EUROPEAN GREEN CITIES NETWORK

GREEN BUILD TOOL

Urban District Analipsi
Volos – Greece

VOLOS MUNICIPAL ENTERPRISE
FOR URBAN STUDIES CONSTRUCTION
& DEVELOPMENT

GREECE, 2005

Contents

EGCN Green Build Tool – Test in: district ANALIPSI, Volos - Greece

General information

Name of city/district	**Volos Municipality**
Part of region / city	**District Analipsi**
Country / Nation	**Greece**
Inhabitants	**85.000**

Short description:

Our case study urban area is the district "Analipsi" and more specifically the section confined by the streets "Analipseos", "Kassaveti", "A.Gazi" and "Maurokordatou". It is a residential district in a relatively old section of the city.

Concisely, "Analipsi" is a residential district of big blocks of flats in the central urban area. It is a region of means to high incomes (petit bourgeois to bourgeois classes). The district is place of residence for pensioners, tradesmen and public employees. We can observe a big rate of individual property (privately-owned buildings or apartments).

Moreover, there are services supplementary to residence (supermarkets, ovens, butcheries, groceries, restaurants and cafés). A Police Department and several school units neighbour with the district. Commonly, in both sides of the main road axes "Kassaveti" and "Analipseos" (among the wider streets of Volos), commerce and services are hosted in the ground floor of the buildings. Mass means of transport service sufficiently this urban region.

Analipsi is a typical Greek urban district. Situated in the central urban zone, it is dominated by big blocks of flats, many of which recently erected. Most old buildings were lost due to big earthquakes that shocked the city on 1950. The old detached houses that managed to stand, gave way gradually to blocks of flats through the building system of quid pro quo. Commenting on the age of buildings a basic conclusion is that the newer the building the bigger its height.

The typology of newer buildings is relatively common. Traditional elements like roofs, front yards and atriums are ricocheted. The dominant building material is cement. All new buildings of 3 or more storeys have a flat roof and the floors are cased with tiles. They spare big casements and big balconies shadowed by awnings. Newer blocks of flats are marked by a variety of curves and colours to distinguish their exterior.

Our test sample includes 15 buildings (blocks of flats and family houses), which sum as a total 178 residential apartments of various types and sizes. The majority of apartments are large (we have observed many four-room flats, roughly 100 s. m.).

Testing Criteria

1. Energy consumption for the district

(fill in fields for m^2_{netto} **OR** m^2_{brutto} **OR** m^3, depending on figures available)

		District	Regional average	Regional standard
Heating and domestic hot water	kWh/m^2_{netto}.year			
	kWh/m^2_{brutto}.year	**126**	**All buildings are of low energy standards**	**All buildings are of low energy standards**
	kWh/m^3.year			
Only Heating	kWh/m^2_{netto}.year			
	kWh/m^2_{brutto}.year			
	kWh/m^3.year			
Only domestic hot water	kWh/m^2_{netto}.year			
	kWh/m^2_{brutto}.year			
	kWh/m^3.year			
Electricity	kWh/m2.year			

Comments: Rate *126* reflects one apartment.

As far as the consumption of energy is concerned, it is important to notice the simultaneity of connection of the majority of flats with natural gas supply. We do believe that this turn will reduce the consumption of energy and, as a general, will upgrade the energy performance of buildings. We have a positive outcome in the case of buildings which already use natural gas and this is going to extend because of the big fluctuation of oil prices.

Conclusion:

Average energy consumption is fairly low.

But it is necessary to have a detailed look at the different types of buildings and the differences in buildings ages to evaluate more precisely about status and progress.

2. Energy Supply for heat uses for the district

fuels

		District	Regional average
Biomasse	%		
Solar energy	%		

Oil	%	**82**	
Natural gas	%	**3**	
Coal	%		
electricity	%	**15**	
others	%		
TOTAL	%	**100**	**100**

Specific emissions of heating / hot water production of households

		CO2	SO2	NOx
Emission per Inhabitant	kg / year			

Comments:

Buildings from late 1950's, from 1970's and from 1980's mostly use oil for heating production.

On 2005-2006 there will be a change from oil to natural gas in the urban district's heating system. This means that most of the buildings that use oil (82% of our test sample) will use natural gas, not in total but in a great percentage. Today the use of natural gas has a very low percentage; only 3% of our test sample uses natural gas for heating. The use of natural gas will reduce the emissions per year.

Conclusion:

These are not very excellent figures for the time being, but we believe that the forthcoming turn of district's heating systems towards natural gas will make a positive change.

3. Energy efficiency of heat distribution systems

Heat losses of distribution system, compared to total energy amount sold	%	
Supply temperature of distribution system	° C	**90**
Return temperature of distribution system	° C	**70**

Additional information about activities

Activities to increase efficiency of heat distribution system	**Percentage of households of district**	
Windows made of aluminium	%	**40**
Will of change oil boiler to natural gas boiler	%	**60**
	%	

Comments:

Forward and return temperatures indicate a certain amount of losses. The losses are relatively big, in the case of central heating systems, but this is a rather expected performance. Newer blocks of flats (in our test sample these are the buildings after 1990) use autonomic heating systems that give better performances.

4. Building integrated solar energy systems

Amount of solar systems

	Percentage of buildings of district	Regional average
Amount of buildings using solar energy	**10 %**	**Unknown**
M2 installed solar installation per 100 persons	**114 m²**	

Efficiency of installed solar systems

	Percentage of total amount of solar collector systems of district	
Amount of solar collector systems gaining more than 350 kWh/ m2.year	**Unknown**	

Architectural integration of solar installations

	Percentage of total amount of solar collector systems of district	
Amount of well integrated solar collector systems	%	

Comments:

In our case study district, we haven't record any special application or installation for alternative energy production, or energy saving. The solar water heaters are merely individual flat solutions and indeed with a rather low presence, given the long lasting fair weather conditions in Greece. 17 out of 178 apartments that compose our sample use solar systems for the purpose of heating water.

The type of solar collectors mostly used in our area is SI – 130. The productivity of this collector is 130 lt of hot water and can work from – 20 °C to 160 °C. Each collector has a surface of 2m².

In the building level it would be worthwhile to install a solar energy collective system to meet better the needs of all flats, while reducing individual costs and losses. Unfortunately it is not a common practise to confront the building's energy demands in the stage of architectural study. This is very important because in this stage it is easier to incorporate on the building clever installations for the reduction of energy consumption and energy losses.

5. Efficient building ventilation system with heat recovery

instruments	briefly description	results
Regulationes by law	**No regulations**	
Subsidies	**Subsidies may be given occasionally through special Research Programs**	
Information activities	**Realised by the Regional Energy Centre of Thessaly**	**Will to alter the municipal buildings**
Realised examples / demonstration buildings	**"Tsalapatas" old brick and tiles factory and the building of DEMEKAV (situated out of the district Analipsi)**	**They use as demonstration projects**
Other		

Comments:
In Greece this is not yet a priority issue. However, in the local level take place some successful activities by the Regional Energy Centre of Thessaly.

6. Natural/emission free building materials

Amount of actual renovation projects within district: _____

instruments	briefly description	results
Regulationes by law	**No regulations**	
Subsidies	**Subsidies are given occasionally through special Research Programs**	
Information activities	**Realised by the Regional Energy Centre of Thessaly**	**Will to alter the municipal buildings**
Realised examples / demonstration buildings		
Other		

Comments:
In Greece this is not yet a priority issue. However, in the local level take place some activities by the Regional Energy Centre of Thessaly.

7. Efficient use of glazing for passive solar gains

instruments	Briefly description	results
Regulationes by law	**No regulations**	
Subsidies	**Subsidies are given occasionally through special Research Programs**	
Information activities	**Realised by the Regional Energy Centre of Thessaly**	**Will to alter the municipal buildings**
Realised examples / demonstration buildings	**"Tsalapatas" old brick and tiles factory**	**Uses as a demonstration project**
other		

Comments:
In Greece this is not yet a priority issue. However, in the local level take place some activities by the Regional Energy Centre of Thessaly.

Preliminary evaluation on EGCN Green Build Tool criteria:

1. **Energy consumption.** Average energy consumption is fairly low.
2. **Energy supply** shows not very excellent figures concerning renewable fuels, compared to other municipalities in Greece. This may be caused by relatively less rural area in Volos Municipality. Regarding the urban district's heating system a change from oil to natural gas will be established during 2005-2006.
3. **Energy efficiency of heat distribution system.** Potential for improved energy efficiency.
4. **Building integrated solar energy systems.** The use of solar installations is quite important, though it is not the main energy supply source, and is mostly used for heating water. Efficiency and degree of architectural well integrated installations is unknown.
5. **Efficient building ventilation systems.** In Greece this is not yet a priority issue.
6. **Natural/emission free building materials**. In Greece this is not yet a priority issue.
7. **Efficient use of glazing for passive solar gains.** In Greece this is not yet a priority issue.

European Green Cities Certificate – considering Volos

Based on the above Green Build Tool criteria, we conclude that:

Volos is in a good position regarding criteria 1-2-3. Besides good results for criterion 1, there is a potential for even further improvements and for achieving improvements on criteria 2-3 as well.

Criterion 4 looks good, but could be better given the climate of the Region. A constant close investigation is required to evaluate on solar efficiency progress and architectural integration on newer buildings.

On criteria 5 -6 – 7 we should comment that, though subsides are rather limited, a good work is carried out in Volos by the Regional Energy Centre of Thessaly, with some successful examples to demonstrate.

A preliminary conclusion is that Volos shows to be committed to energy efficiency programmes and further improvements regarding the Green Build Tool monitoring and evaluation criteria; although for some issues the policy is still incomplete.

TESTING THE GREEN BUILD TOOL

1. DESCRIPTION OF CASE STUDY URBAN AREA

Our case study urban area is the district "Analipsi" and more specifically the section confined by the streets "Analipsi", "Kassaveti", "A.Gazi" and "Maurokordatou". It is a residential district in an old section of the city.

Social characteristics of region

As a general "Analipsi" it is a residential district in the central urban area with big blocks of flats. It is a region of means to high incomes (small bourgeois to bourgeois classes). The district is place of residence for pensioners, tradesmen and public employees. We can observe a big rate of individual property (privately-owned buildings or apartments). The majority of apartments are big (many four-room flats, roughly 100 s. m.).

Moreover, there are services supplementary to residence (supermarkets, ovens, butcheries, groceries, restaurants and cafés). Near the region is located a Police Department and several school units. Commonly, both sides of the main road axes "Kassaveti" and "Analipsi" (they are among the biggest in width streets of Volos), host commerce and services in the ground floor of the buildings. Mass means of transport service sufficiently this urban region.

The buildings of the region

In this district, as a majority, stand new erected blocks of flats with many storeys. You can also see older buildings of one or two storeys. Intense building activity, regarding the construction of blocks of flats, is observed. Free downstairs for car parking exists mainly in flat blocks of the interior of the case study area, which is dominated by new buildings.

There are pavements of big width and rows of trees on all streets. Street sides are dominated by a big number of parked cars. Clear plot spaces there are in the backyards of the buildings.

2. METHODOLOGY

Our test sample consists of fifteen (15) buildings. Fifteen (15) caretakers of blocks of flats and other buildings have been interviewed on November – December 2004. We had a representative test sample using as a criterion the age and the height of the buildings standing in the district. The method we used to collect information on the building's energy characteristics was the personal interview with their caretakers. An interview sheet was prepared therefore and a person has been sent to fill in the sheets, take photos of the associated buildings and examine the district.

Next, we gathered the filled interview sheet and imported data in Excel program to make their statistic editing and take the information we needed. We attach the interview sheet translated in English along with the statistic outcomes of the data.

3. TEST SAMPLE

Next we juxtapose analytically all fifteen (15) buildings that comprised our test sample, for reasons of comparison and for better understanding of our district's general character. In each case we array information on the identity of the building (age, floors, etc), its energy characteristics (fuel, consumption, special installations, etc) and an illustrative photo.

3.1. Building No1

3.1 Building no 1

This is a 4 storey building with shops in the ground floor. It consists of 24 apartments that vary in size (from a studio of 25m^2 to a big apartment of 125m^2). As a total 45 people live in this block of flats. The building was constructed on 1981.

The fuel used for heating is oil and the mean yearly consumption is between 17 and 19 tons, depending on the severity of the winter. The oil burner is being cleared twice per year, while every year on October it is being maintained. This building is not supplied with natural gas. For heating water they use electric water heaters.

Cooling of the flats is obtained with air conditioners. Indeed we have a big percentage of air conditioners per apartment in this block of flats (62,50%). Good lighting conditions are secured by the orientation of the building (Eastwards) and the big casements on this forefront. Most balconies are covered by awnings, which protect during hot summer periods. There is a flat roof and the dominant materials of the building are cement and aluminium.

3.2. Building No2

This is a 6 storey building. It consists of 25 apartments that vary in size (from a studio of 30m^2 to a big apartment of 115m^2). As a total 75 people live in this block of flats. The building was constructed on 1997, and this is evident by its outer sight as well as by its inner arrangements.

The fuel used for heating is oil and the mean yearly consumption is 17 tons. The oil burner is being cleared and maintained every year, on May. There is a supply of natural gas but flats have just begun to use it. Moreover, 18 apartments spare a fireplace. A boiler system is heating water. Overall, these installations have resulted to a relatively low rate of oil consumption, 7,8 lit/m^2/year.

In many apartments cooling is obtained with air conditioners. We have a medium percentage of air conditioners per apartment in this block of flats (48%). Good lighting conditions are secured by the orientation of the building (Eastwards – Westwards – Southwards). Most balconies are covered by awnings, which protect during hot summer periods. There is a flat roof and the dominant materials of the building are cement and aluminium.

3.3. Building No3

This is a 5 storey stilted building. It consists of 10 apartments that vary in size (from a studio of 30m^2 to a big apartment of 159m^2). As a total 30 people live in this block of flats. The building was constructed on 1980.

The fuel used for heating is oil and the mean yearly consumption is between 6 and 7 tons, which means we have a consumption rate of 7,8 lit/m^2/year. The oil burner is being maintained every year, on September. This building is not supplied with natural gas. For heating water they use electric water heaters, while there is only 1 solar water heater.

In some apartments cooling is obtained with air conditioners. Good lighting conditions are secured by the orientation of the building (Eastwards). Front side's frames are made of aluminium, while these of the back side are made of wood. Balconies are covered by awnings. There is a flat roof and the dominant materials of the building are cement and aluminium.

3.4. Building No4

This is a single storey house. This is one of the older constructions of our sample, since it was constructed on 1958. It consists of 3 apartments that comprise a total dwelling surface of 180 m^2. As a total 4 people live in this building.

Electricity is used for heating. More specifically, they only use electric radiators. This building is not supplied with natural gas. For heating water they use electric water heaters.

Cooling is obtained with the use of air conditioners. It is noticeable that we have counted 7 air conditioners for 3 apartments, in overall. The orientation of the building is eastwards - southwards. Frames are made of aluminium or wood. There is a tiles roof and the dominant material of the building is cement.

3.5. Building No5

This is a 4 storey building with basement. It consists of 5 apartments. The building was constructed on 1977.

The fuel used for heating is oil and the mean yearly consumption is 4,5 tons, which means we have a consumption rate of 8,9 lit/m^2/year. The oil burner is being maintained every year, on September. This building is not supplied with natural gas. For heating water they use water heaters, electric or solar.

In most apartments cooling is obtained with air conditioners. Good lighting conditions are secured by the orientation of the building (Eastwards - Westwards). Frames are made of wood. Balconies of the west side are covered by awnings. There is a flat roof and the dominant material of the building is cement.

3.6. Building No6

This is a 4 storey building. It consists of 8 apartments that vary in size (from a studio of 28m² to a big apartment of 126m²). As a total 19 people live in this block of flats. The building was constructed on 1974.

The fuel used for heating till last year was oil. In two cases boiler systems were used for heating water and moreover one of these apartments spears a solar water heater. The rest apartments spare electric water heaters. There is a supply of natural gas starting form this year.

In some apartments cooling is obtained with air conditioners. We have a medium percentage of air conditioners per apartment in this block of flats (50%). Good lighting conditions are secured by the orientation of the building (Southwest – Northeast). Frames are made of wood in ground floor and first floor, while the above floors have aluminium frames. There is a flat roof and the dominant material of the building is cement.

3.7. Building No7

This is a 6 storey stilted building. It consists of 25 apartments. As a total 70 people live in this block of flats. The building was constructed on 1990.

The fuel used for heating is oil and the mean yearly consumption is 24 tons, which means we have a big consumption rate of 13,6 lit/m^2/year. The oil burner is being maintained every year, on May. This building is not supplied with natural gas. For heating water it spares a boiler system.

In some apartments cooling is obtained with air conditioners. The orientation of the building is westward. Frames are made of aluminium. All balconies are covered by awnings. There is a flat roof and the dominant materials of the building are cement and aluminium.

3.8. Building No8

This is a 4 storey stilted building. It consists of 3 apartments, 95m^2 each. The building was constructed on 1995.

This building has been just connected with natural gas. It also spares a boiler system for hot water.

Cooling is obtained with air conditioners. The orientation of the building is eastwards and southwards. Frames are made of PVC. There is a flat roof and the dominant material of the building is cement.

3.9. Building No9

This single storey house is the oldest constructions of our sample, since it was constructed on 1953. It consists of 2 apartments that comprise a total dwelling surface of 280 m^2. As a total 5 people live in this building.

Electricity is used for heating. More specifically, they only use electric radiators. This building is not supplied with natural gas. For heating water they use electric water heaters.

Cooling is obtained with the use of 2 air conditioners. The orientation of the building is eastwards - westwards. There are no awnings. Frames are made of wood. There is a tiles roof and the dominant material of the building is cement.

3.10. Building No10

This is a 5 storey building with stores on the ground floor. It consists of 17 apartments. As a total 55 people live in this building. The building was constructed on 1978.

The fuel used for heating is oil and the mean yearly consumption is 13 tons, which means we have a consumption rate of 10,04 lit/m^2/year. The oil burner is being maintained every year, on September. This building is not connected with natural gas, though there is a supply. For heating water they use water heaters, mostly electric (there are only 2 solar water heaters).

Some apartments spare air conditioners. Good lighting conditions are secured by the Eastward orientation of the building. Frames are made of wood and aluminium. Balconies are covered by awnings. There is a flat roof and the dominant material of the building is cement.

3.11. Building No11

This is a 5 storey stilted building. It consists of 11 apartments. As a total 40 people live in this building. The building was constructed on 1995.

This building is connected with natural gas. This is the only case in our sample that we have data on natural gas consumption, because the gas supply started one year ago. The mean yearly consumption in this building is 12.600 m^3. This means we have a consumption rate of 12,3 m^3/m^2/year. The gas burner is being maintained every year, on May. The building spares a boiler system for hot water and moreover we have record 6 solar water heaters.

In the majority of the apartments cooling is obtained with air conditioners. The orientation of the building is eastwards and southwards. Frames are made of aluminium. There is a flat roof and the dominant materials of the building are cement and aluminium.

3.12. Building No12

This is a 6 storey stilted building. It consists of 11 apartments. The building was constructed on 1993.

This building has been just connected with natural gas. It also spares a boiler system for hot water.

Cooling is obtained with air conditioners. The orientation of the building is eastwards. Frames are made of aluminium. There is a flat roof and the dominant material of the building is cement.

3.13. Building No13

This is a 5 storey stilted building. It consists of 10 apartments. The building was constructed on 1994.

The fuel used for heating is oil. The oil burner is being maintained every year. This building is connected with natural gas this year. For heating water they use water heaters, mostly electric (there is only 1 solar water heater), while they also spare a boiler system.

In this block of flats, the half apartments spare air conditioners. Good lighting conditions are secured by the Eastward orientation of the building. Frames are made of aluminium. All balconies are covered by awnings. There is a flat roof and the dominant material of the building is cement.

3.14. Building No14

This is a 4 storey building with stores on the ground floor. It consists of 26 apartments. The building was constructed on 1978.

The fuel used for heating is oil and the mean yearly consumption is 20 tons, which means we have a consumption rate of 10,92 lit/m^2/year. The oil burner is being maintained every year, on May. This is not a supply of natural gas in this building. For heating water they use water heaters, mostly electric (there are only 3 solar water heaters).

Some apartments spare air conditioners. The orientation of the building is eastwards - westwards. Frames are made of wood. Most balconies are covered by awnings. There is a flat roof and the dominant material of the building is cement.

3.15. Building No15

This is a 4 storey building with stores on the ground floor and a basement. It consists of 13 apartments. The building was constructed on 1978.

The fuel used for heating is oil and the mean yearly consumption is 13 tons, which means we have a consumption rate of 12,67 lit/m^2/year. The oil burner is being maintained every year, on September. This is not a supply of natural gas in this building. For heating water they use electric water heaters.

Some apartments spare air conditioners. The orientation of the building is eastwards - westwards. Frames are made of wood. Most balconies are covered by awnings. There is a flat roof and the dominant material of the building is cement.

4. GREEN BUILT TOOL – GENERAL ANALYSIS

ENERGY CHARACTERISTICS OF THE STUDY AREA

3.1 Heating

There is a supply of natural gas in the district, but not all residences are connected with natural gas. Almost all the blocks of flats are connected or intend to submit an application for their connection with natural gas. Newer buildings have been connected already with natural gas (runs for the first year). Older buildings and some blocks of flats make use of oil for heating, up to today.

Because the most residences are connecting with natural gas for the first time the current year, we have a lack of consumption data in these cases. Though, we have managed to found a block of flats that uses natural gas for heating and hot water for the second year. In this case we have a total of 1.023 m^2 residential space that gives an indicative yearly consumption of 12.600 m^3 for the period November - March 2003-2004. As far as the consumption of natural gas is concerned, this means we have a rate of 12,3 m^3/m^2/year.

On the contrary we have gathered sufficient data for the consumption of oil, witch is the most common fuel used for heating and hot water in the city and in Greece in general. We have an average oil consumption rate of 10,12 lit/m^2/ year. The biggest consumption rate (13,64) was registered in the case of a 6 storey newel building with a flat roof and westward direction, were only oil is used for heating and hot water. It is noteworthy to mention that, in the case of the building with the biggest residential surface, we have registered the minimum consumption rate (7,82) and this is due to the fact that fireplaces are alternatively used there for heating.

Indicators of energy consumption for heating

Fuel	**Natural Gas**	**Oil**
Cosumption/m^2/year	*12,3 m^3*	*10,12 lit*

3.2 Hot Water for Use

For heating water electric water heaters (consumption of electric energy) are mainly used. Solar water heaters are fewer, usually applied on detached houses or two-storey houses. The percentage of solar use (with an efficiency of 53,33 lit/m^2 collector area) per flat/residence is relatively low (22,43%), given the weather conditions in Greece (long hot summer period). This is rather a special characteristic of the district, while in other districts of the city the use of solar water heaters is definitely major.

A lot of new blocks of flats spare a boiler system (combined use of oil or natural gas for heating and hot water).

3.3 Cooling – Lighting – Ventilation

Cooling of residences is very important due to long lasting summer period and it is obtained mainly with the use of air conditioners (in all the categories of buildings). It is important to notice that all buildings examined supplied air conditioners and this is easy to notice in the photos we have taken. An average rate of 57,28% of flats / residences supply at least one air conditioner.

The shading of residences, also a very important matter, is achieved with awnings in the majority of the balconies (13 out of 15 cases). Orientation of balconies is usually eastwards – westwards, to avoid the cold wind during winter while benefiting from the sun course. Casements in all flats secure good lighting and ventilation conditions.

3.4 Insulation

There are window and door frames of aluminium and PVC on the new blocks of flats, while there are wooden frames on older buildings. Although, in many cases of older buildings frames have been recently replaced with new ones from aluminium for better insulation, bigger safety and reduce of noise. Blocks of flats have an insulated flat roof, while ground and two-storey buildings are mixed (usually oldest buildings having a roof and newer constructions having a flat roof). The floors of flats are cased with tiles. The sovereign material in all types of buildings is the cement.

CONCLUSIONS

Analipsi is a typical Greek urban district. Situated in the central urban zone, it is dominated by big blocks of flats, many of these recently erected. Most old buildings were lost due to big earthquakes that shocked the city on 1950. The old detached houses that managed to stand gave way gradually to blocks of flats through the building system of quid pro quo. Commenting on the age of buildings conclusion is that the newer the building, the bigger its height.

The typology of newer buildings is relatively common. Traditional elements like roofs, front yards and atriums are ricocheted. The main building material is the cement. All new buildings of 3 or more storeys are having a flat roof and the floor is cased with tiles. They spare big casements and big balconies shadowed by awnings. Newer blocks of flats are marked by a variety of curves and colours to distinguish their exterior.

In our case study district we haven't record any special application or installation for alternative energy production, or energy save. The solar water heaters are merely individual flat solutions and indeed with a rather low presence, given the long lasting fair weather conditions in Greece. At least in the building level it would be worthwhile to install a solar energy collective system to meet better the needs of all flats, reduce individual costs and the losses. Unfortunately it is not a common practise to confront the building's energy demands in the stage of architectural study, though this is very important because in this stage it is easier to incorporate on the building clever installations for the reduction of energy consumption and energy losses.

As far as the consumption of energy is concerned, it is important to notice the simultaneity of the connection of the majority of flats with natural gas supply. We do believe that this turn will reduce the consumption of energy and as a general will upgrade the energy performance of buildings. We have a positive outcome in the cases of buildings which already make use of natural gas and this is going to extend because of the big fluctuation of the oil prices.

Recording Form of Building's Energy Characteristics

Urban District: *ANALIPSI (Analipseos St. – A. Gazi St. - Mavrokordatou St. – Kasaveti St.)*

No Questionnaire: .....
Date:.....
Interviewed: .....
Communication Tel.:.....

BUILDING'S IDENTITY

Street:..... No.:

No of floors:.....

No of apartments or s.m. of residence:.....

Year of built: .....

BUILDING'S ENERGY CHARACTERISTICS

Fuel for Heating:.....

Consumption of fuel (e.g. oil lit/year): .....

Maintenance of boiler: *every*.....

Natural Gas supply: .....

Connection of apartments with natural gas: yes no

System for Hot Water for Use (heater/boiler):.....

No of air conditioners: .....

Building's roof (π.χ. roof/flat roof): .....

Frames (π.χ. aluminum, timber): .....

Existence of awning (e.g. yes for all): .....

Orientation of balconies:.....

Dominant materials on the external (π.χ. glass, cement):

.....

Other comments: .....

.....

No	FLOORS	S.M. OF RESIDENCE	YEAR OF BUILT	FUEL	CONSUMPTION (tn/year or m3/year)	BOILER CONSERVATION (times/year)	SUPPLY OF N.G. IN APPARTMENT	CONNECTION WITH N.G.	HOT WATER for USE	No of AIRCODITIONERS	ROOF
1	4	2000	1981	oil	18	2	N	N	electric heater	15	flat roof
2	6	2175	1997	oil	17	1	N	Y	boiler system	12	flat roof
3	5	889	1980	oil	7	1	N	N	electric heater	3	flat roof
4	1	180	1958	electricity			N	N	electric heater	7	roof
5	4	501	1977	oil	4,5	1	N	N	electric heater	3	flat roof
6	4	606	1974	natural gas			Y	Y	electric heater	4	flat roof
7	6	1760	1990	oil	24	1	N	N	boiler system	7	flat roof
8	4	285	1995	natural gas		1	Y	Y	boiler system	2	flat roof
9	1	280	1953	electricity			N	N	electric heater	2	roof
10	5	1295	1978	oil	13	1	N	Y	electric heater	6	flat roof
11	5	1023	1995	natural gas	12600	1	Y	Y	boiler system	8	flat roof
12	6	980	1993	natural gas		1	Y	Y	boiler system	7	flat roof
13	5	859	1994	natural gas		1	Y	Y	electric heater - boiler system	5	flat roof
14	4	1832	1978	oil	20	1	N	N	electric heater	10	flat roof
15	4	1026	1978	oil	13	1	N	N	electric heater	7	flat roof

STATISTIC ANALYSIS OF RECORDING FORMS

No	FRAMES	AWNING	ORIENTATION	MATERIAL	No of ROOMS	COMMENTS
1	aluminium	Y	E	cement	24	
2	aluminium - wood	Y	E - W - S	cement	25	fire place
3	aluminium	Y	E	cement	10	solar heater
4	aluminium - wood	N		cement	3	
5	wood	Y	E - W	cement	5	3 solar heaters
6	aluminium - wood	Y	NE - SW	cement	8	2 boiler system - 1 solar heater
7	aluminium	Y	W	cement	25	
8	PVC	Y	N - A	cement	3	
9	wood	N	E - W	cement	2	
10	aluminium - wood	Y	E	cement	17	2 solar heaters
11	aluminium	Y	S - E	cement	11	6 solar heaters
12	aluminium	Y	E	cement	11	1 solar heater
13	aluminium	Y	E	cement	10	1 solar heater
14	wood	Y	E - W	cement	26	3 solar heater
15	wood	Y	E - W	cement	13	