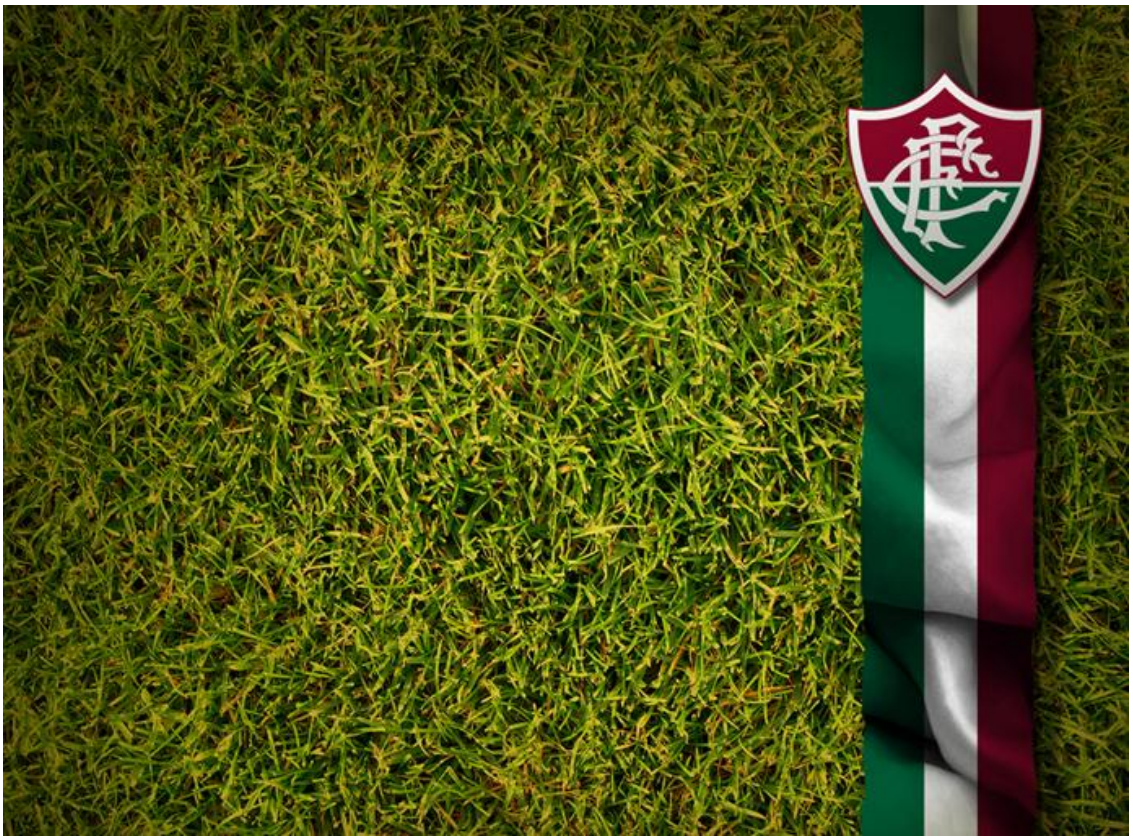
GHG INVENTORY REPORT

Project:

GHG Emissions Inventory

FLUMINENSE Football Club

Technical Report



February 2014

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Abbreviations

LCA	Life Cycle Assessment
ISO	International Standardization Organization
IMELS	Italian Ministry for the Environment Land and Sea
GWP	Global Warming Potential
WRI	World Resource Institute
DEFRA	UK Department of Environment Food and Rural Affairs
IPCC	International Panel on Climate Change
WBCSD	World Business Council for Sustainable Development
MCT	Ministério da Ciência, Tecnologia e Inovação – Brazil
IEA	International Energy Agency
CEF	Carbon Emission Factor

1. Introduction

Global warming and climate change has been identified as one of the key sustainable development issues and one of the greatest challenges facing mankind in future decades. Climate change impacts both human and natural systems and can cause a significant changes in future resources use, production and economic activities. As a response, many international and national initiatives has been developed and implemented to limit the concentration of greenhouse gases in the Earth's atmosphere.

Also many businesses taking steps in order to reduce their impact on climate change by introducing different corporate policies or by following international/national policies. These policies usually lead to participation in different emissions trading programs or voluntary programs or introduce new regulations and standards on energy efficiency and emissions.

As a first step a company, nation or other entity needs to quantify and report their GHG emissions and/or reductions to be able to understand and manage their GHG risks and to be prepared for any future national or regional climate policies.

Fluminense Football Club, in collaboration with Instituto-e and IMELS[1], has decided to do a GHG Emission Inventory analysis of its organization, and the present report describes methodologies and results of the GHG inventory of Fluminense F.C.

1.1 GHG Inventory accounting

The GHG inventory of Fluminense F.C. (hereandafter „Company") has been developed according to the GHG Protocol Corporate Accounting and Reporting Standard (Corporate standard, 2004 edition) published by WRI/WBCSD. The GHG Protocol Corporate Standard represents a base for many GHG standards and programs used around the world. It gives guidelines to companies, governments and organizations which want to determine their own GHG inventory on the basis of Kyoto Protocol greenhouse gases. According to our international experience, it is possible to provide a more detailed and complete GHG Inventory with using of this protocol than GHG Protocol for Brazil.

GHG Protocol gives basics and specifications to develop GHG Inventory study, depending on the defined scope and objective and the analyzed system characteristics.

International Standard Organization for Climate Registry (ISO) adopted the *Corporate Standard* in 2006 as the basis for its *ISO 14064-I*.

Standard ISO 14064 includes:

i. Specification with guidance at the organization level for quantification, reporting and reduction of greenhouse gas emissions
ii. Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
iii. Specification with guidance for validation and verification of greenhouse gas assertions.

[1] Italian Ministry for Environment Land and Sea

The GHG inventory has to consider six different types of greenhouse gases, identified by Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

The GHG inventory is expressed in tCO_2 equivalent (tCO_{2e}). This measuring unit allows comparison of the emissions of different GHGs, on the basis of their Global Warming Potential (GWP) by converting amounts of other gases to the equivalent amount of CO_2. The GWP for a 100 years' timeline equivalent has been used for the development of this GHG inventory, according to the protocol selected for the analysis. In Table 1 the GWP of the most common GHGs is reported. Following Table 2, for example the emissions of one ton of CH_4 is the equivalent to emissions of 25 tons of CO_2.

Table 1 – GWP of the most important gases identified by the Kyoto Protocol

GHGs	Chemical formula	GWP[2] 100years
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_2O	298
HFC-23 (Hydrofluorocarbons)	CHF_3	14.800
HFC-134a	CH_2FCF_3	1.300
Sulphur hexafluoride	SF_6	23.900
PFC-14 (Perfluorocarbons)	CF_4	6.500
PFC-116 (Perfluorocarbons)	C_2F_6	9.200

1.2 Fluminense Football Club

Fluminense Football Club, commonly known as Fluminense, is a Brazilian professional football club based in Laranjeiras, Rio De Janeiro. Fluminense is one of the four most famous football clubs in Rio De Janeiro, together with Botafogo, Flamengo and Vasco da Gama. It plays in the *Campeonato Carioca*, the State of Rio De Janeiro's premier state league.

The club was founded on July 21st 1902. Fluminense stadium in Laranjeiras is the oldest stadium in Brazil and a lot of players from the club were members of the Brazilian national football team.

Fluminense F.C. has decided to do GHG Emission Inventory of its football organization, including the professional football team and also young teams.

[2]Source: 2007 IPCC Fourth Assessment Report (TAR)

2. GHG Inventory modelling according to GHG Protocol Corporate Accounting and Reporting Standard

2.1 Principles for GHG Inventory accounting

A credible GHG emission inventory assessment is an important figure, giving a reliable base for the future Organization's planning in a wider context of a Carbon Management project. It also represents a perspective decision making tool for the management strategy related to the Company's activities regarding the GHG emissions.

Therefore, the GHG emission inventory assessment is based on principles specified by the WRI/WBCSD *GHG Protocol – A Corporate Accounting and Reporting Standard*. In order to be in compliance with this standard, the GHG accounting and reporting should be based on the following principles:

Relevance: The final result of the assessment has to represent, for the company itself as well as for all the users, understandable and reliable base for related decision making procedure that will follow up.

Completeness: The GHG inventory has to cover all relevant emission sources within defined inventory boundary, with a clear explanation of all exclusions of emissions sources in case there are some.

Consistency: The application of consistence methodologies is important in order to obtain meaningful comparisons of GHG emissions over time. Any changes in data, inventory boundaries, methodologies used, etc., have to be transparently documented over the time.

Transparency: All the issues related to the GHG inventory must be documented in a factual and coherent manner, based on a clear audit trail. In case of any assumptions or estimates, references to the methodologies and data sources used have to be clearly indicated.

Accuracy: The quantification of GHG emissions reported in the inventory should ensure a level of emissions not significantly different comparing to the actual ones, meaning that the level of uncertainty should be reduced as much as possible.

2.2 Organizational and operational boundaries

In order to identify the emission sources to be included in the GHG inventory, the boundaries of the analysis have to be set.

2.2.1 Organizational boundaries

The organizational boundaries determine the operations and sources to be considered in the calculations. Three different approaches are available:

- *Operational control* - the organization considers all the emissions over which has the power to introduce and put in practice operative strategies;
- *Financial control* – the organization considers all the emissions over which has the power to introduce financial and operative strategies with economic profits;
- *Equity-share approach* – the organization considers all the emissions related to the operation in which is involved, but referring to the financial control it has over the same operations.

The GHG inventory of Fluminense F.C. football teams was calculated using the **operational control** approach.

The organizational boundaries were defined as:

- Fluminense F.C. includes the main team, with 38 professional players, and 5 young teams, with 313 young players of different ages

The Fluminense F.C. organizational boundary is actually distributed between three different locations:

- The Fluminense F.C. main team headquarters is the Laranjeiras stadium, located in Laranjeiras district of Rio De Janeiro, Rua Álvaro Chaves. The elements considered in the analysis are presented with the block of the stadium, including dressing rooms and the other facilities inside the stadium, and certain offices included in the stadium building.
- In the year chosen for the analysis, 2012, the Fluminense main team played some games in Botafogo stadium as a home stadium, located in Engenhao district. Due to that fact, certain GHG emission sources associated to those games on the location of Botafogo stadium were included in the analysis as well.
- The sport centre for young teams has another location, Xerém (Rio De Janeiro), Avenida Pastor Manuel Avelino de Souza. This centre includes some football fields and buildings.

For each of these location, except the sport centre for young team Xerém, the activity data collected has to be allocated due to the fact that it host also other football clubs or sport clubs in general. Detailed description of allocation approach, for different locations as well as for different type of activity data received, will be presented in the chapter Selection and collection of GHG activity data.

2.2.2 Operational boundaries

The GHG inventory of Fluminense football team, according to GHG Protocol and ISO 14064 operational boundary, includes identification of GHG emissions and removals within predefined organizational boundary and it's categorization into direct (Scope 1) emissions, energy indirect (Scope 2) emissions and other indirect (Scope 3) emissions.

Scope 1 includes direct emissions from the GHG emission sources owned or controlled by the organization, in case of Fluminense F.C. the emissions related to combustion of natural gas.

Scope 2 or energy indirect GHG emissions from generation of imported electricity, heat or steam consumed by the organization, in case of Fluminense F.C. presented only with consumed electricity.

All other GHG emissions sources, such as input materials, waste or mobility, are categorized as other indirect (Scope 3) GHG emissions of Fluminense F.C. GHG inventory.

2.3 Base year

The GHG inventory includes emissions from the sources identified inside organizational boundaries, but it also has to be related to a defined time frame. Its common practises to account the GHG inventory upon a single year, according to the international standards GHG Protocol and ISO 14064. For Fluminense's GHG inventory the reference year is 2012.

3. Quantification of GHG Emissions and Removals

Once all the boundaries, organizational (taking into account the Fluminense F.C. related specifics) and operational, has been defined the GHG emissions and removals can be quantified and documented by applying the following steps:

- ✓ Identification of GHG sources and sinks
- ✓ Selection of quantification methodology
- ✓ Selection and collection of GHG activity data
- ✓ Select or development of GHG emission or removal factors
- ✓ Calculation of GHG emissions and removals and
- ✓ Roll-up all GHG emissions to Event level

3.1. Identification and calculation of GHG emissions

The Company has identified and document all GHG sources contributing to its direct and energy indirect GHG emissions (scope 1 & 2 emissions), from the organizational point of view. No GHG emission removals have been identified, which could contribute to its GHG removals.

Other indirect GHG emissions (scope 3) has been also identified as well, documented and included in the corporate GHG inventory. The list of included scope 3 emissions will be presented within the following chapters.

3.2. Quantification Methodology applied

The most common approach for the calculation of GHG emissions has been used, presented by the application of documented GHG emission or removal factor. These GHG emission factors stand for the ratios which connect the proxy measure of the activity at the GHG emission source with the relating GHG emissions.

The following formula presents the basic principle of Emission Factor based approach, where emissions are calculated multiplying activity data by an appropriate emission factor.

GHG emissions [tCO_2e] =

*= Activity data [mass/volume/kWh/km] * Emission factor [tCO_2e/(mass/volume/kWh/km)]*

Depending on the type of available activity data in formula, sometimes, different conversion factors have to be included.

A detailed description of the methodology, followed by other useful guidance, can be found in the *GHG Protocol – A Corporate Accounting and Reporting Standard (published by* WRI/WBCSD). This so-called GHG Protocol Corporate Standard presents a base for many GHG standards and programs used around the world.

Beside the Corporate Standard for the accounting and reporting of GHG emissions the ISO 14064 has been used as well. ISO adopted the *Corporate Standard* in 2006 as the basis for its *ISO 14064-I.*

Standard ISO 14064 includes:

i. Specification with guidance at the organization level for quantification, reporting and reduction of greenhouse gas emissions
ii. Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
iii. Specification with guidance for validation and verification of greenhouse gas assertions.

3.3. Selection and collection of GHG activity data

After the Company has identified its GHG emission sources and classified it by scopes, the next step is to collect all the activity data necessary for the development of Company GHG Inventory.

There are two main types of activity data used in the GHG Inventory calculation:

- Primary activity data - observed data collected from specific facilities owned or controlled by the organization. In general, in order to be representative, primary data need to reflect typical conditions for relevant services.
- Secondary activity data - generic or average data from published sources that represent emissions according to source typology, related to organization operations, activities or products.

No secondary data as a substitution for primary activity data has been used for calculation of Scope 1 & 2 emissions. Secondary data has been used only for the calculation of other indirect (Scope 3) GHG emissions.

For both categories a data quality analysis has been performed in order to determine uncertainty limits associated with calculation results and to proceed with its reduction. Detailed analysis of data uncertainty assessment will be presented later on, in the chapter Uncertainty and Sensitivity.

The approach used in the activity data collection was to provide as much as possible relevant and representative data regardless if the data are provided directly by the Company as a primary activity data, or from different official sources as the secondary activity data.

To perform activity data collection and to prepare the corporate GHG inventory a checklist has been prepared and delivered to the Company. The quality of reported GHG emissions data depends on the quality of activity data used to calculate GHG emissions as well as on the quality of selected emission factors.

In case of Fluminense GHG analysis, two check-lists were provided: the first one regarding the professional team and Laranjeiras site, the other one regarding the young teams and Xerém site.

Furthermore, certain data for the Engenhao stadium (Botafogo stadium, in which Fluminense's first team played some matches as a home team) has been also collected and included in the GHG Inventory.

In the following Tables 2 – 9 collected activity data, divided by belonging GHG emission sources are listed followed by the necessary assumptions made. The presentation of the activity data collected is divided by belonging scope.

Considering the fact that a certain activity data (e.g. electricity and gas consumption) has been provided for much wider area, including other facilities outside the Fluminense F.C. organizational boundary, these data had to be allocated first before applying any calculation tool on it. Applied allocation will be explained in details in the following chapters.

The activity data, primary and secondary, are collected in consistent with the requirements of the selected quantification methodology.

3.3.1. Scope 1

Laranjeiras site, where the main football team headquarter is located, is a sport centre that includes football, but also other sports with their buildings and facilities. The Fluminense football team's area is indicated in the figure below with blue line and includes stadium and some buildings inside the stadium structure, while the red line indicates the total sport centre site area.

Figure 1 – Larnjeiras site, with Fluminense F.C. football team area (blue line)

Regarding scope 1 emissions, the consumption of natural gas (99.242 m^3) was provided only for the entire sport centre area (red line). To allocate the total consumption associated with Fluminense football club, a spatial criteria was used. As indicated on the map of the sport centre, provided by the organization, the floor areas of buildings were calculated (assuming no heating for swimming pools), resulting in 44,5% for Fluminense F.C. over a total covered area. This percentage has been used to allocate the natural gas consumptions of Fluminense F.C. for the Laranjeiras site (44.118,8 m^3).

Xerém site, young teams training centre, has its own consumptions that were considered as total (7.110 m^3).

Another approach was used for Engenhao stadium. During the 2012, Fluminense main team played in this stadium 13 matches in 4 different months, as a home team. In this case monthly activity data on natural gas consumption were available for the total stadium activities. Considering the fact that total stadium activities also included Botafogo trainings and home matches, and moreover a certain number of matches of other football teams of Rio De Janeiro, the following parameters has been provided in order to allocate the consumption of natural gas on Fluminense main team (4.537,6 m^3):

- Stadium working day per month;
- Stadium working hours per day;

- Total activity time in the stadium for 1 match.

For Engenhao stadium, the activity data related to water and electricity consumptions has been also allocated by using the same approach as for natural gas.

Once the amount of natural gas consumption for Fluminense F.C. for all three sites was determined the following step of GHG emissions calculation can be applied.

Emission factor to calculate GHG Emission from natural gas consumption is 56255 kgCO2/TJ from IPCC 2006.

Table 2 – Fuel combustion on site

Operational boundary: Scope 1	
GHG Emission source	**Primary data**
Natural gas consumption for: - **Laranjeiras site,** - **Xerém site,** - **Engenhao stadium**	• **Total annual natural gas consumption**

About air conditioning systems, the only refrigerant gas used is R22, which emissions related to refrigerant leakage were not taken into account, according to Kyoto Protocol.

In 2012, the year of analysis, no fire extinguishers were present in the boundary considered. (Source: Fluminense F.C.).

3.3.2. Scope 2

Electricity consumption from the Brazilian national grid was the only GHG emission source included in scope 2. Also in this case total annual electricity consumption was provided for Xerém site (260.081 kWh), while for Engenhao stadium monthly activity data on electricity consumption has been provided. These activity data were allocated to Fluminense F.C. by following the time approach defined in the previous paragraph, resulting in a total consumption of 191.735,7 kWh for Fluminense's activities.

For Laranjeiras site, annual electricity consumptions for the entire sport centre were available (938619 kWh). To determine the part of electricity consumption related to Fluminense F.C. a spatial approach was used as for natural gas, but considering different areas. In fact, while natural gas is used almost completely for heating of buildings, electricity has various applications, such as illumination and, more generally, for all electrical devices' operation. Based on this considerations, in Laranjeiras site the total floor area of Fluminense (blue line in Figure 1) and the total sport centre area (red line in the same Figure 1) were considered, resulting in a rate of 43% used to determine the annual electricity consumptions of Fluminense F.C. for Laranjeiras site in 2012 (403.783 kWh).

Table 3 – Electricity consumptions from Brazilian national grid

Operational boundary: Scope 2	
GHG Emission source	**Primary data**
Electricity consumption in:	• **Total annual electricity consumption**

- Laranjeiras site, - Xerém site and - Engenhao stadium	

Scope 2 emissions were accounted using total consumptions of the three sites with a GHG emission factor for Brazilian electricity grid from Brazilian MTCI[3] (0.0653 kgCO2eq/kWh), while for the GHG emissions related to transmission and distribution losses (T&D) an IEA factor for Brazilian electricity grid was used.

3.3.3. Scope 3

GHG Inventory for Fluminense F.C. included the following other indirect, scope 3, emissions:

- Water consumption
- Passengers transport, using different means of transport (vehicles not owned by the Company)
- Mobility (vehicles not owned by the Company)
- Waste transport
- Input materials and related transport
- GHG emissions related to Scope 1 and 2 emissions sources (natural gas fugitive emissions and Transmission and Distribution losses for electricity grid)

Water consumption

The activity data for water consumption collected for all three sites has been presented in the following Table 4.

Table 4 – Water consumption

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Water consumption in Laranjeiras site, Xerém site, Engenhao stadium	• **Annual water consumption (Laranjeiras and Xerém sites)** • **Monthly water consumptions for Engenhao stadium**

The total annual water consumption for Xerém site (young teams) has been considered for the calculation of related GHG emissions (6.958,7 m^3).

For Laranjeiras site, the primary activity data referred to the total annual water consumption for the entire sport centre (69.474 m^3).

Taking into account a large water consumption used for maintenance of the swimming pools at one hand and water used for irrigation of football field on the other side, neither spatial nor volumetric allocation didn't seemed to provide the fair representation of real situation. It has been assumed that the swimming pools within the Laranjeiras sport centre are the main sources of water consumption. A rough estimation on their maintenance's water consumption was done considering the following assumptions:

- Total surface of 2 olympic swimming pools and average water depth of 2 meters
- Use of swimming pools for 9 months per year (the 3 months with the lowest temperatures were excluded according to Brazil's climate conditions)

[3] MinisteriodaCiéncia, TecnologiaeInovação - Brazil

- Complete renewal of water once a month

Once calculated, the water amount related to swimming pools activities has been subtracted from the total annual water consumption for Laranjeiras sport centre, resulting roughly around 35% from the total annual water consumption to be used for Fluminense football club activities in 2012 (24.474 m^3).

For Engenhao stadium the time use approach for allocation, described previously, has been used, with the same assumptions on monthly working days, daily working hours and Fluminense time activities. In that way the amount of water consumption associated with Fluminense F.C.in Engenhao stadium was determined (1.105,6 m^3).

Once the data on water consumption for these three sites has been obtained, GHG emissions were calculated.

In water consumption analysis were considered the following emission sources: Infrastructure and energy use for water treatment and transportation to the end user (EF from Ecoinvent).

No information from Fluminense about wastewater amount and type of treatment, so it was not considered for the lack of data and information.

Wastewater treatment

Activity data regarding the wastewater treatment in Fluminense sites, Professional team and young teams, were not available. In any case, the following assumptions were done in order to include this emission source in the GHG inventory:

- 60% of the water consumed in the three sites (Latanjeiras, Xerèm and Engenhao stadium) – which amount was calculated as explained in the previous paragraph – is used for court irrigation (60% is a conservative assumption);

- the remaining 40% (9.790 m3, 2.783,5 m3 and 442 m3 for Laranjeiras, Xerèm and Engenhao respectively) is collected into sewage, and then treated in some municipal wastewater treatment plant.

To account for the GHG emissions deriving from the treatment, it was applied an EF for a municipal wastewater treatment plant of medium/high capacity (in terms of EI) from Ecoinvent database.

Passengers transport

Fluminense football team doesn't own any vehicles and it uses third party vehicles, so the related GHG emissions are included in the Inventory as scope 3 emissions.

The GHG emission sources grouped under Passengers transport includes the following:

- General transport, separated by teams:
  - Professionals team and
  - Young team
- Away matches transfer
  - Professionals team and
  - Young team

General transport

Collected activity data, for the subcategory General transport, for both teams are presented in the Table 5 below.

Table 5 – Transport vehicles not owned by Fluminense

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Passenger transport vehicles, general use for both teams	• **Number, type and fuel used per vehicle** • **Total annual distances travelled per vehicle** • **Quantity of consumed fuel per vehicle**

Considering the fact that for the professional team the "Quantity of consumed fuel per vehicle" has been recalculated from the distance travelled, by using the average fuel consumption, the activity data on distance travelled per vehicle has been used for the calculation of related GHG emissions.

In order to have a uniform approach, the same type of activity data has been used for young team as well.

Away matches transfer

Both teams, professional and young, have been played matches away, as guests. The transfer of both Fluminense football teams was considered. Activity data available are shown in the Table7 below.

Table 6 – Away matches

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Transfer of both teams for the away matches	**For each trip, for both teams, the following data were provided:** • **One way distance traveled, per type of transport (airplane and bus)** • **Number of passengers (purchased tickets)**

Assumptions:

- The airplane transport was divided into three categories, depending on the distance travelled, followed with three different GHG emission factors used to calculated the related GHG emissions, considering km and number of passengers
- It has been assumed that the buses used for transfer of both Fluminense teams are rented and reserved only for them, and the related GHG emissions are considering only as total km travelled

Mobility

Emissions from mobility were also included in scope 3. In particular the following sources were considered:

- Mobility of club members (Professional and young teams)
  - Players mobility;
  - Managers, directors and other training staff;
- Mobility of external collaborators for the matches played at home (only for professional team):
  - Journalists;

- Police;
- Referees and assistants
- Ambulance;

- Mobility of audience (only for professional team).

Mobility of club members and external collaborators

Available activity data for the mobility of club members and external collaborators are shown in the Table 8 below.

Table 7 – Club members and external collaboratorsmobility

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Mobility of club members and external collaborators for the matches played at home	• **Role and number of people involved, per category** • **Distance travelled, as average annual or per trip** • **Number of working days per year** • **Type of vehicles used** • **Number of persons per car**

Assumptions:

- For the mobility of young teams, 3 working days per week were assumed, considering the players are not professionals
- Due to the lack of activity data for the cars used the average GHG emission factors is used, considering average data about different fuel cars, their specific consumption and GHG emission factor for each fuel considered.
- It was noticed that the total number of players and administrative workers given in the general information section of the check-list is greater than the total number of people comprehended in the "mobility data", for both Fluminense main team and young teams. Since mobility data for this number of members were not provided, they were regarded as inactive members and emissions were not included in this inventory.

Audience Mobility

The main team played 30 home matches in 2012 and Fluminense estimated that an average number of audiences in each match were 20.876. The distribution by mean of transport use, as indicated by Fluminense FC, is the following:

- 50% by car
- 20% by bus
- 20% by train (assumed is metro)
- 10% on foot or by bike

Since no statistical data about origin of audience were available, distances travelled per transport typology had to be assumed:

- Car transport: considering the stadium location and the territory of Rio De Janeiro city, the maximum distance to reach the stadium is about 60 km. However, taking into account also that the most populated areas of Rio De Janeiro are closer to the stadium, a distance of 25km (one way distance, from home to stadium) was chosen as representative value. The number of persons per car was fixed to 4, considering that going to a football match is an activity usually shared with other people;
- Bus transport: the same considerations made for car transport are valid;
- Metro transport: the metro of Rio De Janeiro has a total length of about 41 km (source Wikipedia), so a distance of 20 km was considered as the base value for persons travelling with metro (one way distance).
- Due to the lack of data, for the audience using car to get to the games an average car (explained in the previous chapter) has been used in the calculation

A sensitivity analysis was performed for this GHG emission source, making changes on the values of distances assumed for car, bus and metro transport, and changing the number of persons per car. The results of this analysis are shown in chapter Sensitivity and uncertainty.

Waste Management

Waste management as a GHG emission source includes emissions from:

- Transport of waste from production site (Laranjeiras and Xerém) to treatment site and
- Waste treatment (landfill).

The following Table 6 includes the activity data collected for waste management sector.

Table 8 – Waste management

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Transport and treatment of waste from Laranjeiras and Xerém sites	• **Type of waste produced** • **Total annual quantity of produced waste per type** • **Type of treatment (disposal on landfill)** • **Distances to treatment sites** • **Type of vehicle used for waste transport**

Assumptions:

- Paper and plastic: assumed composition of 50% plastic, 25% paper and 25% cardboard;
- Food: number of garbage bags was available; it was assumed that a medium weight of one garbage bag is 7.5 kg[4];
- Hygienic and office materials: an average weight of one garbage bag of 7.5 kg;

[4]http://cre-msd.uwaterloo.ca/Documents/Transportation%20documents/Waste/Garbage%20collection%20-%20assessment.pdf

Input materials

This scope3 GHG emissions source includes both production of input materials' and related transport. A list of goods has been provided separately for professional team as well as for young teams. The list of input materials is divided by categories, like: drinks, fruits, clothes (shirts, shorts, socks etc.), cleaning supplies, general purchased and other goods.

The Table 9 below shows the activity data available for calculations.

Table 9 – Input materials

Operational boundary: Scope 3	
GHG Emission source	**Primary data**
Input materials for professional and young teams	• **Type of input material** • **Supplier related data (location, transport distance)** • **Type of vehicle used for transport** • **Total annual quantity per input material** • **Packaging data (only for few items)**

Assumptions:

- When GHG emission factor for selected input material was not available, the main component (or components) has been chosen and the related EF was used;
- In some cases, necessary assumptions (i.e. medium weight of one item) were done or density has been assumed in order to obtain the mass of selected input material goods);
- When none of the assumptions described in previous bullets were not enough to calculate the GHG emissions from the production of certain goods these goods were excluded from the inventory
- Regarding garments (Adidas is the supplier) information about materials that t-shirts, shorts, balls, socks, jackets, tennis and football shoes and other items are made of were found on their web site[5]. The main materials used are polyester and nylon.
- For tennis and football shoes an average GHG emission has been calculated by analysing their composition.

Transport of input material is calculated by using activity based method (per tkm).

Fugitive Emissions

As mentioned earlier, other indirect (scope 3) GHG emissions also includes fugitive emissions from combusted natural gas and the GHG emissions coming from losses related to electricity transmission & distribution. These GHG emissions are calculated by using the same activity data already presented (annual amount of consumed natural gas and electricity) and the appropriate GHG emission factors.

[5] www.adidas.it

3.4. Selection or development of GHG emission or removal factors

The GHG emission factors are process or activity specific factors, depending on different parameters (like: location of the GHG emission source, carbon content of the fuel, precise technology applied etc.), and they are used to calculate the GHG emissions arising from such process or activity.

These are some of the main guidelines which has been followed during the selection or development of GHG emission and removal factors:

- Coming from the well documented source, recognized origin
- Appropriate for the GHG source or sink concern, process/activity specific
- Current for the time of quantification

The sources of the GHG emission factors used vary depending on the availability of the appropriate GHG emission factor for the territory covered by the GHG inventory, Brazil in case on Fluminense F.C. When the GHG emission factors for Brazil were not available, other reliable data sources have been used, in most cases DEFRA (UK Department of Environment Food and Rural Affairs) or IPCC (International Panel on Climate Change) data bases. The list of all used GHG emission factors, including also other conversion factors used, is presented in the Appendix A, at the end of this report, as well as within the MS excel calculation tool.

3.5. Calculation of GHG emissions and removals

GHG Inventory for the Fluminense F.C., with predefined organizational boundary specifics, has been calculated by using a tool created in MS Excel. The GHG emissions included in the Fluminense F.C. GHG Inventory have been divided by different GHG emission sources by dedicating excel sheet to each of them

Besides the MS excel sheets described above, the MS excel tool also contains the following sheets:

- Emission factors
- Professional team results
- Young team results

The total GHG emission inventory for Fluminense F.C. is calculated by rolling up of all the GHG emission from different GHG emission source, taking into account the emissions classification in three Scopes.

As required by ISO 14064-1 all the GHG emissions included in the Inventory classified as direct GHG emissions (Scope 1) has been quantified and reported separately for each GHG, in tonnes of CO2e.

4. GHG Inventory Results

The results of GHG Inventory for Fluminense football club for 2012, as the selected base year, are presented using as reporting unit tons of CO_2 equivalent [tCO2e].

Total GHG emissions of Fluminense Football Club, including both professional football team and young teams, for the year 2012 are **2.580,80 tCO_2e**.

These emissions are divided in **1.825,10 tCO_{2e}** for the professional team and **755,71 tCO_{2e}** for the young football teams.

The following Table 10 shows Fluminense GHG inventory composition by scopes, in absolute value and percentage. The ratio between GHG emissions by scopes is also reported in the Figure 2.

Table 10 – GHG inventory rates

	Total GHG emissions [tCO2e]	GHG Emissions composition [%]
Scope 1	112,51	4,36%
Scope 2	55,87	2,16%
Scope 3	2.412,42	93,48%

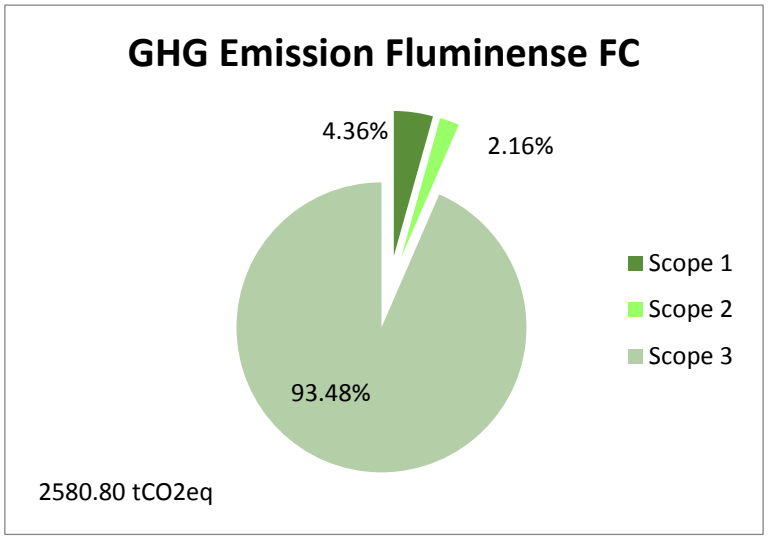

Figure 2 – Fluminense F.C. GHG inventory divided by scopes

Scope 1 emissions

The only GHG emission source within Scope 1 emissions is natural gas combustion. Scope 1 GHG emissions were analysed more in detail, quantifying separately each greenhouse gas included in the Inventory but considering the fact that the only Scope 1 emission source is natural gas combustion the gas CO2 presents more than 99% of total GHG emissions (Table 11).

Table 11 – Scope 1 GHG emissions

	Scope 1 GHG emissions [tCO2e]		
	CO2	CH4	N2O
Natural gas	112,20	0,25	0,06

Scope 2 emissions

The energy indirect (scope 2) emission won't be analyzed in details since it is presented only by consumed electricity from the national grid.

Scope 3 emissions

Scope 3 emissions presents more than 90% of total GHG inventory emissions for Fluminense F.C. Detailed GHG emission results are presented in the Table 12 below, while Figure 3 shows the percentage of GHG emission sources included in scope 3.

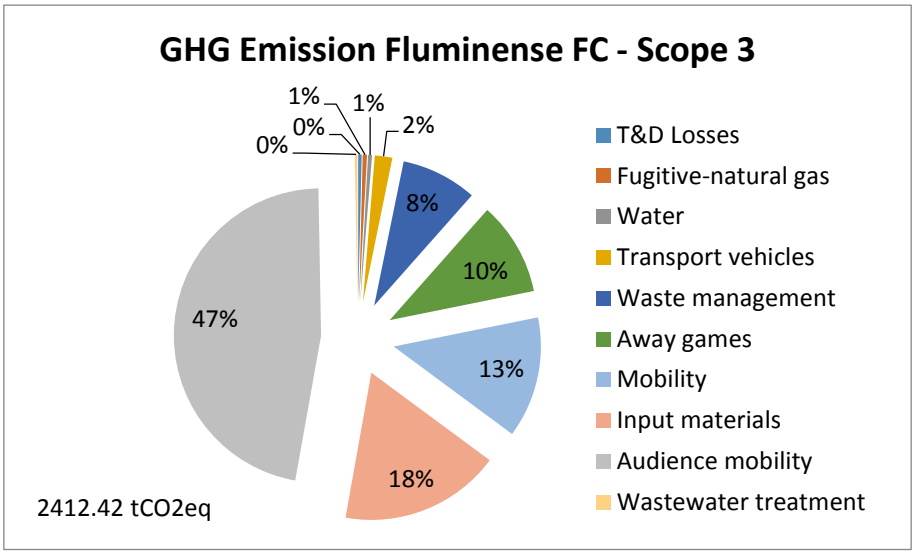

Figure 3 – Scope 3 GHG emissions rates

Table 12 – Total GHG emissions in scope 3

GHG Emission sources	Total GHG Emissions [tCO2e]
T&D Losses	9,20
Fugitive-natural gas	11,40
Water	10,37
Transport vehicles	46,53
Waste management	
Treatment	181,97
Transport	18,80
Away games	248,25
Mobility	320,98
Input materials	
Production	419,73
Transport	6,79
Audience mobility	
Car	795,78
Bus	325,67
Metro	10,02
Wastewater treatment	6.95
Sub Total Scope 3	**2.412,42**

5. Sensitivity and uncertainty

5.1 Sensitivity

A sensitivity analysis was conducted for the "audience" emissions, in order to evaluate the variations given by different choices in the assumptions made regarding distances travelled by audience with three ways of transport (bus, car and metro).

Two approaches were followed: changes in distances assumed as base value for car, bus and metro transport, and variation of number of persons per car.The following table shows the results of sensitivity analysis conducted.

Table 13 – Sensitivity analysis' results on the emissions from audience

Audience emissions [tCO2e]						
GHG car [tCO_{2e}]		km	km	km	km	km
		15	25	30	40	50
n persons per car	2	954,93	1.591,55	1.909,86	2.546,48	3.183,11
n persons per car	3	636,62	1.061,04	1.273,24	1.697,66	2.122,07
n persons per car	4	477,47	795,78	954,93	1.273,24	1.591,55
n persons per car	5	381,97	636,62	763,95	1.018,59	1.273,24
GHG metro [tCO_{2e}]		km	km	km	km	km
		5	10	20	30	40
		2,51	5,01	**10,02**	15,03	20,04
GHG bus [tCO_{2e}]		km	km	km	km	Km
		15	25	30	40	60
		195,40	325,67	390,80	521,06	781,60

5.2 Uncertainty

The uncertainty of the GHG inventory of Fluminense was also calculated. The analysis was conducted following the GHG Protocol Uncertainty tool, and it was performed on about 98,7% of total emissions that make Fluminense's GHG Inventory, including Scope 1 and 2, and a big part of Scope 3 emissions.

According to the GHG methodology, the uncertainty of GHG emissions is calculated starting from uncertainty of both activity data and GHG emission factors. A conservative approach has been followed when choosing data quality indicators. The results are shown in the Table 14 and graph below.

Table 14 – Uncertainty analysis' parameters for Fluminese F.C.

Fluminense uncertainty parameters	
GSD2	1,449
median	2.546,21
95% lower bound	1.756.259
95% upper bound	3.691.483

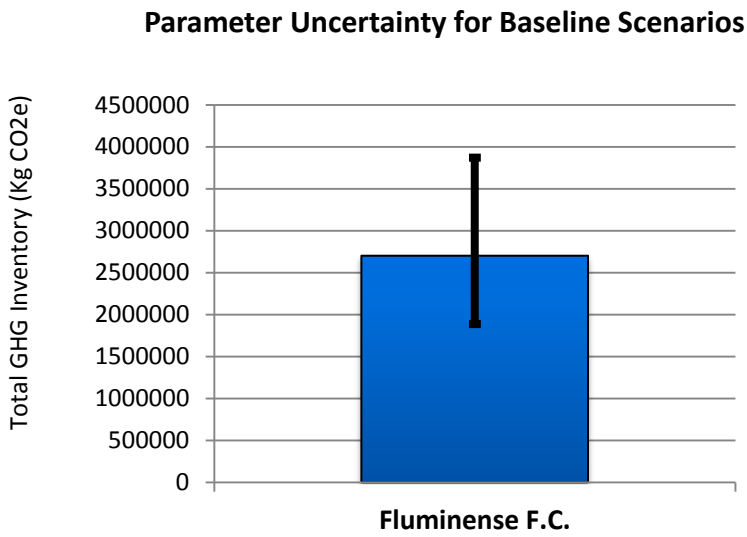

Figure 4 – Uncertainty results for Fluminense F.C. GHG inventory

The results show that the GHG inventory has an uncertainty of +44.9% and -31% over the global value.

This high level of uncertainty is mostly related to the high uncertainty of scope 3 activity data, especially the main GHG emission sources of audience mobility and input material, taking into account the fact that scope 3 emissions participating more than 90% in the total GHG Inventory.

High uncertainty related to all kind of mobility's could be improved if a specific data collection would be organized (e.g. public survey) in order to have a better statistical base for the calculation.

The main focus in activity data quality improvement should be on Scope 1 and 2 emission sources, where the main GHG emission sources (electricity and gas consumption) had to be allocated by using different allocation criteria (temporal, spatial etc.) instead of having the exact consumption from the measurement equipment.

6. Conclusions and final consideration

Fluminense F.C. wants to carry out the GHG Inventory of its organization in order to be the first football team accounting for its GHG inventory, and to establish forward specific reduction measures to reduce their impact to climate.

The process of control and management of information was conducted according to the cooperation between Fluminense F.C. technical team for data collection (supported by Instituto -E technical team) and a technical team from IMELS (Italian Ministry for the Environment, Land and Sea) for calculation and elaboration of data.

According to Fluminense organization, the person involved and responsible for the information in the GHG Inventory report was Luiz Carlos Rodrigues – Coordinator of Environmental Program of Fluminense Football Club.

The GHG Inventory for 2012 is the first GHG inventory for Fluminense F.C. and considered the difficulty in collecting data, it is suggested to create a specific database in order to collect, control and manage all the information necessary to the calculation of the next GHG Inventories.

In this step it was carried out the first GHG Inventory for Fluminense F.C., in order to examinate their total carbon footprint and indentify the main footprint sectors. After that, corrective actions and reduction measures will be identified and implemented according with Fluminense environment policies; reductions will be certified by a third part verification.

Taking into account the fact that the activity data for the main GHG emission sources (classified under Scope 1 and 2 emissions) had to be allocated first (except for Xerém site), by using very uncertain allocation methods, the main focus should be the improvement of activity data quality and the data collection procedurein general.

These improvements are necessary in order to be able to perceive the GHG inventory results properly and to be able to analyse them and to track GHG emissions over time.

APPENDIX A – GHG Emission factors

GHG Emission Factor	Source
Fuel and energy	
Carbon emission factor for the power grid of Brazil	http://www.mct.gov.br/index.php/content/view/317402.html#ancora
T&D loses of the Brazilian power grid	http://data.worldbank.org/indicator/EG.ELC.LOSS.ZS/countries?display=default
NaturalGas_CO2	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2_ Energy;Stationary_Combustion. Tab. 2.4
NaturalGas_CH4	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2_ Energy;Stationary_Combustion. Tab. 2.4
NaturalGas_N2O	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2_ Energy;Stationary_Combustion. Tab. 2.4
Natural gas_fugitive emissions	Bilan Carbon - Emission Factor Guide (ADEME) 2007 (25/249) + IPCC NCV
Transports	
MSW transport_lorry 21t	transport, municipal waste collection, lorry 21t, CH, [tkm]; Life Cycle Inventories of Waste Treatment Services - Final report ecoinvent data v2.0, 2007
Gasoline light vehicle	1° Inventario Nacional de Emisoes Atmosfericas por Veiculos Automotores Rodoviarios, Ministero do Meio Ambiente, 2011
Diesel light vehicle	1° Inventario Nacional de Emisoes Atmosfericas por Veiculos Automotores Rodoviarios, Ministero do Meio Ambiente, 2011
Average car	1° Inventario Nacional de Emisoes Atmosfericas por Veiculos Automotores Rodoviarios, Ministero do Meio Ambiente, 2011
Air transport_long	Inventário de Emissão de CO2 da SEMA-PR visando sua redução e neutralização (2009)
Air transport_medium	Inventário de Emissão de CO2 da SEMA-PR visando sua redução e neutralização (2009)
Air transport_short	Inventário de Emissão de CO2 da SEMA-PR visando sua redução e neutralização (2009)
Freight transport_light comm vehicle up to 3.5t_diesel average	2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting - table 7c
Freight transport_light comm vehicle_petrol class I (up to 1.305t)	2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting - table 7c
Train - metropolitan	metropolitan of Sao Paolo (2011 sustainability report) http://www.metro.sp.gov.br/relatoriodesustentabilidade-2011/en/index.aspx
Bus_transport local system	Bus local system, Sao Paolo Metro sustainability report 2011, http://www.metro.sp.gov.br/relatoriodesustentabilidade-2011/en/index.aspx

Travel bus	Inventário de Emissão de CO2 da SEMA-PR visando sua redução e neutralização (2009)
Water and waste	
plastic, to landfill	disposal, plastics, mixture, 15.3% water, to sanitary landfill, CH, [kg] - Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0, 2007
paper, to landfill	disposal, paper, 11.2% water, to sanitary landfill, CH, [kg]; Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0, 2007
packaging cardboard, to landfill	disposal, packaging cardboard, 19.6% water, to sanitary landfill, CH, [kg]; Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0, 2007
glass, to landfill	disposal, glass, 0% water, to inert material landfill, CH, [kg]; Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0, 2007
rifiuti: paper, plastic, cardboard, glass	Average value
MSW_biogenic	Ecoinvent, Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0
Waste_Mixed food and garden waste	2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting - table 14b
Waste_Food and drink waste	2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting - table 14b
Waste_Garden waste	2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting - table 14b
Urban waste_Landfill disposal	disposal, municipal solid waste, 22.9% water, to sanitary landfill, CH, [kg] - Life Cycle Inventories of Waste Treatment Services, Final report ecoinvent data v2.0, 2007
Composting	disposal, biowaste, to agricultural co-fermentation, covered, CH, [kg] - Life Cycle Inventories of Bioenergy, Final report ecoinvent data v2.0, 2007
Water consumption_tap water, at user	tap water, at user, RER, [kg]; Life Cycle Inventories of Chemicals - Final report ecoinvent 2000, 2004
Wastewater treatment	treatment of wastewater, average, capacity 4.7E10l/year, RoW, [m3]; Life Cycle Inventories of Waste Treatment Services - 2013 - ecoinvent v3.0
Materials	
Packaging cardboard	packaging, corrugated board, mixed fibre, single wall, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007
Cotton textile	textile, woven cotton, at plant, GLO, [kg]; Life Cycle Inventories of Renewable Materials, Final report ecoinvent Data v2.0, 2007
Poliestere	polyester resin, unsaturated, at plant, RER, [kg]; Life Cycle Inventories of Chemicals, Final report ecoinvent data v2.0, 2007
Nylon	nylon 66, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007

PVC	polyvinylchloride, suspension polymerised, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper - Final report ecoinvent data v2.0 - 2007
Aluminum	aluminium, production mix, at plant, RER, [kg]; Life Cycle Inventories of Metals, Final report ecoinvent 2000 - 2007
Steel wool_steel	reinforcing steel, at plant, RER, [kg]; Life Cycle Inventories of Metals, Final report ecoinvent data v2.0, 2007
Soft drinks_europe	Research on the Carbon Footprint of Carbonated Soft Drinks, Beverage Industry Environmental Roundtable, June 2012
Bottled water_1.5l pet bottle_europe	Research on the Carbon Footprint of Bottled Water, Beverage Industry Environmental Roundtable, June 2012
Polyurethane foam	polyurethane, flexible foam, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007
Synthetic rubber	synthetic rubber, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007
Shoes materials	Average plastics emission factor
Soap and detergents	soap, at plant, RER, [kg]; Life Cycle Inventories of Detergents, Final report ecoinvent data v2.0, 2007
Peso sacco immondizia_100L	Bustaplast Flexible Packaging S.r.l. http://www.bustaplast.it/prodotti
Polyethylene LDPE	polyethylene, LDPE, granulate, at plant, RER, [kg] - Life Cycle Inventories of Packaging and Graphical Paper - v2.0 - 2007
Plastic film extrusion	extrusion, plastic film, RER, [kg] - Life Cycle Inventories of Packaging and Graphical Paper - v2.0 - 2007
Polystyrene	polystyrene, general purpose, GPPS, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007
Paper	paper, woodcontaining, LWC, at plant, RER, [kg]; Life Cycle Inventories of Packaging and Graphical Paper, Final report ecoinvent data v2.0, 2007
Bananas	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Pineapple	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Orange, Lemon, Lime, tangerine	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Apple	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Papaya	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Mango, Guavas	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.

Watermelons	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Pumpkins	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Lettuce and chicory	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Garlic	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Potatoes	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Aubergine	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Sugar beet	UK_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Onion	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Carrots anf turnips	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Artichokes	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Eggs	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Cucumber	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Pepper (piper spp)	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Tomatoes	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Sugar	sugar, from sugarcane, at sugar refinery, BR, [kg]; Life Cycle Inventories of Bioenergy, Final report ecoinvent data v2.0, 2007
Rice	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.

Olives	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Corn cereals_processed breakfast cereals	GHG-energy calc Background Paper, Ben J. Rose (2010)
Cream, Milk powder, cheese	GHG-energy calc Background Paper, Ben J. Rose (2010)
Peas, green	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Flour	GHG-energy calc Background Paper, Ben J. Rose (2010)
Bread	GHG-energy calc Background Paper, Ben J. Rose (2010)
Jam, yogurt	GHG-energy calc Background Paper, Ben J. Rose (2010)
Milk (dairy and soy)	GHG-energy calc Background Paper, Ben J. Rose (2010)
Maize_corn	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Soy oil	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Jelly powder - soup powder	GHG-energy calc Background Paper, Ben J. Rose (2010)
Juice drinks	GHG-energy calc Background Paper, Ben J. Rose (2010)
Grapes as wine	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Chicken meat	GLO_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Pig meat	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Beef	EU_ How low can we go? An assessment of greenhouse gas emissions from the UK food system and the scope to reduce them by 2050. FCRN-WWF-UK.
Mixed meat	Average emission factor
Salt	sodium chloride, powder, at plant, RER, [kg]; Life Cycle Inventories of Chemicals, Final report ecoinvent data v2.0, 2007

APPENDIX B – Data for emissions sources considered

GHG emissions source	Quantity	Unit
Scope 1		
Natural gas consumption		
Laranjeiras site	44118.8	m3
Xerèm site	7110	m3
Engegnhao studium	4537.6	m3
Scope 2		
Electricity consumption		
Laranjeiras site	403783	kWh
Xerèm site	260081	kWh
Engegnhao studium	191735.7	kWh
Scope 3		
Water consumption		
Laranjeiras site	24474	m3
Xerèm site	6958.7	m3
Engegnhao studium	1105.6	m3
Transport vehicles Profissional team		
Van (diesel)	5232	km
Onibus (diesel)	69006	km
Kombi (gasoline)	10560	km
Transport vehicles Xerèm team		
Onibus (diesel)	43200	km
Van (diesel)	40200	km

Scope 3 – Waste

Team/site	Kind of waste	Quantity [kg]	Destination	Transport Vehicle	Fuel	Distance to treatment site [km]
Profissional - Laranjeiras	plastic	257.26	Landfill	Caminao	Diesel	37.4
	plastic	149.76				
	food and grass	21120				
	paper and plastic*	204800				
Xerem	food	15075				40
	hygienic materials, office material	15075				
	grass	116480				

Scope 3 – Away matches

Viagens rio - aeroporto - hotel - estádio (ONE WAY TRIP - NEED TO MULTIPLY BY 2) – Profissional				
Endereço de partida ou distância percorrida em km	**Endereço de chegada *(se caso a distância percorrida for preenchida não é necessário indicar o endereço de chegada)***	**Tipo de transporte**	**Número de bilhetes comprados**	**Distância do hotel ao local da partida em km**
360		airplane	30	12
443		airplane + bus	30	3
940		airplane	30	5.5
1870		airplane	30	9.6
395		airplane	30	1.5
1125		airplane	30	6.6
676		airplane	30	2.6
352		airplane	30	32.8
749		airplane	30	9.2
1125		airplane	30	6.6
360		airplane	30	5.8
1212		airplane	30	8.6
352		airplane	30	32.8
360		airplane	30	4.8
1877		airplane	30	8.4
1967		airplane	30	4.3
4580		airplane	30	5.6
1967		airplane	30	4.3
1125		airplane	30	6.6
1967		airplane	30	4.3

Viagens – Xerèm							
Team	**Endereço de partida ou distância percorrida em km**	**Endereço de chegada *(se caso a distância percorrida for preenchida não é necessário indicar o endereço de chegada)***	**Tipo de transporte**	**Distance travelled (one way trip) bus [km]**	**Distance travelled (one way trip) airplane [km]**	**Número de bilhetes comprados**	**Distância do hotel ao local da partida [km]**
JUNIORES	40km (CT-NI) x2		bus	40		28	0
	50km (CT-LJ) x2		bus	50		28	0
	30km (CT-OL) x2		bus	30		28	0
	55km (CT-CM) x2		bus	55		28	0
	200km (CT-MC) x2		bus	200		28	0
	40km (CT-NI) x2		bus	40		28	0
	50km (CT-BG) x2		bus	50		28	0
	25km (CT-DC) x2		bus	25		28	0
	70km (CT-CFZ) x2		bus	70		28	0
	150km (CT-NF) x2		bus	150		28	0
	30km (CT-MD) x2		bus	30		28	0
	50km (CT-LJ) x2		bus	50		28	0
	35km (CT-BS) x2		bus	35		28	0
	60km (CT-CC) x2		bus	60		28	0
	50km (CT-GV) x2		bus	50		28	0
	50km (CT-LJ) x2		bus	50		28	0
	40km (CT-NI) x2		bus	40		28	0
	300km (CT-CG) x2		bus	300		28	0
	35km (CT-IG) x2		bus	35		28	0
	60km (CT-CC) x2		bus	60		28	0
	40km (CT-NI) x2		bus	40		28	0
	150km (CT-VR) x2		bus	150		28	0
	50km (CT-AST) x2		bus	50		28	0
	720km (RJ-RP)		bus	720		28	10
	320km (RP-SP)		bus	320		28	15
	250km (SP-SC)		bus	250		28	3
	250km (SC-SP)		bus	250		28	0
	440km (SP-RJ)		bus	440		28	0
	490km (RJ-BC)		bus	490		28	8

	100km (BC-BH)		bus	100		28	0
	450km (BH-RJ)		bus	450		28	0
	1913km (RJ-VSA) x2		airplane + bus	50	1863	28	12
	675km (RJ-CU) x2		airplane		675	28	9
	1.122km (RJ-PA) x2		airplane		1122	28	10
	1.142km (RJ-ES) x2		airplane + bus	22	1120	28	5
	55km (CT-CM) x2		bus	55		28	0
	80km (CT-IT) x2		bus	80		28	0
	200km (CT-MC) x2		bus	200		28	0
	50km (CT-BG) x2		bus	50		28	0
	200km (CT-MC) x2		bus	200		28	0
	30km (CT-SM) x2		bus	30		28	0
JUVENIL	30km (CT-SM) x2		bus	30		28	0
	30km (CT-SM) x2		bus	30		28	0
	30km (CT-SM) x2		bus	30		28	0
	55km (CT-CQ) x2		bus	55		28	0
	36km (CT-CG) x2		bus	36		28	0
	50km (CT-GV) x2		bus	50		28	0
	40km (CT-NI) x2		bus	40		28	0
	55km (CT-CM) x2		bus	55		28	0
	30km (CT-OL) x2		bus	30		28	0
	200km (CT-MC) x2		bus	200		28	0
	55km (CT-CM) x2		bus	55		28	0
	30km (CT-SM) x2		bus	30		28	0
	80km (CT-IT) x2		bus	80		28	0
	40km (CT-SC) x2		bus	40		28	0
	55km (CT-JP) x2		bus	55		28	0
	50km (CT-GV) x2		bus	50		28	0
	517 km(RJ-LIN) x 2		airplane + bus	100	417	28	18
	1.142km (RJ-ES) x2		airplane + bus	22	1120	28	5
INFATIL	50km (CT-GV) x2		bus	50		28	0
	55km (CT-CQ) x2		bus	55		28	0
	30km (CT-MD) x2		bus	30		28	0
	50km (CT-GV) x2		bus	50		28	0
	40km (CT-NI) x2		bus	40		28	0
	55km (CT-CM) x2		bus	55		28	0

	30km (CT-OL) x2		bus	30		28	0
	200km (CT-MC) x2		bus	200		28	0
	50km (CT-BG) x2		bus	50		28	0
	35km (CT-BS) x2		bus	35		28	0
	50km (CT-GV) x2		bus	50		28	0
	170km (CT-RS) x2		bus	170		28	0
	300km (CT-GC) x2		bus	300		28	0
	150km (CT-VR) x2		bus	150		28	0
	70km (CT-CFZ) x2		bus	70		28	0
	55km (CT-CM) x2		bus	55		28	0
	30km (CT-SM) x2		bus	30		28	0
	80km (CT-IT) x2		bus	80		28	0
	40km (CT-SC) x2		bus	40		28	0
	60km (CT-JP) x2		bus	60		28	0
	50km (CT-GV) x2		bus	50		28	0
	813km (RJ-LD) x2		airplane		813	28	0
	40km (LD-AP)		bus	40		28	3
	100km (AP-CP)		bus	100		28	7
	65km (CP-LD)		bus	65		28	0
	450 km (RJ-BH) x2		bus	450		28	2
MIRIM	25km (CT-PB) x2		bus	25		28	0
	50km (CT-GV) x2		bus	50		28	0
	80km (CT-IT) x2		bus	80		28	0
	30km (CT-TIG) x2		bus	30		28	0
PRÉ-MIRIM	100km (CT-RB) x2		bus	100		28	0
	100km (CT-RB) x2		bus	100		28	0
	100km (CT-RB) x2		bus	100		28	0
	100km (CT-RB) x2		bus	100		28	0
	100km (CT-RB) x2		bus	100		28	0
	100km (CT-RB) x2		bus	100		28	0

Scope 3 – Mobility

Mobilidade dos membros do clube (Profissional)							
Membros do clube (jogadores do time profissional, técnicos, médicos, funcionários do escritório, etc.)	**Membros do clube**	**Endereço de residência no Rio**	**Distância média domicílio-clube [km]**	**Quantos dias por semana a pessoa vai ao estádio, escritório, etc.**	**Tipo de transporte**	**No. de semanas trabalhadas por ano**	**Número médio de pessoas por carro no caso do uso de carros como meio de transporte**
Players	38	-	364'800	5	car	44	1
manager, director, etc..	10	-	172'000	5	car	44	1
Administrative employees	20	Penha	20	5	bus	44	-

Mobilidade do staff responsável pelas partidas jogadas em casa (Profissional)						
Staff em partidas (médicos, jornalistas, policiais, equipes de TV, gandulas, juizes, ambulância)	**Membros**	**Endereço no Rio (hospital, delegacia, emissora de TV, etc.)**	**Average distance to the stadion [km]**	**N. jogos em casa**	**Tipo de transporte (exemplo: carro, ônibus, moto...)**	**Número médio de pessoas por carro no caso do uso de carros como meio de transporte**
Jornalista	40	downtonwn - Engenhão	20	30	car	1
Policiais	150		15	30	ônibus	40
Gandulas	8		15	30	car	1
Refree and Assistant	7	downtonwn - Engenhão	20	30	car	1
Ambulância	1	downtonwn - Engenhão	20	30	car	1

Mobilidade dos membros do clube (Xerèm)							
Membros da equipe de futebol (jogadores categorias de base, comissão técnica, funcionários, etc.)	**Endereço de residência no Rio**	**Distância média (domicílio-clube) [km]**	**Quantos dias por semana a pessoa vai ao CT, Estádio, escritório, etc.**	**Tipo de transporte**	**Nº de semanas trabalhadas por ano**	**Nº de semanas trabalhadas por ano**	**Número médio de pessoas por carro no caso do uso de carros como meio de transporte**
4	Petrópolis	25.7	3	car	44-48	46	4
2	Barra	61.1	3	car	44-48	46	2
2	Jacarepaguá	58.2	3	car	44-48	46	2
1	Vila Isabel	41.8	3	car	44-48	46	1
3	Baixada	30.0	3	car	44-48	46	3
2	Laranjeiras	51.3	3	car	44-48	46	2
5	Penha	29.3	3	car	44-48	46	5
95	Zona Norte	40.0	3	bus	44-48	46	
53	Baixada	30.0	3	bus	44-48	46	
26	Tijuca/Zona Sul	46.6	3	bus	44-48	46	
24	Petrópolis	25.7	3	bus	44-48	46	
26	Xerém	3.0	3	bus/on foot	44-48	46	
34	Caxias/Irajá	30.8	3	bus	44-48	46	
15	Bonsucesso	34.1	3	bus	44-48	46	
5	Campo Grande	58.8	3	bus	44-48	46	
10	Niterói	51.8	3	bus	44-48	46	
8	São Cristóvão	39.5	3	bus	44-48	46	
3	Três Rios	87.8	3	bus	44-48	46	
10	Nova Iguaçu/S.João Meriti	45.2	3	bus	44-48	46	
8	Magé	37.1	3	bus	44-48	46	
15	Barra/Jacarepaguá	61.1	3	bus	44-48	46	

Scope 3 – Input materials

Profissional													
Insumo de necessidade do clube	**Informações do fornecedor**			**Tipo de veículo usado para o transporte dos insumos**	**Tipo de combustível (diesel, gasolina, biodiesel etc.)**	**No. De viagens/ano**	**Quantidade anual de insumos necessários ao clube por tipo de veículo**	**Unidade**	**Se a unidade = peça, indique a massa da peça [kg]**	**Tipo de insumo do material da embalagem primária**	**Massa do insumo da embalagem primária**	**Tipo de insumo do material da embalagem secundária**	**Massa do insumo da embalagem secundário**
	Nome	**Localização**	**Distância[km]**					**toneladas; kg m3; lit; peças]**			**[kg]**		**[g]**
water	Bioleve	Lindóia - SP	523	caminhão	diesel	12	28800	unidades	0.213	plastic	0.0052	paperboard	10.224
isotonic	Gatorade	Laranjeiras - RJ	3	caminhão	diesel	8	9528	unidades	0.50	plastic	0.027	plastic	
t-shirt	Adidas	São Paulo	450	caminhão	diesel	12	10219	unidades	0.200	plastic			
short							3422	unidades	0.200	plastic			
soccer cleats							271	unidades	0.300	paperboard			
soccer socks							740	unidades	0.108	plastic			
tenis							700	unidades	0.320	paperboard	0.400		
trunks							670	unidades	0.092	plastic			
soccer vest							310	unidades	0.08				
coat trip							567	unidades	0.650				
balls							120	unidades	0.428				
towels	PRO-RCK Confecção LTDA – TEXLINE	Tijuca - RJ	10	carro	gasolina	3	100	unidades	0.670	paperboard	0.080		

Xerèm									
Insumo de necessidade do clube	**Informações do fornecedor**			**Tipo de veículo usado para o transporte dos insumos**	**Tipo de combustível (diesel, gasolina, biodiesel etc.)**	**No. De viagens/ano**	**Quantidade anual de insumos necessários ao clube por tipo de veículo**	**Unidade**	**Se a unidade = peça, indique a massa da peça [kg]**
	Nome	**Localização**	**Distância[km]**					**toneladas; kg m3; lit; peças**	
CLEANING SUPPLIES									
Rubber Gloves	Eliana Aderne	Encantado, RJ; CEP: 20745-000	45	Caminhão	Diesel	12	120	item	
General cleaner							48	5L gallon	
Steel wool							120	item	
Floor mat (tappetino)							120	item	
Dish cloth (strofinaccio)							144	item	
Perfex roll (300 m) - carta							48	Rolls	
Aluminium foil (100 m)							60	Rolls	
Toilet paper (big roll - 300 m) - carta							120	Box w/ 8	
Paper towel (100 m) - asciugamano							60	Box w/8	
Soap paste (500 g)							24	Box w/ 24	
Foam soap (700 ml)							72	item	
100L garbage bags							48	Packs w/ 100	
200L garbage bags							48	Packs w/ 100	
40L garbage bags	Bras Clean	Portuguese, CEP: 21920-410	37	Caminhão	Diesel	12	36	Packs w/ 100	
Saco para Gelo (50 x 70 x 0,20)							24	Packs w/ 1000	
Caustic soda (500 g)							60	item	
Chlorinated detergent							48	5L gallon	
Kitchen detergent							72	5L gallon	
Toilet broom							48	item	
General broom							36	item	

Verclin (fruit and vegetable sanitizer) (3kg)							12	item	
Bleach (Inject Oxi) - candeggina							24	20Kg gallon	
Soap powder							96	1Kg packs	
Fabric softner							12	20Kg gallon	
Alcohol 70%	EMX	Itaguaí	90	Caminhão	Diesel	34	432	lit	
Common alcohol							144	lit	
Plastic apron - grembiule							72	item	
Pastic bag roll (25X35) w/500 bags							60	rolls	
Plastic bag roll (40X60) w/500 bags							60	Rolls	
Disposble spoons							48000	Item	
100mL disposable cups							12	box w/2000	
200mL disposable cups							96	box w/2500	
300mL disposable cups							96	box w/2000	
Sponge							360	item	
PVC wrap 28cm X 15m							36	item	
Gfood 105 (alcaline degreasener)							48	5L gallon	
GFood 107 (Câmara frigorífica)							48	5L gallon	
Napkins 20 X 20							1800	Packs with 100	
GENERAL PURCHASES									
Sugar							850	Kg	
Liquid sweetener							102	200mL bottles	
Parboiled rice							340	5Kg pack	
Olive oil							510	500mL bottles	
Green olives							34	5Kg buket	
CATCHUP							136	400g bottles	
Corn cereal with sugar							340	500g boxes	
Cream							68	200g boxes	
Peas							34	280g boxes	

Tomato extract							340	850g tin	
Mandioc flower							68	Kg	
Bread crums							34	Kg	
Wheat flower							34	Kg	
TAPIOCA flower							34	Kg	
Corn flower							170	Kg	
Strawberry jam							136	300g cups	
Guava jam							136	300g cups	
Grape jam							136	300g cups	
Guava sweet (Goiabada)							34	Kg	
Strawberry iogurt							408	L	
Condensed milk							68	400g boxes	
Light maionese							272	500g flask	
Corn							34	280g boxes	
Chocolate milk powder							340	Kg	
Soy oil							136	900mL bottles	
Coffe powder							136	Fardos	
Rasberry jelly powder							170	Kg	
Lime jelly powder							170	Kg	
Strawberry jelly powder							170	Kg	
Peach jelly powder							170	Kg	
Coconut pudin powder							170	Kg	
Cheese spread (250g)							34	Box with 12	
Salt							34	Kg	
Pineaple juice							1020	Lit	
Grape juice							1020	Lit	
Cashew juice							1020	Lit	
Mango juice							816	Lit	
Acerola juice							612	Lit	
Guava juice							952	Lit	
Passionfruit juice							1224	Lit	
Boxed cashew juice							136	1L boxes	
Boxed orange juice							136	1L boxes	
Boxed mango juice							136	1L boxes	
Boxed grape juice							136	1L boxes	

Aple vinagre (500mL)							34	Box with 12	
Wine vinagre (500mL)							34	Box with 12	
Guarana cordial							102	L	
"FRUITS"									
Pineaple	Frutline	Xerém	10	Caminhão	Diesel	48	144	Items	
Banana							144	20kg box	
Orange							480	20kg box	
Lime							96	Sacos	
Apple							96	20kg box	
Papaya							48	20kg box	
Mango							48	20kg box	
Watermelon							144	Peças	
Tangerine							96	20kg box	
Pumpkin							960	Kg	
AIPIM - manioca							96	20kg box	
Iceberg lettuce							48	20kg box	
Lettuce							48	20kg box	
Garlic							384	Kg	
Potatos							48	Saco	
Eggplant - melanzane							240	Kg	
Beetroot - barbabietola							96	20kg box	
Onion							96	Sacos	
Carrot							48	20kg box	
Choke - (Artichoke)							48	20kg box	
Escarole							48	20kg box	
Eggs							48	20kg box	
Cucumber							240	Kg	
Capsicum - peperoncino							240	Kg	
Parsley - prezzemolo							48	Bunch	
Tomato							96	20kg box	
COLD CUTS									
BLANQUET LIGHT	Verdini Meirelles	Penha	30	Caminhão	Diesel	34	102	kg	
LEITE DESNATADO							476	Box w/ 12L	
LEITE INTEGRAL							612	Box w/ 12L	
PEITO DE PERU ou FRANGO DEFUMADO							136	2,5kg each	

LIGHT									
PRESUNTO MAGRO							102	2,5kg each	
QUEIJO MINAS - formaggio							102	3kg each	
QUEIJO MUSSARELA - formaggio							102	3kg each	
QUEIJO PRATO - formaggio							136	3kg each	
ACÉM							27200	Kg	
ALCATRA C/ MAMINHA							2040	Kg	
CAPA DO CONTRA FILÉ							1340	Kg	
CARNE MOÍDA							2040	Kg	
CHÃ							1360	Kg	
COXA E SOBRECOXA							4080	Kg	
FILÉ DE FRANGO							4080	Kg	
FRALDINHA							2040	Kg	
LAGARTO PLANO							1360	Kg	
PALETA							2720	Kg	
PEITO DE FRANGO COM OSSO							4760	Kg	
SPORT MATERIAL *									
Camisa	Adidas	São Paulo	500	Caminhão	Diesel	5	1496	Items	0.15
Meião - calze							1982	Items	0.108
Short - pantaloncini							1808	Items	0.2
Chuteira							100	Items	0.28
Bola - palloni							75	Items	0.415
Colete - canottiera							200	Items	0.08
Agasalho de viagem - cappotto da viaggio							193	Items	0.6

Scope 3 –Audience

Profissional			
Number of matches in 2012	Average number of visitors per match	Ways of transport - distribution	
30	20876	Car	50.00%
		Train	20.00%
		Bus	20.00%
		foot/bicycle	10.00%

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