Environmental management policies in the Higher Education (HE) sector: quantified aspects from 5 case-studies in France under the ECOCAMPUS initiative

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1. SYNOPSIS

Through a quantified analysis of both energy, water and waste issues, the ECOCAMPUS initiative aims to outline a surprising challenge: both an important end-use sector and the place where most of environmental facts and data have been originally pointed out and analysed, the Higher Education (HE) Sector neither fully recognises the related costs nor accurately demonstrates their impact to students.

2. ABSTRACT

Many facts or evidence and programmes of action concerning the protection of the environment rely on data collected and analysed in higher education institutions. However, it is only recently that, through some kind of a «spin-off effect», world wide scientists became aware of implementing any of the Environmental Management Systems (EMS) *in situ* i.e. in their own workplace. The main purpose of the ECOCAMPUS[i] initiative is then to demonstrate the benefits resulting from a more coherent “What-We-Preach”/“What-We-Do” attitude. A triple goal has been assigned to the EWW field of measurements and analysis - (i) energy, including electricity, supply and demand (E) - (ii) water demand (W) - (iii) waste generation and management (W). A key piece of the ECOCAMPUS paradigm, the EWW methodology, is no doubt a very efficient choice as long as both top managers or decision-makers and academic staff can be convinced to shift from the common “laissez-faire” to a voluntary policy.

In a partnership with Ademe, the present study is the preliminary part of a broader programme, aiming to install, in the mid-range, the ECOCAMPUS initiative as a standard managing rule. In a further step, pilot operations are to be performed in about a dozen different campuses between 2001 and 2003, not ignoring however many obstacles that deserve to be further analysed. These are some of the goals of the present first step mainly performed during the year 2000. Data from four places are analysed here : two are public universities, located in the west and south of France, one is an engineering department from a private polytechnical college in the Paris area ; the last one, located in the Bordeaux Region, investigates students lodging services and catering facilities. All these data, also including previous results from the campus of the University of Bordeaux, represent a very significant, and as far as we know in Europe, the largest sample available. Concerning about 100 000

students and related academic staff, these 5 campuses consume 75 GWh of electricity, 2 millions m^3 of water, and generate tons of miscellaneous (municipal-like, industrial and toxic) wastes.

Obviously aiming to optimise both the use of electricity and water, the analysis also includes a rough estimate of the energy and water conservation potential and a preliminary assessment of the "Why-How" possible solutions for better environment programmes. The production of waste, systematically kept in mind, is not as thoroughly investigated in this present paper as energy and water use. As a concluding remark, two links between the present work and recent energy policy trends are very briefly discussed from both a domestic and a post-Kyoto point-of-view, namely the so-called Clean Development Mechanisms.

3. INTRODUCTION [ii]

In the last decade, in many universities [iii], more and more scientists and academic staff members world-wide have become more and more aware of the impact of human activity on the environment : (i) under UNESCO's International Association of Universities sponsorship, a declaration was published in 1993 [iv] (ii) another chart has been submitted by the European COPERNICUS [v] network. Aiming to reduce the local impact – e.g. *in-situ* environmental management of the higher education (HE) institutions or research facilities a few important commitments have been listed (EVA 98), (LAI 98). A similar, although independent initiative was launched five years ago by participants in the Energy-University-Environment (EUE-95) Seminar, hosted by the University of Bordeaux 1 (France). This pointed out that in most of their university campuses or research laboratories, the management of natural resources, including energy and/or water use, is commonly based on a *"per default"* policy, i.e. "*laissez-faire*". Issued from the EUE-95 Declaration Statement, the ECOCAMPUS[vi] paradigm, has been both defined as a Specific Methodology and experienced in a few university campuses as shown below. On the other hand, in the framework of the recent post-Kyoto negotiations including the COP 6 Conference (The Hague November 2000), it seems that there is a urgent need, and probably an appropriate place, for the Universities to update - when existing - their environmental Policies, namely to possibly establish a partnership, based upon the new Clean Development Mechanisms (CDM) opportunities.

Following on previous studies, and in particular the feasibility study performed as part of the ECOCAMPUS ™ European Collaboration, the work presented here, started in Spring 1998, was recently extended to four other French campuses. Up to now, three main issues have been targeted : (1) to establish on a per-use and per-organisation basis the sharing of grid electricity and water mains end-uses, and also demonstrate several significant areas of conservation potential; (2) to evaluate the ways, means and obstacles that would allow or prevent environmental priorities in the daily management of all higher education activities to be permanently included as key criteria, particularly in the areas where the conservation

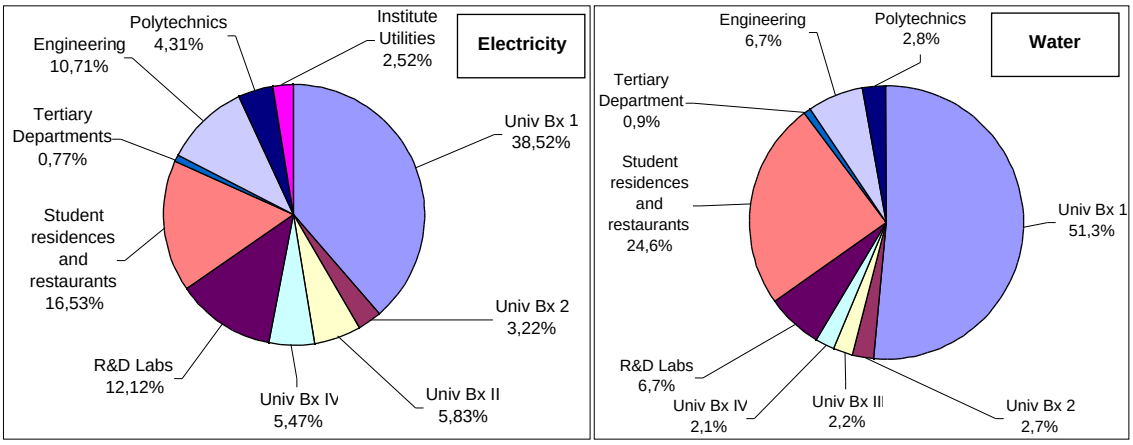
resources have been identified; and (3) to develop a broader collaboration aiming to disseminate, thanks to the support of Ademe, the French Environment and Energy Management Agency, the ECOCAMPUS methodology to a significant percentage of French university campuses.

One of the main interests of the present study is the support it has received, not only from the Ademe, but from EdF, the national electric utility, and the Agence de Bassin Adour-Garonne, the Regional Water Resources regulatory body. Then, for the first time in France and, as far as we know, one of the first in Europe, a pilot DSM programme aiming to analyse both electricity and water demand under a similar programme of field measurements, by the same team of scientists, has been performed. This is a case-study of special interest in France, particularly in terms of the future opportunities that may result from the liberalisation of the electricity market. Although the higher education campuses are probably not a key target, now being the legal way in the country, the Third Party Access (TPA) procedures are regarded as a new market for foreign or independent producers, although the obstacles are not yet fully investigated. Then, in its present step, the main goals of such DSM programme are (i) to survey the main features and specifications of the local electricity and water supply grid and network in order to analyse the possible impact of the new legislation and (ii) to characterise the demand in buildings that are commonly found on a university campus (lecture halls, research laboratories, facilities, student restaurants and dorms, sports hall, etc.).

4. THE ECOCAMPUS EWW PARADIGM

Certainly due to the collapse of oil prices in the mid-80s and during the 90s, regardless of the decision-making level, the energy-related impact of activities in higher education was not very often regarded by most university managers as a key question. This notwithstanding, in a large majority of cases, some awareness of the environmental issues was present. Like other R&D groups in several European regions and countries in the so-called “academic process”, the Bordeaux group has proposed to collect and analyse the physical and financial data directly or indirectly associated with energy, including electricity demand (E), water consumption (W) and the recycling techniques and process of the waste (W) generated. For a complete understanding of this, all data had then to be systematically assessed in physical units (MWh or GJ, m^3, tons, etc.) and in monetary units, both from the investment and O&M costs point-of view. This is defined as the quantitative ECOCAMPUS EWW methodology, which intends to permit an accurate estimate of the full energy and energy-related environmental costs.

Figure 1 –Campus of Bordeaux ("TPG" campus) :
Shares of Electricity and Water Consumption on an Activity Basis



In a first step, this method has been implemented in the framework of the ECOCAMPUS European collaboration [vii] which involves seven countries : five are EU countries (Denmark, Finland, France, Greece and Portugal); the other two from Central Europe (Poland, and Romania). It officially started in 1997. In the final report (ROT 99), entitled " ECOCAMPUS : A Practise-What-You-Preach European Collaboration", the main data are analysed and a few conclusions discussed. It is noted, in particular, that all participants in the ECOCAMPUS collaboration are well aware that they are seeing just the top of the iceberg… " [viii]. Regarding energy end-uses, for example, the energy policies in their common status, far from being implemented on a DSM basis, are often left as a "*laissez-faire*" policy, a way however recognised as less and less affordable. In contrast, as unambiguously demonstrated in the feasibility studies, the voluntary energy policies now being successfully implemented in a few universities, do not only comply with the Sustainable Development Programmes, they also provide significant money savings. Among other examples cited in (ROT99), the following key guidelines in the ECOCAMPUS strategic actions have to be underlined :

- " … due to the constantly growing base of installed equipment, including PCs and peripherals, the electricity demand is continuously growing. If the present 6–8 % annual growth continues, the resulting bills will be doubled in the next decade ….".
- " … many benefits, one of the most significant is the number of new lecturers or scientists that could be enrolled thanks to the money savings. In the framework of a benefits-sharing policy, this fact deserves to be more thoroughly investigated and communicated as a perfect example of an affordable win-win strategy… "

Then, among the four main goals assigned to participants in that European collaboration by the ECOCAMPUS Work Programme, the feasibility studies successfully reached the initial goal and played an important role in two directions, in particular :

- to set as evidence the conservation potential with an acceptable payback time will demonstrate that, when accurately sized, then optimised, the new or retrofitted equipment may result in significant extra benefits;
- to let both undergraduate and graduate students participate in a very enthusiastic manner in most case-studies.

5. THE UNIVERSITY CAMPUS OF TALENCE-PESSAC-GRADIGNAN (TPG)

About 75% of the local higher education buildings that were built in the past four decades in the Bordeaux region are located in Bordeaux suburbs, on the territories of three municipal authorities : TALENCE, PESSAC, GRADIGNAN, (acronymised as TPG), about 6 km south of downtown Bordeaux. Most data has been previously published (BON 99), with only the most significant information concerning electricity demand, and for the purpose of comparison, water demand, is shown in Figure 1 and benchmarked in Tables 2 and 3. With a total land area of about 2.5 km_ and a total buildings surface of 502,000 m_, the campus is among the largest in France. Each year about 50,000 students are enrolled in one of the higher education organisations available on the site, offering nearly all disciplinary fields but medicine (the medical university campus is located in another part of the city). Moreover, many services are also available such as student restaurants and residences, a water supply facility, post office, culture and sports rooms and facilities. As long as the electricity consumption and water demand are regarded, the TPG campus is equivalent to a town of bout 10,000 inhabitants. In 1998, the total power requirement was about 9,5 MW and the accumulated maximum power load reached 10,3 MW. Annual electricity consumption was 25 GWh, resulting in a bill of 12,7 MF (taxes not included) or about 2.2 M EURO, not ignoring an important growth of electricity demand of 8% between 1997 and 1998. Fresh water consumption on the campus was more than 700,000 cubic meters per year, excluding geothermal water used to heat a swimming pool (150,000 m^3/year). After a strong decrease in the first half of the 1990s, water consumption is steady or slowing declining. Concerning electricity demand, as shown in Figure 1, the University of Sciences and Technologies (the so-called University of Bordeaux 1) is the most important end-user with 38,52%, student restaurants and hotels are second (16.53%) and R&D labs, owned and operated by CNRS, the French Research Council, ranks third (12.12%). Not surprisingly, a similar order of magnitude applies to water demand with respectively 51.3%, 24.6% and 6.7%. In Table 1, electricity demand on a per activity basis on the whole TPG campus, is given.

Table 1. TPG Campus : Electricity demand ratio on a per activity basis

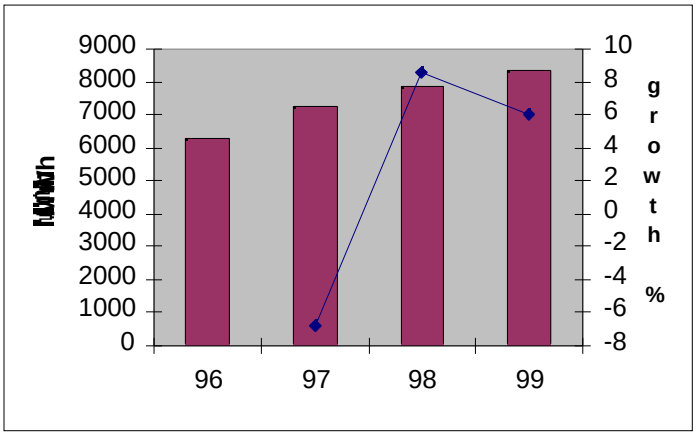
Activity	Buildings Area (m_)	Annual Cons. (MWh) *	Annual Cons. (kWh/m_)
Administration	39,000	1,287	33
R-D labs	80,000	9,416	118
Lecture halls	230,000	8,517	37
Restaurants	17,000	1,513	88
Students Hotels	96,000	3,729	39
Sports Facilities	20,000	715	36
Libraries	18,000	462	25
Total	502,000	25,639	(Average : 51.1)

* Numbers shown in the Table have not been systematically measured ; some of them are only estimated

6. THE FOUR OTHER FRENCH CASE-STUDIES

In the present section, a very brief survey of the main specifications of these campuses are given, as a more detailed analysis has been done by Ph. LAGIERE (LAG 00). Different organisations were investigated: two public universities, one private polytechnical university (north-western Paris area) and CROUS-Aquitaine, the most important regional operator of student restaurants and residences. All resulting indicators or ratios, compared with those obtained from previous work, are shown in section 6.

Figure 2. University of Rouen Campus : Y-Axis on left : Bar Chart of Annual Electricity Consumption 1996-99 (MWh) and Y-Axis on right : Annual Growth



Public Universities

These HE institutions are located in the metropolitan areas of Rouen and Marseilles (north-western and south-eastern France respectively).

University of Rouen

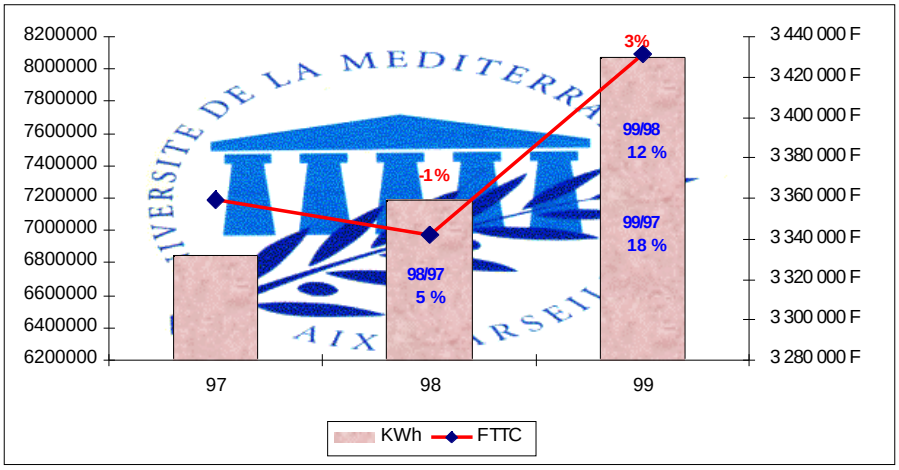
The University of Rouen is a relatively young university, created in the late-1950s, with 26,000 students enrolled in nearly all disciplines. Teaching and research activities are located on the territory of five cities (Elboeuf, Evreux, Le Madrillet, Mont Saint-Aignan, Rouen) at six different sites. The six campuses occupy a total land area of 220,000 m_, with 32 buildings. As commonly seen in France, some buildings are “ancient” ones (built in the early 60s), while the most recent ones were built in late 90s. Most buildings are heated with natural gas boilers. Four, however, are heated with electric converters.. The present work, initiated by the management as part of an important programme of retrofit and recommissioning, is a preliminary energy and environment audit of the Mont Saint-Aignan campus. One example is enough to understand the challenge and the need for more complete information : two departments having strong R&D activity together consume 58% of the electricity supplied by the utility. One of these will soon move. Our data and analysis may permit the measurement

of the impact of such a change although this is only a preliminary step in a more complete study to be done in the future.

University of Aix-Marseilles 2 (more commonly known under its official name "Université de la Méditerranée")

The main campuses of this university, hosting 13 Departments or Institutes, are located in three cities : Aix-en-Provence, Gap and Marseilles. Only two of these campuses are investigated in the present work namely "La TIMONE" and "Secteur Nord" both part of the Faculty of Medicine and Pharmacy. Out of a total area of 284,000 m_ for the "Université de la Méditerranée" as a whole, "La TIMONE" and "Secteur Nord" buildings occupy 90,000m_ and 30,000m_. About 700 students are trained in each location. A complete energy audit was also done by an independent consultant, which is not included here. The function of one ECOCAMPUS staff member is to permit a perfect permanent interface between the Head of Facilities at University of Marseilles and the consultant, an experience that has been proved to be quite successful and efficient.

Figure 3. University of Marseille-Méditerranée Campus: Growth of Electricity Consumption (Y-Axis on left) and Total Costs (Y-Axis on right: 1 Euro _ 6.55 FF)



Private Polytechnical Universities

IPSL (Institute Polytechnique Saint-Louis) is a privately owned and operated polytechnical institute. About 2,300 students are trained here in nine engineering departments. Staff members include 121 full-time persons. There are four main buildings with a total enclosed area of 30,000 m_, including lecture halls, offices, sport facilities and meal/boarding student services. On the campus, like Rouen Mont Saint-Aignan campus, the present work is to be regarded as the first step of a more complete work in the future. As results have not yet been fully analysed, only partial data are shown in Tables 2 and 4.

CROUS-Aquitaine

As shown in section 4 (Figure 1), student restaurants and residences consumption is the second largest for the TPG campus as a whole, both in terms of electricity and water expenses. Such a situation, which is the result of uncontrolled growth of consumption, appears completely unaffordable to the managers. Data from a preliminary study (DEV99), although restricted to the ones located in the TPG campus, nicely demonstrates both the limits of the "*laissez-faire*" policy previously applied and the benefits possibly resulting from a

voluntary policy. The managers have therefore decided to carry out a deeper analysis to the whole set of buildings.

CROUS-Aquitaine provides four different types of services in specialised buildings, nearly all having electric and water meters. The list of these buildings is shown as follows:

- 9 “villages” similar in appearance to 3 or 6 stories multi-family buildings hosting 4,630 small (9m_) bedrooms.
- 18 “residences” or “flat-like” buildings: small apartments about (15-25 m_) that are occupied by 1 or 2 persons.
- 7 restaurants offering typical French lunches and dinners: 2 million meals were supplied in 1999.
- 9 cafeterias offering “fast-food” meals: 1.1 million meals were supplied in 1999.

7. COMPARISON AND PRELIMINARY ANALYSIS OF DATA

General presentation

A list of the most significant figures and data are given in Tables 1, 2 and 4. In a few cases, such data have been estimated, in particular when meters are not available in the buildings that are included in the study. As is well known, sub-metering, when adapted to the size and the demand, is one of the best ways to permit managers to obtain a perfect knowledge of the state-of-the-art in that matter. However, this is not a very common tool of analysis, a situation that may hopefully change very quickly, as the benefits appear to be extremely high.

Table 2. Electricity Demand in Teaching and R-D Buildings: Main Indicators and Ratios

Institution	Power (MW)	Annual Cons. (GWh)	Electr./Tot. kWh ratio	Energy Cost ratio	Consumpt. Growth Rate	An. Cons. (kWh/stud.)	An Cons. (kWh/ m_)
Danish Tech. Un.[a]	N/A	29.4	31%		4.0% (90-95)	4,978	78.6
U. of Bordeaux 1 [b,d]	2.2	12	55.3%	75%	7.0% (96-98)		Aver. 75
TPG campus [b]	10.3	25	N/A	N/A	5.2% (96-98)		Aver.51.1
U. of Rouen [c]	2.8	7.6	39.8%	61.5%	6.0% (97-99)		
U. of Marseille [c]	1.8	8.1	39.5%	65.8%		700-3,900	43-91
IPSL [c]	0.5	0.18*	34%	52.6%	2.5% (97-99)	280	32.0 *

a : from ROT 99 (1995 data) *b : from DEV 99* *c : present work* *d: FAU 99* ** estimated data*

Comments

University of Rouen Mont Saint-Aignan campus

- Partnership (budget co-funding): Ademe, Ecocampus.
- The power demand varies from 15 W/m_ (Sports hall) to 95-130 m_ in R&D buildings. In these buildings, the annual demand also shows very large variations, between 30 and750 kWh/m_. It should be noted here that the R&D in chemistry are very important consumers, in particular as they have to comply with very stringent standards in terms of air quality. Regarding heat demand, in these buildings, it is shown that the highest rate is 5.4 W/m_-°C, about twice times the average ratio. A similar example was identified at the University of Bordeaux 1.
- All buildings except two showed a significant growth in demand during night hours (10 p.m.-8 a.m.) during the 1997-99 period. It has also been shown that about 30 % of the electricity is consumed during these night hours. Although not having been examined in great detail, it seems clear that this situation is a consequence of the increased amount of information & communication technologies equipment and the impacts of the stand-by mode.
- With a subscribed power of 2.8 MW, and a total annual electricity consumption of 7.6 GWh, the annual bill is about 500,000 Euros. As part of the present and very preliminary study, a few retrofit measures permitting significant savings (low payback time, a few shorter than 1 year) are shown in Table 3. More savings will probably be pointed out in future steps. Up to now, an estimated 0.15 GWh, and 9,000 Euros, could be saved very soon with a low investment cost (about 5,000 Euros). The average cost of conserved electricity is

3.5 Eurocents/kWh, about half of the billed cost of 1 kWh. Although not precisely evaluated here, extra savings are certainly possible as long as users become more conscious of the situation, a measure to be suggested by the Facilities Engineering Department.

- Water demand is mainly shared between sanitary and catering uses on the one hand and cooling equipment in R&D labs on the other. No metering of end-uses has been done yet, and only the total consumption is obtained through the bill, this about 72,000 m^3, costing 150,000 Euros.
- All types of waste are generated. Industrial –toxic-like (5 metric tons per year) and organic-like (dead animals) are collected (and hopefully recycled) by a private company (bill not yet unavailable). Municipal-like wastes are collected by a service of the City Council.

Table 3. University Campus of Rouen : Examples of Retrofit Measures

	Electricity Savings (kWh)	Money Savings (Euros)	Investment Costs (Euros)	Payback Time (years)
Comput. Mgmt of lighting	42,000	1,800	n.a.	< 1 yr
Fluocompact Bulbs	17,000	2,200	1,350	< 1 yr
Water Heaters : Optim. Tariff	0	1,600	3,800	1 – 5 yr
St-By Mode on PCs	60,000	2,600	0	
Appropr. O/M on Fridge-Freezers	11,000	500	0	
St-By Mode on Copiers	6,200	3,000	0	
Links on inner grid	0	1,400	2,000 – 3,000	< 3 yr
Ventilation on IUT Bldgs	14,600	600	100-300	< 1 yr
Total	150,800	13,700	_ 5,000	

University of Aix-Marseilles 2 (also called University of Marseille-Méditerranée)

- Partnership (budget co-funding) : Ademe, Ecocampus, EDF, Ministry of Education.
- The most significant figures concerning the energy demand of these places are shown in Table 4. Between 1997 and 1999, the growth of the electricity and heating demand was 2 % and 17 %, respectively.
- The cost per “person” (a “person” is defined locally as a staff member or a student) is 62 and 32 Euros for electricity and heating energy, respectively, and 54 Euros for water.
- The water demand ratio is O.73 m^3/m_. The 1997-1999 growth is 13 %.
- As in Rouen, there is a strong willingness to shift as quickly as possible to a DSM voluntary policy. However, in spite of a strong environmental management concern, a key priority in this area is not yet posted.

Table 4. University Campus of Marseille-Méditerranée: Electricity and Heating Costs and Consumption

	Subscribed Power (kW)	Ann. Cons. (GWh)	Ann. Bill (Euros)	Consumption (kWh/m_)	Ann. Cost per “person” (Euros)
Electricity	1,800	8	530,000	67	62
Thermal Energy		11	250,000	90	32

IPSL

- Partnership (budget co-funding) : Ademe, Ecocampus, Val d'Oise Regional Energy Agency, Seine Water Basin Agency.
- The total cost of EWW services was about 340,000 Euros in 1997 or 145 Euros per "person" (students and staff).
- The share of electricity and heating energy cost are very similar : 37 % and 41 %. Water and waste costs represent 15 % and 7 %, respectively.
- The restaurant serving lunch to the staff members shows a ratio of 6 kWh/meal, much higher than the 1 kWh/meal ratio for student restaurants (Table 5).
- Concerning the electricity bill, the regular increase of the extra charges (reactive power, overpower, etc. from 1 % of the 1995 bill to about 10 % in 1998, has to be noted here as being a very common situation in different places that have been analysed.

CROUS-Aquitaine

- Partnership (budget co-funding): Ecocampus, EDF (see DEV 99).
- The total EWW costs are 1,95 Millions of Euros in 1999.
- The total energy demand is 45,2 GWh, about 81 % and 19 % of which is consumed in the hotels and food services, respectively.
- Electricity represents 9.9 GWh in 1999. About 69% and 31% of the electricity is consumed in the hotels and food services, respectively. The related electricity bill represent 52% of the total energy bill (44% for natural gas and 4% for oil).
- Natural gas being the main fuel used in boilers providing heating services, the electricity demand is for appliances only, not ignoring that the number and types of appliances is rapidly growing. On average, the annual consumption is 800 kWh and 1200 kWh per bed in "villages" and "residences" respectively and 1 kWh per meal in both restaurants and cafeterias
- The total energy content, including natural gas or oil, of a single meal depends on the type of meal, being smaller in a cafeteria than in a conventional restaurant. It also varies considerably from one place to another: from an average value of 3.8 kWh/meal it can be up to twice that (7.2 kWh/meal) or much smaller (1.9 kWh/meal).
- Regarding the annual electricity consumption in a student's room : (i) these consume as much energy per m_ as, on average, any room in a family home or apartment (ii) shows important discrepancies, very similar to the restaurants'.

Table 5. Electricity Demand in Students Restaurants and Hotels: Main Indicators and Ratios

Institution	Annual Cons. (MWh)	Electr./Total Energy Demand	Annual Cons. (kWh/m_)	Annual Cons. (kWh/meal)	Annual Cons. (kWh/bed)
Krakow [a,d]	200		115		
Bucharest [a]	700	9-15 %	65		
ENITA-Bordeaux [b]			43		
IPSL [c]	300	36 %	48		1,200
CROUS-Aquit. [c, d]	9,900	21.9 %		1	Aver. :1,300

a : from ROT 99 *b : from DEV 99* *c : present work*
d: FAU 99

The ECOWEB database

As part of the present work, an interactive database is being developed and implemented. All figures and data are then expected to be systematically loaded by the campus manager staff in this new ECOWEB database. When fully in operation, this would permit all concerned to obtain an on-line comparison of their ratios and indicators with other similar data and, as a consequence, to be able to track the most significant savings by implementing the most cost-effective and efficient technologies. Such a tool seems to fit perfectly with the needs of such

managers, as demonstrated by the request of CROUS-Aquitaine to operate an ECOWEB database tailored to their requirements by March 2001.

8. CONCLUSIONS

In the framework of the ECOCAMPUS initiative, a short and preliminary analysis aiming to support a further, and more complete, Environmental Management Policy in the French HE Sector has been presented. From five French case-studies concerning electricity demand, quantitative aspects are shown and compared with some of our previous data. One of the main goals is to provide a clear demonstration of the benefits, particularly as long as significant money savings are requested, to top managers, decision-makers and academic staff that are not yet totally convinced to shift from the common “laissez-faire” to a voluntary energy-efficient & environmentally-safe policy. Altogether, probably one of the largest sample European-wide, these case-studies represent about 80,000 students and related academic staff : they consume 92 GWh of electricity (and about 200 GWh of heat plus 1.5 million m^3 of water, not ignoring that they generate tons of miscellaneous wastes (municipal-like and/or industrial and toxic). On each site, the conservation potential, not fully investigated yet, is expected to be systematically evaluated in further work. However, the common opinion is that both electricity demand and t water demand growth should be necessarily stopped and hopefully stabilised to its mid-90’s level.

The main purpose of the ECOCAMPUS Initiative is then to demonstrate the benefits resulting from more and more coherent actions between the “What-We-Preach” and “What-We-Do” attitudes. To reach that goal our data should be extrapolated. However, as is well known, any extrapolation of data is a very difficult problem and deserves to be handled very carefully. Bearing this in mind, the data obtained herein has been extended in order to obtain an order of magnitude for the whole French student population, a number roughly estimated to be t 2.5 millions, which is about 30 times the present sample. For the HE organisations alone, the resulting annual electricity demand is then 2.7 TWh. However, in order to get a correct order of magnitude of the “university” end-use sector, not only the impact of those R&D laboratories owned and managed by the Ministry of Education and Research, but by the other ministries (Ministers - for Atomic Energy-, Industry, Agriculture, Transport and Public Works and Health, in particular) would necessarily be considered too. As far as we know, such data are not completely known and published. Regardless of this, the electricity demand in that R&D sector is certainly not negligible when compared to the total for the HE sector, being probably in our opinion of the same order of magnitude. Also, it is clear that the HE & R&D area is one of the electricity end-use sectors showing one of the highest growth rates. In a further step, in a partnership with Ademe, about a dozen of new case-studies will be performed in the next two academic years, not only improving our database by a factor of 3 or 4, but increasing its accuracy.

Finally, the present study and future steps, having as an aim to obtain a more quantitative assessment of data, is of great interest for analysing two main trends of the new French energy policy in the HE sector. The first one regards the “pros and cons” of a possible implementation, on any university campus, of the “eligibility” criteria through Third Party Access to the grid. The second aspect is linked with the new French U3M (Universities of the 3rd Millenium) Programme of construction and retrofitting or recommissioning of university buildings and related facilities. It helps to understand the how’s and why’s of probable benefits that an extended ECOCAMPUS Programme may bring to any part of U3M programmes if soundly implemented and perfectly synchronised with it.

9. ACKNOWLEDGEMENTS

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11. ENDNOTES

[i] ECOCAMPUS is a Trademark of University of Bordeaux 1, registered by INPI, the French National institute of Industrial Property

[ii] A preliminary, and incomplete version of the present paper entitled « ECOCAMPUS : a "Practice-What-You-Preach" DSM Programme in French University Campuses » has been presented to the « Electricity for a Sustainable Urban Development » UIE 2000 Conference – Lisbon (Portugal)

[iii] Frequently quoted in the present document, the word « universities » is used in replacement of both Higher Education (HE) Institutions, Polytechnics and/or Technical Institutes, R-D laboratories, …Then, it does nor refer to administrative criteria only covering the places where the Academic staff teach and train the students and the scientists do their research

[iv] See Appendix 1, ECOCAMPUS Report

[v] The COPERNICUS network was created in 1989, by CRE, the Conference of European Rectors of Universities (See Appendix 2, end of the ECOCAMPUS Report)

[vi] ECOCAMPUS is a Trademark of University of Bordeaux 1, registered by INPI, the French National Institute of Industrial Property

[vii] Contract STR 1006–96 FR (THERMIE Programme - Project Manager : I. SAMOUILIDIS).

[viii] Final Report of the Ecocampus collaboration : section 12 of the Executive Summary in (ROT99)