other foods	11,95
Eating out	95,18
Lunch and dinner	51,99
Coffee, milk, coffee/milk and chocolate	0,80
Sandwiches and savouries	8,61
Soft drinks and other non alcoholic drinks	7,10
Snacks	10,24
Beers, choppps and other alcoholic drinks	7,71
School meals	3,52
Light and diet food	0,28
Others	4,92
Number of families	746 555
Average size of family	3,19

Source: IBGE, Surveys Department, Work and Income Coordinating body, Family Budget Survey 2008-2009.

Notes:

1. The term 'household' is being used to indicate the 'Consumption Unit' targeted by the survey as mentioned in the introduction.

2. Total income brackets and monthly variations in family assets including monetary income, non monetary income and variations in assets.

(1) Including those with no income.

Table 3 represents expenditure by households in the city of Campo Grande according to the Household Budget Survey conducted by the Brazilian Geography and Statistics Institute –IBGE 's with values updated and weighted according to values used for the State of Mato Grosso do Sul by that survey for the period 2008-2009.

	Weight (%)	Weight	
Total expense	100.0000000	1.0000000	g: group
Current expenditure	90.6000000	0.9060000	i: Item
Consumption expenditure	79.2000000	0.7920000	si: sub-Item
Food	15.0000000	0.1500000	g
Cereals, vegetables and oil plants	0.94279519	0.0094280	i
Rice	0.61356512	0.0061357	si
Corn for canjica	0.04988334	0.0004988	si
Corn for popcorn	0.02494167	0.0002494	si
Beans	0.25440505	0.0025441	si
Meals, starches and pastas	0.43398510	0.0043399	i
Macaroni	0.13468503	0.0013469	si
Manioc meal	0.01496500	0.0001497	si
Flour	0.08979002	0.0008979	si
Oat meal	0.01196290	0.0001196	si
Corn meal	0.00031479	0.0000031	si
Breadcrumb meal	0.00031479	0.0000031	si
Farinha láctea	0.00031479	0.0000031	si
Yeast	0.01184048	0.0001184	si
Grated coconut	0.03261532	0.0003262	si
Oat flakes	0.00031479	0.0000031	si
Cerial flakes	0.01198866	0.0001199	si
Flaked maize	0.01198866	0.0001199	si
Manioc starch	0.05365004	0.0005365	si
Corn meal	0.02867702	0.0002868	si
Corn starch	0.01750719	0.0001751	si
Pasty dough	0.01274085	0.0001274	si
Pizza dough	0.00031479	0.0000031	si
Tubercles and roots	0.20951005	0.0020951	i
Potato	0.07076626	0.0007077	si
Carrot	0.03538313	0.0003538	si

***Tabela 3** – Campo Grande Household Budget Survey data updated according the weighting attributions adopted by the IBGE for the State of Mato Grosso do Sul – period 2008-2009.*

Manioc (Cassava)	0.07076626	0.0007077	si
Garlic	0.03259439	0.0003259	si
Sugar and derivates	0.64088820	0.0064089	i
Crystal sugar	0.13492383	0.0013492	si
Refined sugar	0.48909889	0.0048910	si
Light and diet sweeteners	0.01686548	0.0001687	si
Greens and vegetables	0.39415053	0.0039415	i
Lettuce	0.05986001	0.0005986	si
Onions	0.04489501	0.0004490	si
Tomato	0.17958004	0.0017958	si
Fresh Coriander and onion leaf	0.00894264	0.0000894	si
Spinach	0.00064089	0.0000064	si
Chicory	0.01699204	0.0001699	si
Cauliflower	0.00891166	0.0000891	si
Cabbage	0.01471508	0.0001472	si
Parsley	0.00064089	0.0000064	si
Puimpkin	0.01235446	0.0001235	si
Courgette	0.00466501	0.0000467	si
Egg Plant	0.00655895	0.0000656	si
Beetroot	0.00662085	0.0000662	si
Chayote	0.00845672	0.0000846	si
Corn on the cob	0.00655895	0.0000656	si
Cucumber	0.00719840	0.0000720	si
Sweet pepper	0.00655895	0.0000656	si
Fruits	0.49384512	0.0049385	i
Banana	0.11972002	0.0011972	si
Orange	0.07482502	0.0007483	si
Apple	0.05986001	0.0005986	si
Pineapple	0.02714665	0.0002715	si
Coconut	0.00692993	0.0000693	si
Guava	0.00692993	0.0000693	si
Lime	0.00692993	0.0000693	si
Papaya	0.04195921	0.0004196	si
Mango	0.00692993	0.0000693	si
Passion fruit	0.04188631	0.0004189	si
Watermelon	0.02842962	0.0002843	si
Strawberry	0.00692993	0.0000693	si
Peach	0.00692993	0.0000693	si

Cantaloupe	0.01496322	0.0001496	si
Grapes	0.04347546	0.0004348	si
Top-grade beef	1.05991432	0.0105991	i
Rump	0.34779086	0.0034779	si
Rump skirt	0.25910432	0.0025910	si
Loin	0.21312735	0.0021313	si
Topside	0.03607024	0.0003607	si
Outside flat	0.00724699	0.0000725	si
Filé-mignon	0.00724699	0.0000725	si
Sirloin	0.18932758	0.0018933	si
2nd grade beef	0.86363389	0.0086363	i
Chuck	0.23956377	0.0023956	si
Ribs	0.12874295	0.0012874	si
Hump	0.02328771	0.0002329	si
Liver	0.04913732	0.0004914	si
Topside	0.03306298	0.0003306	si
Shin	0.04043218	0.0004043	si
Blade	0.05473034	0.0005473	si
Rump skirt	0.04000123	0.0004000	si
Flank	0.04389666	0.0004390	si
Neck steak	0.08913855	0.0008914	si
Neck	0.01828982	0.0001829	si
Knuckle	0.02805671	0.0002806	si
Visceras (bovine)	0.07529366	0.0007529	si
Pork	0.09814022	0.0009814	i
Pork chops	0.02500439	0.0002500	si
Pork ribs	0.01061104	0.0001061	si
Pork loin	0.02212572	0.0002213	si
Fresh fat	0.00100132	0.0000100	si
Pork leg	0.03939774	0.0003940	si
Industrialised meat and fish	0.56920885	0.0056921	i
Tinned meat	0.02940894	0.0002941	si
Dry/jerked meat	0.07633163	0.0007633	si
Fresh sausage	0.07572248	0.0007572	si
Spam	0.02750563	0.0002751	si
Ham	0.03017653	0.0003018	si
Sausage	0.05455572	0.0005456	si

Tuna	0.13775396	0.0013775	si
Tinned sardines	0.13775396	0.0013775	si
Fresh fish	0.11776817	0.0011777	i
Freshwater fish	0.08125988	0.0008126	si
Sea fish	0.03650830	0.0003651	si
Poultry and eggs	0.58363512	0.0058364	i
Chicken	0.43398509	0.0043399	si
Chicken giblets	0.01496500	0.0001497	si
Chicken eggs	0.13468503	0.0013469	si
Milk and dairy products	1.18223524	0.0118224	i
Pasteurised milk	0.25123413	0.0025123	si
Type C milk	0.33240099	0.0033240	si
Ordinary powdered milk	0.04196789	0.0004197	si
Infnt formula milk	0.01789213	0.0001789	si
Mussarela/prato cheese	0.05237751	0.0005238	si
Cream cheese	0.05237751	0.0005238	si
Minas cheese	0.10475502	0.0010476	si
Cream	0.00000241	0.0000000	si
Yoghurt, curds and jellied milk	0.18961491	0.0018961	si
Condensed milk	0.00000241	0.0000000	si
Butter	0.12464534	0.0012465	si
Light and diet butter	0.01496500	0.0001497	si
Bakery products	0.85300517	0.0085301	i
Bread rolls	0.40405508	0.0040406	si
Biscuits	0.11090257	0.0011090	si
Crackers	0.11357248	0.0011357	si
Mini stick bread (bag)	0.00860968	0.0000861	si
Stick bread	0.00860968	0.0000861	si
Specialty pan bread	0.01935432	0.0001935	si
Hamburger buns	0.01935432	0.0001935	si
Potato bread	0.00860968	0.0000861	si
Wholemeal pan bread	0.01935432	0.0001935	si
Honey bread	0.00908882	0.0000909	si
Corn bread	0.00860968	0.0000861	si
Cheese bread	0.03316587	0.0003317	si
Wholemeal bread	0.00860968	0.0000861	si
Mandy bread	0.00860968	0.0000861	si

Sweet bread	0.03592560	0.0003593	si
Rye bread	0.00860968	0.0000861	si
Pan bread	0.01935432	0.0001935	si
Hot-dog rolls	0.00860968	0.0000861	si
Fats and oils	0.29930006	0.0029930	i
Soy oil	0.26408829	0.0026409	si
Olive oil	0.03521177	0.0003521	si
Beverages and infusions	1.05015715	0.0105016	i
Coffee	0.25298218	0.0025298	si
Instant coffee	0.00449746	0.0000450	si
Soft drinks	0.42163697	0.0042164	si
Non alcoholic drinks	0.01686548	0.0001687	si
Beer and chopp	0.30357862	0.0030358	si
Other alcoholic drinks	0.05059644	0.0005060	si
Tinned and preserved food	0.10475502	0.0010476	i
Palm heart	0.01751536	0.0001752	si
Olives	0.04178876	0.0004179	si
Peas	0.00002329	0.0000002	si
Margarine	0.03594047	0.0003594	si
Creamed rice	0.00870663	0.0000871	si
Corn on the cob	0.00002329	0.0000002	si
Bean stew (Feijoada)	0.00010529	0.0000011	si
Sausage	0.00065194	0.0000065	si
Salt and condiments	0.32923662	0.0032924	i
Mayonaise	0.02993001	0.0002993	si
Tomato paste	0.07482502	0.0007483	si
Refined salt	0.02993001	0.0002993	si
Meat and chicken bouillon	0.00146340	0.0000146	si
Pepper	0.04333611	0.0004334	si
Dehydrated soup	0.04503471	0.0004503	si
Seasoning	0.06611620	0.0006612	si
Vinager	0.03860118	0.0003860	si
Prepared foods	0.34419507	0.0034420	i
Frozen foods	0.19000774	0.0019001	si
Savouries	0.15418733	0.0015419	si
Other foods	0.47888010	0.0047888	i
Sweets and chewing gum	0.04150593	0.0004151	si

Sweets	0.04848762	0.0004849	si
Chocolate bar	0.05797317	0.0005797	si
Chocolate powder	0.11046168	0.0011046	si
Preserves in syrup	0.06418097	0.0006418	si
Preserves in paste or solid form	0.07233398	0.0007233	si
Frozen sweets	0.08151484	0.0008151	si
Ready to bake mixes	0.00080731	0.0000081	si
Honey, syrup and karo	0.00080731	0.0000081	si
Gelatine powder	0.00080731	0.0000081	si
Outside the home	3.95076080	0.0395076	i
Lunch and dinner	2.22822909	0.0222823	si
Coffee, milk, coffee/milk and chocolate	0.03160609	0.0003161	si
Sandwiches and savouries	0.36346999	0.0036347	si
Soft drinks and other non alcoholic drinks	0.30025782	0.0030026	si
Snacks	0.44248521	0.0044249	si
Beers, chopp, and other alcoholic drinks	0.33186391	0.0033186	si
School meals	0.23704565	0.0023705	si
Light and diet food	0.01580304	0.0001580	si

Housing	28.60000000	0.2860000	g
Rent in money	2.00000000	0.0200000	i
Apartment rent	1.00000000	0.0100000	si
House rent	1.00000000	0.0100000	si
Non monetary rent	10.10000000	0.1010000	i
Renting apartament	5.05000000	0.0505000	si
Renting house	5.05000000	0.0505000	si
Condominium	0.30000000	0.0030000	i
Aprtment Condominium	0.30000000	0.0030000	si
Taxes and Services	8.10000000	0.0810000	i
Electricity	2.84914713	0.0284915	si
Fixed phone	0.94971571	0.0094972	si
Mobile phone	1.37181158	0.0137181	si
Telephone, TV & internet pkg.	0.63314381	0.0063314	si
Internet	0.08017844	0.0008018	si
Domestic gas (cylinder)	1.05523968	0.0105524	si
Water and sewage	1.16076365	0.0116076	si

Domestic items and home maintenance	3.20000000	0.0320000	i
Charcoal	0.07565012	0.0007565	si
Matches	0.30260047	0.0030260	si
Batteries	0.37825059	0.0037825	si
Candles	0.15130024	0.0015130	si
Lap	0.34042553	0.0034043	si
Brick	0.22695035	0.0022695	si
Cement	0.24964539	0.0024965	si
Sand	0.11347518	0.0011348	si
Stone	0.12104019	0.0012104	si
Iron and steel	0.18156028	0.0018156	si
Decks	0.07565012	0.0007565	si
Floors	0.27234043	0.0027234	si
Paint	0.30260047	0.0030260	si
Lawnmower	0.22695035	0.0022695	si
Rake	0.07565012	0.0007565	si
Hoe	0.10591017	0.0010591	si
Cleaning articles	0.70000000	0.0070000	i
Chlorinated Water	0.03537345	0.0003537	si
Alcohol	0.00051925	0.0000052	si
Softeners	0.05496368	0.0005496	si
Wax for floors	0.06554399	0.0006554	si
Disinfectant	0.04535892	0.0004536	si
Detergent	0.06395774	0.0006396	si
Steel Sponge	0.04853935	0.0004854	si
Insecticide	0.00051925	0.0000052	si
Kerosene	0.00051925	0.0000052	si
Glass-cleaner	0.00051925	0.0000052	si
Furniture polish	0.00051925	0.0000052	si
Cleaning cloth	0.00051925	0.0000052	si
Soap in solid bars	0.10444686	0.0010445	si
Soap Powder	0.25030286	0.0025030	si
Saponaceous materials	0.00051925	0.0000052	si
Brooms	0.02787840	0.0002788	si
Furniture and domestic items	1.70000000	0.0170000	i
Kitchen table	0.28333333	0.0028333	si
Dining Table	0.24285714	0.0024286	si

Set of sofa and chairs	0.16190476	0.0016190	si
Double bed	0.28333333	0.0028333	si
Single Bed	0.12142857	0.0012143	si
Double Matress	0.20238095	0.0020238	si
Single Matress	0.10523810	0.0010524	si
6-door Wardrobe	0.13761905	0.0013762	si
Steel Stand	0.06476190	0.0006476	si
Table for Computer	0.04047619	0.0004048	si
Stand for TV and sound apparatus	0.05666667	0.0005667	si
Electrical/electronic equipment	2.20000000	0.0220000	i
Air conditioning	0.13466355	0.0013466	si
Stove	0.19512921	0.0019513	si
Microwave Oven	0.07909884	0.0007910	si
Freezer	0.09097596	0.0009098	si
Blender	0.07107723	0.0007108	si
Washing Machine	0.45480848	0.0045481	si
Refrigerator	0.47796795	0.0047797	si
Ventilator	0.06654545	0.0006655	si
Sound reproduction apparatus	0.07532931	0.0007533	si
Television set	0.33829348	0.0033829	si
Videocassete	0.08341470	0.0008341	si
Computer	0.10426838	0.0010427	si
Printer	0.02842748	0.0002843	si
Repair of household articles	0.30000000	0.0030000	i
Household articles repair	0.30000000	0.0030000	si

Vestuário	4.40000000	0.0440000	g
Menswear	1.00000000	0.0100000	i
Male Shorts and Bermudas	0.19645069	0.0019645	si
Long Male Shorts	0.48326290	0.0048326	si
Male Shirt	0.25261337	0.0025261	si
Male T-shirt	0.06767304	0.0006767	si
Women 's clothing	1.20000000	0.0120000	i
Female shorts and Bermuda model	0.08991436	0.0008991	si
Blouse	0.30759556	0.0030760	si
Very feminine long shorts	0.35949487	0.0035949	si
Female T-shirt	0.07143600	0.0007144	si

Lingerie	0.14617462	0.0014617	si
Skirts	0.05336965	0.0005337	si
Skirts	0.17201494	0.0017201	si
Children's Clothes	0.60000000	0.0060000	i
Uniform	0.05495814	0.0005496	si
Infants long pants	0.06735497	0.0006735	si
Infants Coats	0.04123991	0.0004124	si
Infants Clothing	0.05267768	0.0005268	si
Infants shorts	0.06381718	0.0006382	si
Infants Shirts	0.06182080	0.0006182	si
Infants T-shirts	0.05360834	0.0005361	si
Nappies	0.07560296	0.0007560	si
Infants sports outfit	0.04211373	0.0004211	si
Infants Overalls	0.02439584	0.0002440	si
Shorts and T-shirt set	0.06241045	0.0006241	si
Shoes and accessories	1.40000000	0.0140000	i
Men's shoe	0.29476471	0.0029476	si
Women's shoes	0.33683092	0.0033683	si
Children's Shoes	0.0435751	0.0004358	
Male Sandals/slippers	0.05265318	0.0005265	si
Female sandals/slippers	0.05265318	0.0005265	si
Infant sandals/slippers	0.04628204	0.0004628	
Trainers	0.57324087	0.0057324	si
Costume and authentic jewellery	0.20000000	0.0020000	i
Male wristwatch	0.06558046	0.0006558	si
Female wristwatch	0.07664558	0.0007665	si
Earring	0.01523041	0.0001523	si
Bracelet	0.03116495	0.0003116	si
Ring	0.01137860	0.0001138	si
Cloth and haberdashery	0.00000562	0.0000001	i
Cloth	0.00000325	0.0000000	si
Haberdashery	0.00000237	0.0000000	si

Transport	16.50000000	0.1650000	g
Urban	1.20000000	0.0120000	i
Urban Buses	1.08923872	0.0108924	si
Taxi	0.11076128	0.0011076	si

Fuel	4.10000000	0.0410000	i
Petrol/Gasoline – own vehicle	2.00000000	0.0200000	si
Ethanol – own vehicle	1.20000000	0.0120000	si
Diesel	0.90000000	0.0090000	si
Maintenance and accessories	2.10000000	0.0210000	i
Labour	1.29230769	0.0129231	si
Tire	0.80769231	0.0080769	si
Vehicle purchase	8.00000000	0.0800000	i
New vehicle	2.07920932	0.0207921	si
Used vehicle	4.15830537	0.0415831	si
New motorbike	0.37936650	0.0037937	si
Used motorbike	0.75884627	0.0075885	si
New pickup	0.20809085	0.0020809	si
Used pickup	0.41618170	0.0041618	si
Sporadic trips	1.10000000	0.0110000	i
Interstate coach	0.55000000	0.0055000	si
Inter-municipal coach	0.55000000	0.0055000	si

Personal Expenditure	6.90000000	0.0690000	g
Personal Care and Hygiene	2.10000000	0.0210000	i
Perfume	0.80000000	0.0080000	si
Hair Care Products	0.20000000	0.0020000	si
Toilet Soap	0.10000000	0.0010000	si
Menstrual Absorbents	0.06995661	0.0006996	si
Toothpaste	0.10412847	0.0010413	si
Dental Floss	0.05206423	0.0005206	si
Moisturiser	0.16327233	0.0016327	si
Toilet paper	0.15924707	0.0015925	si
Skin cleaning products	0.10517108	0.0010517	si
Tanning products	0.08163616	0.0008164	si
Sunblock	0.08163616	0.0008164	si
Shampoo	0.18288788	0.0018289	si
Recreation and culture	1.30000000	0.0130000	i
Toys and games	0.20000000	0.0020000	si
Mobile phone and accessories	0.40000000	0.0040000	si
Non educational reviews, Books and magazine	0.10000000	0.0010000	si
Recreation and sports	0.30000000	0.0030000	si
Leisure (club)	0.30000000	0.0030000	si
Smoking	0.30000000	0.0030000	i
Personal Services	0.80000000	0.0080000	i

Hairdresser (Haircuts and Hair Colouring)	0.50000000	0.0050000	si
Manicure and pedicure	0.20000000	0.0020000	si
Workout Gym	0.05000000	0.0005000	si
Aesthetics Clinics	0.05000000	0.0005000	si
Miscellaneous Expenses	2.40000000	0.0240000	i
Betting and Gambling	0.10000000	0.0010000	si
Postage	0.10000000	0.0010000	si
Ceremonies and Celebrations	0.40000000	0.0040000	si
Professional Services	1.00000000	0.0100000	si
Properties used occasionally	0.20000000	0.0020000	si
Cinema and events	0.60000000	0.0060000	si

Health Assistance	5.70000000	0.0570000	g
Medicines	2.80000000	0.0280000	i
Painkillers and anti-Fever drugs	0.27696488	0.0027696	si
Anti-allergy drugs and bronco-dilators	0.12065881	0.0012066	si
Anti-conception drugs and hormones	0.10436018	0.0010436	si
Anti-diabetic drugs	0.27037476	0.0027037	si
Common cold and cough medicines	0.27037476	0.0027037	si
Antibiotics and anti-infection medicines	0.31772209	0.0031772	si
Anti-inflammatory and anti-rheumatic medicines	0.39845406	0.0039845	si
Medicines for Hypertension and high cholesterol	0.11788027	0.0011788	si
Hipotensor e hipocolesterínico	0.48693080	0.0048693	si
Gastro-protectors	0.06372107	0.0006372	si
Psychotropic drugs and anti-anorexics	0.22868113	0.0022868	si
Vitamins and invigorators	0.14387717	0.0014388	si
Health Plan/Insurance	1.70000000	0.0170000	i
Unimed	0.56666667	0.0056667	si
PAS/UFMS	0.56666667	0.0056667	si
PAX Mundial	0.56666667	0.0056667	si
Dental Consultations and Treatment	0.30000000	0.0030000	i
Extraction	0.15000000	0.0015000	si
Amalgam Filling	0.15000000	0.0015000	si
Medical Consultation	0.30000000	0.0030000	i

General Practitioner	0.07500000	0.0007500		si
Orthopaedic specialist	0.07500000	0.0007500		si
Paediatrician	0.07500000	0.0007500		si
Ophthalmologist	0.07500000	0.0007500		si
Surgical Services	0.10000000	0.0010000		i
Hospital Admission	0.10000000	0.0010000		i
Miscellaneous Examinations	0.20000000	0.0020000		i
Laboratory Examination	0.185767213	0.0018577		si
Radiography	0.014232787	0.0001423		si
Treatment Material	0.30000000	0.0030000		i
Dressing Material	0.30000000	0.0030000		si

Education	2.00000000	0.0200000	g	
Regular Course	0.52631579	0.0052632		i
Language Course	0.17487315	0.0017487		si
IT Course	0.04961210	0.0004961		si
University Entrance Preparatory Course	0.30183054	0.0030183		si
Higher Education Course	0.63157895	0.0063158		i
Administration	0.30903757	0.0030904		si
Law	0.16591456	0.0016591		si
Mathematics	0.05421012	0.0005421		si
Physiotherapy	0.08926318	0.0008926		si
Medicine	0.01315351	0.0001315		si
Other courses and activities	0.52631579	0.0052632		i
Mandatory education (years 1 to 9)	0.24584549	0.0024585		si
Higher Secondary education	0.21296566	0.0021297		si
Infant education	0.06750465	0.0006750		si
Study books and Technical Reviews	0.10526316	0.0010526		i
Study books	0.10526316	0.0010526		si
School articles	0.21052632	0.0021053		si
School-related stationary and material	0.21052632	0.0021053		si

Other current expenses	11.500000	0.1150000	g	
Federal Taxes	3.2856826	0.0328568		i
IR (Individual Income Tax)	0.9063952	0.0090640		si
IPI (Tax on Industrial products)	1.0196946	0.0101969		si
PIS (Social Insurance paid by employers)	0.2265988	0.0022660		si

COFINS (Corporate Social Contribution)	0.3398982	0.0033990	si
FUNRURAL(Tax)	0.1132994	0.0011330	si
IOF (Tax)	0.6797964	0.0067980	si
State Taxes	1.3595928	0.0135959	i
ICMS (Tax)	0.9063952	0.0090640	si
IPVA (Vehicle Tax)	0.4531976	0.0045320	si
Municipal Taxes	0.5819974	0.0058200	i
IPTU (Council Tax)	0.2420992	0.0024210	si
ITBI	0.2265988	0.0022660	si
ISS (Service provison tax)	0.1132994	0.0011330	si
Labor Contributions	3.8333333	0.0383333	i
INSS (Social Security)	1.7424242	0.0174242	si
FGTS (Unemployment Conreibution)	1.7424242	0.0174242	si
Union Taxes	0.3484848	0.0034848	si
Bank Services	0.4646465	0.0046465	i
Overdraft Interest Charges	0.1402706	0.0014027	si
Credit Card Interest Charges	0.1402706	0.0014027	si
Simple Money Transfer	0.0175338	0.0001753	si
Delayed Money transfer	0.0263007	0.0002630	si
Check Book charge	0.0526015	0.0005260	si
Savings Account	0.0175338	0.0001753	si
Returned Cheques	0.0263007	0.0002630	si
Monthly Statement	0.0438346	0.0004383	si
Pensions, monthly allowances and donations	1.8585859	0.0185859	i
Tythes	0.5310245	0.0053102	si
Donation to philanthropic entity	0.2655123	0.0026551	si
Alimony	1.0620491	0.0106205	si
Private Social Security	0.1161616	0.0011616	i
Investment Funds	0.1161616	0.0011616	si

Assets and Liabilities	9.40000000	0.0940000	g
Asset increase	6.30000000	0.0630000	i
Property Purchase	4.10000000	0.0410000	si
Property Refurbishing	2.20000000	0.0220000	si
Debt Reduction	3.10000000	0.0310000	i
Loans	2.70000000	0.0270000	si
Mortgage	0.40000000	0.0040000	si

Harmonising data from the Brazilian Household Income Survey Data (POF is the Portuguese Acronym) with the standards adopted by the United Nations Statistics Division for the Classification of Individual Consumption According to Purpose - COICOP

The Footprint Calculations based on constructing the Land Use and Consumption Matrix has made us of the United Nations Statistic Divisions scheme for classifying individual consumption according to purpose, the COICOP. To ensure full alignment of the Brazilian data with the international standard we have grouped the many items and sub-items according to the following table:

POF IBGE 2008	United Nations Statistics Division - COICOP - (Classification of Individual Consumption According to Purpose)
Clothing	Clothing and footwear
Menswear Menswear Children's wear Cloth and haberdashery	Clothing
Footwear and gear	Footwear
Costume and real jewelry	

Housing	Housing, water, electricity, gas and other fuels
Rent Rent paid in money Non monitory rent	Actual rentals for housing
	Imputed rentals for housing
Household maintenance	Maintenance and repair of the dwelling
Water Supply and Sewage	Water supply and miscellaneous services relating to the dwelling
Electricity Household gas	Electricity, gas and other fuels
Condominium Services and charges	
Fixed Phone Mobile Phone TV, Internet and Phone package	
Others	
	Furnishings, household equipment and routine household maintenance

Household furnishings and objects	Furniture and furnishings, carpets and other floor coverings Household textiles Glassware, tableware and household utensils Tools and equipment for house and garden
Household appliances	Household appliances
Repairs for household items Household Cleaning Materials	Goods and services for routine household maintenance

Health Care	Health
Medicines Treatment Material	Medical products, appliances and equipment
Dental Consultation and treatment Medical Consultation Medical and outpatient treatment Miscellaneous Examinations	Outpatient services
Surgical services Hospital admission Health Scheme/Insurance Others	Hospital services

Transport	Transport
Vehicle acquisition	Purchase of vehicles
Petrol (gasoline) – own vehicle Alcohol – own vehicle Maintenance and accessories Others	Operation of personal transport equipment
Urban Sporadic urban trips	Transport services
	Communication Postal services Telephone and telefax equipment Telephone and telefax services

Recreation and Culture	Recreation and culture
	Audio-visual, photographic and information processing equipment
	Other major durables for recreation and culture
Toys and games	Other recreational items and equipment, gardens and pets
Recreation and Sports Others	Recreational and cultural services
Non instructional periodicals books and magazines	Newspapers, books and stationery
	Package holidays
Mobile phone and accessories	

Education	Education
Regular Courses	Pre-primary and primary education Secondary education
Other course and activities	Post-secondary non-tertiary education
Higher Education courses	Tertiary education
Teaching books and technical reviews	Education not definable by level
School supplies	
Others	
	Restaurants and hotels
	Catering services
	Accommodation services

	Miscellaneous goods and services
Personal Services	
Hairdresser	
Manicure and Pedicure	
Repairs to personal possessions	
Others	
Hygiene and Personal care	
Perfume	
Hair products	
Toilet Soap	
Instruments and products for Personal use	

	Prostitution
	Personal effects n.e.c.
	Social protection
	Insurance
	Financial services n.e.c.
	Other services n.e.c.
Miscellaneous spending	Individual consumption expenditure of non-profit institutions serving households (NPISHs)
Betting and Gambling	Housing
Communication	Health
Ceremonies and celebrations	Recreation and culture
Professional Services	Education
Properties used occasionally	Social protection
Others	Other services
Other current expenses	
Taxes	
Labor Contributions	Individual consumption expenditure of general government
Bank Services	Housing
Pensions, monthly allowance, donations	Health
Private Social Insurance	Recreation and culture
Others	Education
Asset Increase	Social protection
Imóvel (aquisição)	
Imóvel (reforma)	
Outros investimentos	Tobacco
Debt reduction	
Loan	
Mortgage Installment	

Cereals, Legumes and oil plants	Plant-Based food
Rice	
Beans	
Organics	
Others	
Meals, starches, pasta	
Macaroni	
Flour	
Manioc Meal	
Others	

Plant-Based food	
Roots and Tubercles	
Potato	
Carrot	
Manioc (Cassava)	
Others	
Sugar and derivates	
Sugar and derivates	
Crystal Sugar	
Light and diet	
Others	
Greens and Vegetables	
Tomato	
Onion	
Lettuce	
Others	
Fruits	
Banana	
Orange	
Apple	
Other Fruits	
Fats and Oils	
Soy oil	
Olive Oil	
Others	

Animal-Based food	
Meats, visceral and Fish	
Top quality beef	
Beef	
Pork	
Industrialised meat and fish	
Fresh fish	
Others	
Eggs and Poultry	
Chicken	
Chicken eggs	
Organics	
Others	

Animal-Based food	**Milk and Dairy Products**
	Liquid Milk
	Powdered Milk
	Cheese
	Light and diet
	Organic
	Others
Processed food	**Bakery Products**
	Bread Rolls
	Biscuits
	Light and diet
	Other baked items
	Other baked items
	Salt and condiments
	Tomato paste
	Mayonnaise
	Refined Salt
	Others
	Prepared Foods
	Other Foods
Beverages	**Drinks and infusions**
	Ground Coffee
	Soft Drinks
	Light & diet non-alcoholic drinks
	Others
	Beers and non pasteurized beer
	Other alcoholic drinks

ATTACHMENT D – LAND USE AND CONSUMPTION MATRIX (LUCM)

According to the steps set out above
For the purpose of sub-national Ecological Footprint calculation using Global Footprint Network methodology economic tables are needed to establish the input-product (I-P) ratios identifying the flows of money and accordingly, of resources through the economy.

CLUM Brasil

[gha/cap]	CLUM Brasil						
	Agriculture	Pastures	Forest Resources	Fishery resources	Built Up Areas	Energy & CO2 absorption	Total
Food	0.48	0.62	0.07	0.11	0.01	0.05	1.34
Food	0.40	0.52	0.05	0.09	0.01	0.04	1.11
Vegetable Origin	0.40	0.00	0.00	0.00	0.00	0.00	0.40
Animal Origin	0.00	0.52	0.00	0.09	0.00	0.00	0.60
Non alcoholic beverages	0.03	0.04	0.01	0.01	0.00	0.00	0.09
Alcoholic beverages	0.05	0.06	0.01	0.01	0.00	0.01	0.14
Housing	0.01	0.01	0.05	0.00	0.01	0.08	0.15
Effective Rent	0.00	0.00	0.01	0.00	0.00	0.00	0.02
Imputed Rent	0.00	0.00	0.02	0.00	0.00	0.01	0.04
Repairs and Maintenance	0.00	0.00	0.02	0.00	0.00	0.00	0.02
Electricity, gas & other fuels	0.00	0.00	0.00	0.00	0.00	0.04	0.05
Electricity	0.00	0.00	0.00	0.00	0.00	0.03	0.04
Firewood	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diesel, Kerosene, GLP, charcoal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Household maintenance services	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Air conditioning/heating (home)						0.01	0.01
Mobility	0.02	0.02	0.03	0.00	0.01	0.10	0.19
Vehicle purchase	0.00	0.00	0.01	0.00	0.00	0.01	0.03
Personal vehicle operation	0.01	0.01	0.02	0.00	0.00	0.02	0.07
Transport Services	0.01	0.01	0.01	0.00	0.00	0.04	0.07
Transport (domestic)						0.02	0.02

[gha/cap]	CLUM Brasil						
	Agriculture	Pastures	Forest Resources	Fishery resources	Built Up Areas	Energy & CO2 absorption	Total
Goods	0.11	0.14	0.16	0.02	0.02	0.08	0.53
Clothing	0.01	0.02	0.01	0.00	0.00	0.01	0.06
Footwear	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Furniture, Upholstery, coverings	0.00	0.00	0.03	0.00	0.00	0.00	0.04
Textiles for the home	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Articles for the home	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Glass, crockery, domestic utensils	0.00	0.00	0.00	0.00	0.00	0.00	0.00
House & garden tools & equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Apparatus and equipment products	0.00	0.00	0.00	0.00	0.00	0.01	0.02
Telephone and Fax equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Audiovisual, photos and information	0.00	0.01	0.02	0.00	0.00	0.01	0.04
Other lasting leisure and culture goods	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Other leisure equipment etc.	0.01	0.01	0.04	0.00	0.00	0.01	0.08
Newspapers. books and stationary	0.00	0.00	0.01	0.00	0.00	0.00	0.02
Home maintenance goods	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Tobacco	0.06	0.08	0.02	0.01	0.00	0.01	0.18
Other personal items	0.00	0.00	0.02	0.00	0.00	0.00	0.03
Services	0.08	0.10	0.12	0.02	0.02	0.07	0.40
Water Supply & other household services	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outpatient Services	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Hospital Services	0.00	0.00	0.04	0.00	0.00	0.00	0.05
Postal Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Telephone and Telecopy	0.00	0.00	0.01	0.00	0.00	0.01	0.02
Recreational and cultural Services	0.01	0.01	0.01	0.00	0.00	0.01	0.03
Holiday Package deals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education	0.00	0.00	0.02	0.00	0.00	0.01	0.03

[gha/cap]	CLUM Brasil		Forest Resources	Fishery resources	Built Up Areas	Energy & CO_2 absorption	Total
	Agriculture	Pastures					
Restaurants	0.04	0.06	0.01	0.01	0.00	0.01	0.13
Accommodation	0.01	0.01	0.00	0.00	0.00	0.00	0.02
Personal Care	0.00	0.01	0.01	0.00	0.00	0.01	0.03
Social Protection	0.00	0.00	0.01	0.00	0.00	0.01	0.03
Insurance	0.00	0.00	0.01	0.00	0.00	0.01	0.02
Financial Services	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Other Services	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Household Consumption	0.69	0.89	0.44	0.15	0.07	0.37	2.61
Government	0.03	0.04	0.13	0.01	0.02	0.06	0.29
Total (gha/capita)	0.72	0.93	0.57	0.16	0.10	0.43	2.91

CLUM de Campo Grande

[gha/cap]	Agriculture	Pastures	Forest Resources	Fishery resources	Built Up Areas	Energy & CO_2 absorption	Total
Food	0.53	0.65	0.08	0.11	0.01	0.05	1.42
Food	0.44	0.53	0.05	0.09	0.01	0.04	1.15
Vegetable Origin	0.44	0.00	0.00	0.00	0.00	0.00	0.44
Animal Origin	0.00	0.53	0.00	0.09	0.00	0.00	0.62
Non alcoholic beverages	0.03	0.04	0.01	0.01	0.00	0.00	0.08
Alcoholic Beverages	0.06	0.08	0.02	0.01	0.00	0.01	0.18
Housing	0.01	0.01	0.05	0.00	0.01	0.14	0.23
Effective Rent	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Imputed Rent	0.00	0.00	0.02	0.00	0.00	0.01	0.04
Repairs and Maintenance	0.00	0.00	0.01	0.00	0.00	0.00	0.02
Electricity, gas & other fuels	0.00	0.00	0.00	0.00	0.00	0.05	0.06
Electricity	0.00	0.00	0.00	0.00	0.00	0.04	0.05
Firewood	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diesel, Kerosene, GLP, charcoal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Household maintenance services	0.00	0.00	0.00	0.00	0.00	0.02	0.02
Air conditioning/heating (home)	0.00	0.00	0.00	0.00	0.00	0.02	0.02
Mobility	0.02	0.02	0.03	0.00	0.01	0.09	0.17
Vehicle purchase	0.00	0.00	0.01	0.00	0.00	0.02	0.04
Personal vehicle operation	0.01	0.01	0.02	0.00	0.00	0.02	0.07
Transport services	0.00	0.00	0.01	0.00	0.00	0.03	0.05
Transport (domestic)	0.00	0.00	0.00	0.00	0.00	0.02	0.02

Goods	0.09	0.11	0.15	0.02	0.02	0.07	0.46
Clothing	0.01	0.02	0.01	0.00	0.00	0.01	0.06
Footwear	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Furniture, upholstery, coverings	0.00	0.00	0.03	0.00	0.00	0.00	0.04
Textiles for home	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Articles for the home	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Glass crockery, domestic utensils	0.00	0.00	0.00	0.00	0.00	0.00	0.00
House & Garden tools and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Apparatus, and equipment products	0.00	0.00	0.01	0.00	0.00	0.01	0.02
Telephone and Fax equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Audiovisual, photo and information	0.00	0.01	0.02	0.00	0.00	0.01	0.04
Other lasting leisure and culture goods	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Other leisure equipment etc.	0.01	0.01	0.04	0.00	0.00	0.01	0.08
Newspapers, books and stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Home maintenance goods	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Tobacco	0.04	0.05	0.01	0.01	0.00	0.00	0.12
Other personal items	0.00	0.00	0.02	0.00	0.00	0.00	0.03
Services	0.14	0.18	0.12	0.03	0.03	0.08	0.57
Water Supply & other household services	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Outpatient services	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Hospital Services	0.00	0.00	0.02	0.00	0.00	0.00	0.02
Postal services	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Telephone and Telecopy	0.00	0.00	0.01	0.00	0.00	0.01	0.02
Recreational and cultural Services	0.00	0.01	0.01	0.00	0.00	0.00	0.02
Holiday package deals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education	0.00	0.00	0.01	0.00	0.00	0.00	0.03
Restaurants	0.11	0.14	0.03	0.02	0.01	0.02	0.33
Accommodation	0.01	0.01	0.00	0.00	0.00	0.00	0.02
Personal care	0.00	0.01	0.01	0.00	0.00	0.01	0.03
Social Protection	0.00	0.00	0.01	0.00	0.00	0.01	0.03
Insurance	0.00	0.00	0.01	0.00	0.00	0.01	0.02
Financial Services	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Other Services	0.00	0.00	0.01	0.00	0.00	0.00	0.02
Household consumption	0.78	0.97	0.43	0.17	0.08	0.43	2.85
Government	0.03	0.04	0.13	0.01	0.02	0.06	0.29
Total (gha/capita)	0.81	1.01	0.56	0.17	0.11	0.49	3.14

THE ECOLOGICAL FOOTPRINT OF CAMPO GRANDE

OVERLOAD

In the mid-1980s, humanity began consuming more than the planet naturally had to offer and has been consuming above the necessary one-planet level ever since. Predictions for the year 2050 suggest that, if we carry on like this, we will need two planets to maintain our consumption patterns.

BIOCAPACITY X CONSUMPTION

Currently the world average for the Ecological Footprint is 2.7 global hectares per person while the available biocapacity for each human being is only 1.8 global hectares.

ECOLOGICAL FOOTPRINT

The average Ecological Footprint of an inhabitant of Campo Grande inhabitant is 3.14 global hectares. If everyone in the world were to consume as Campo Grande dwellers do, almost two planets would be needed to keep up their style of living. The Brazilian Ecological Footprint is 2.9 global hectares per person, showing that the Brazilian's average consumption of ecological resources is close to the global Ecological Footprint value.

MOBILISATION

The footprint calculation is a tool to improve public administration, and mobilise the general public to review its consumer habits and choose more sustainable products, while at the same time establishing a dialogue with businessman, encouraging them to improve their production chains.

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