Biomass Action Plan for Vistabella del Maestrat

Proposal from IT FOREST PROJECT

Vistabella del Maestrat, 24th July 2014

KÁROLY RÓBERT UNIVERSITY COLLEGE

UNIVERSITAT JAUME·I

Universitatea "Vasile Alecsandri" din Bacau

Lifelong Learning Programme

Vistabella Maestrat

parc natural de penyagolosa

bio Penyagolosa Qualitat autèntica

forestal del maestrazgo

gegantur Turisme del Penyagolosa

CONTENTS

INTRODUCTION

IT FOREST
ERASMUS INTENSIVE PROGRAMME (IP)

- ITforest is one of the projects selected as **Erasmus Intensive Programme (IP)** financed by the European Lifelong Learning Programme

- **Erasmus IP is a short programme** of study which brings together students and staff from **universities** from at least 3 countries **to work together** in multinational groups and benefit from special learning/teaching conditions and to gain new perspectives on the studied topic

Lifelong Learning Programme

IT FOREST
PROJECT SUMMARY (I)

- **OBJECTIVE:** Familiarize the participants with the use of biomass in energy production to promote new sustainable economic opportunities in rural areas

- **WHEN?:** From 14th to 25th July 2014

- **WHERE?:** Castellón de la Plana and Vistabella del Maestrat

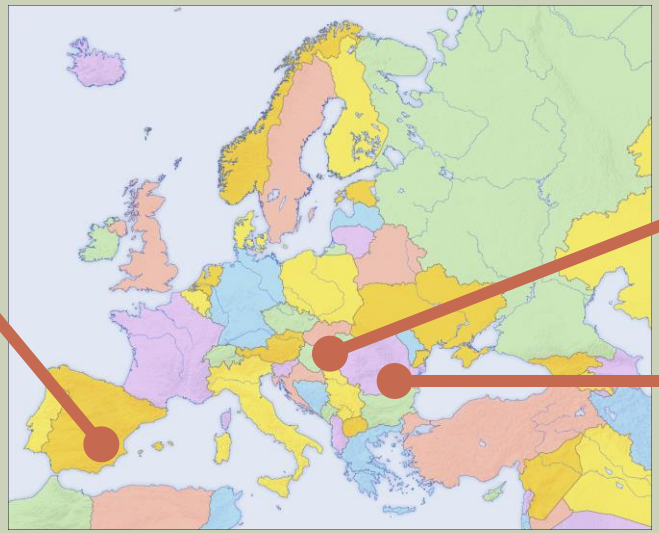
IT FOREST
PROJECT SUMMARY (II)

- WHO? Students and professors from **3 universities** in **3 countries** and different engineering profile working in **multidisciplinar and international groups**

- WHAT? Participants will work together to **develop a plan of action linking the use of biomass as an energy source and the promotion of new economic opportunities** in Vistabella del Maestrat

IT FOREST
PARTICIPANT UNIVERSITIES

Károly Róbert University College Gyöngyös (HUNGARY)



Universitat Jaume I Castellón de la Plana (SPAIN)

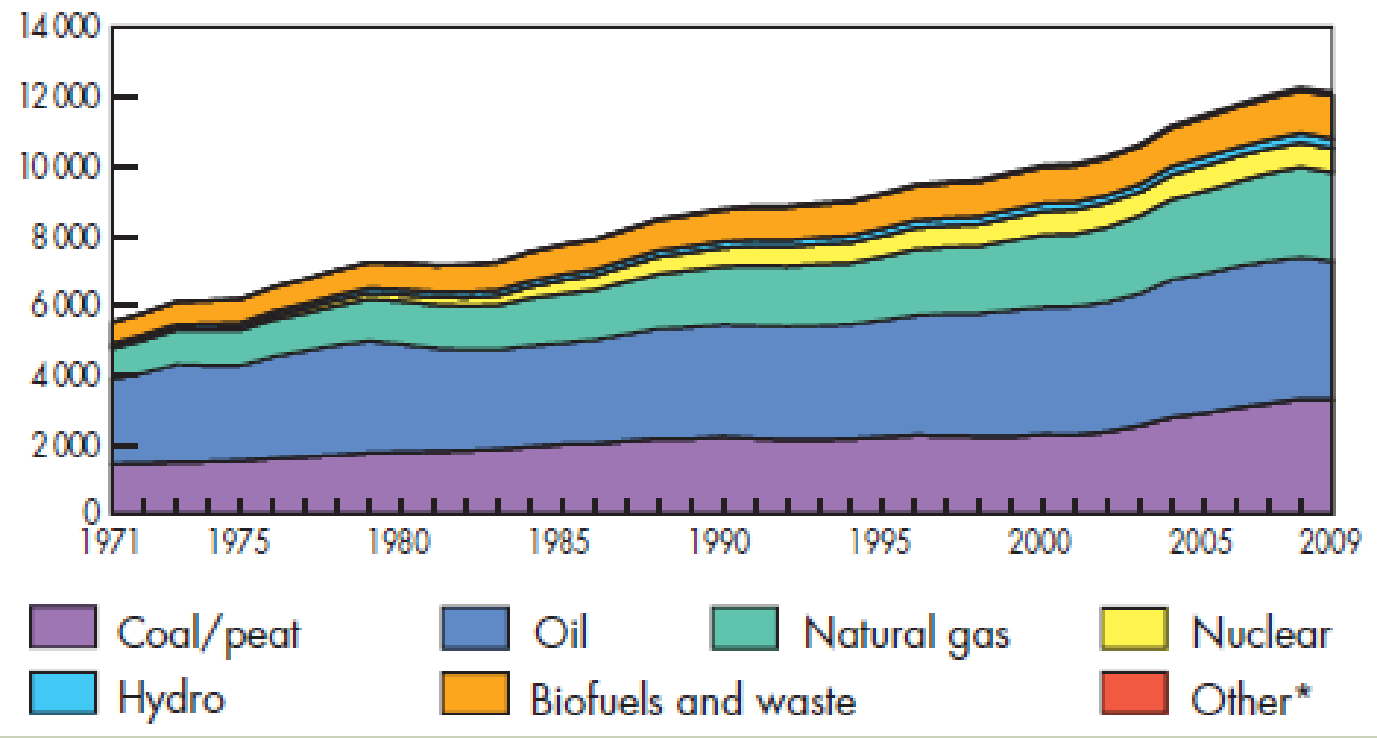
Universitatea Vasile Alecsandri Bacau (ROMANIA)

INTRODUCTION

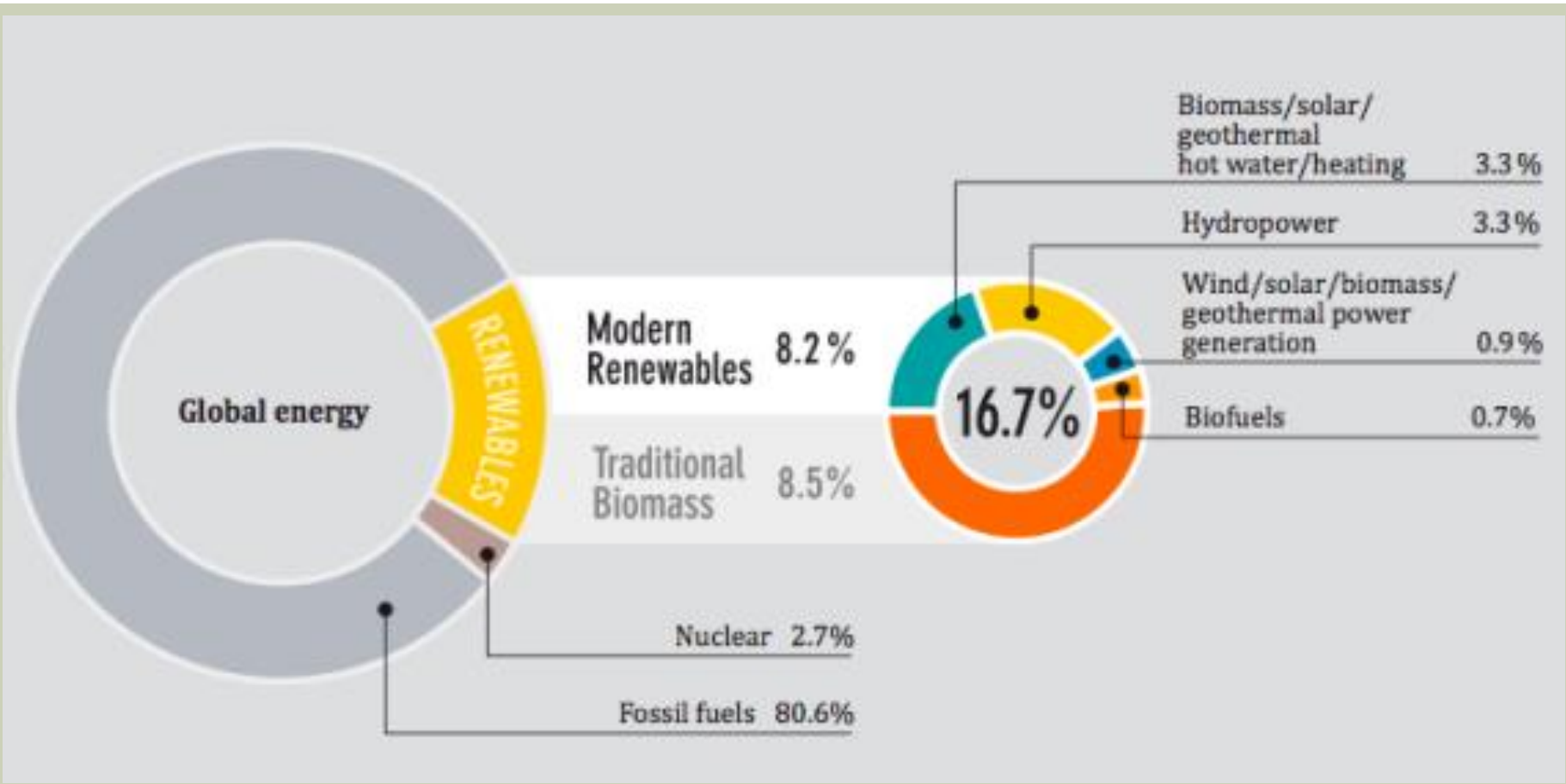
ROLE OF BIOMASS IN GLOBAL ENERGY CONSUMPTION

WORLD TOTAL PRIMARY ENERGY SUPPLY FROM 1971 TO 2009 BY FUEL (MTOE)

- In 1980 the total primary energy demand was 7229 mtoe.
- This value increased to 12271 mtoe to 2008.



GLOBAL ENERGY CONSUMPTION 2010



BIOMASS CATEGORIES

- The biomass can be devided into 3 main groups:
  - The primary biomass: natural vegetation.
  - The secondary biomass: products and wastes from fauna and livestock breeding.
  - The tertiary biomass: every organic wastes and products which belong to all kind human activities.

BIOMASS TO ENERGETICS USING

- The biomass potential which can be apply for energetics (heating) manly involve the following:
  - By-product of forestry (for example branches).
  - The product of the crop which not use for feeding.
  - By-products of food industry and crop which not able to use for fertilizing.
  - Organic materials from other area (livestock, human activities).

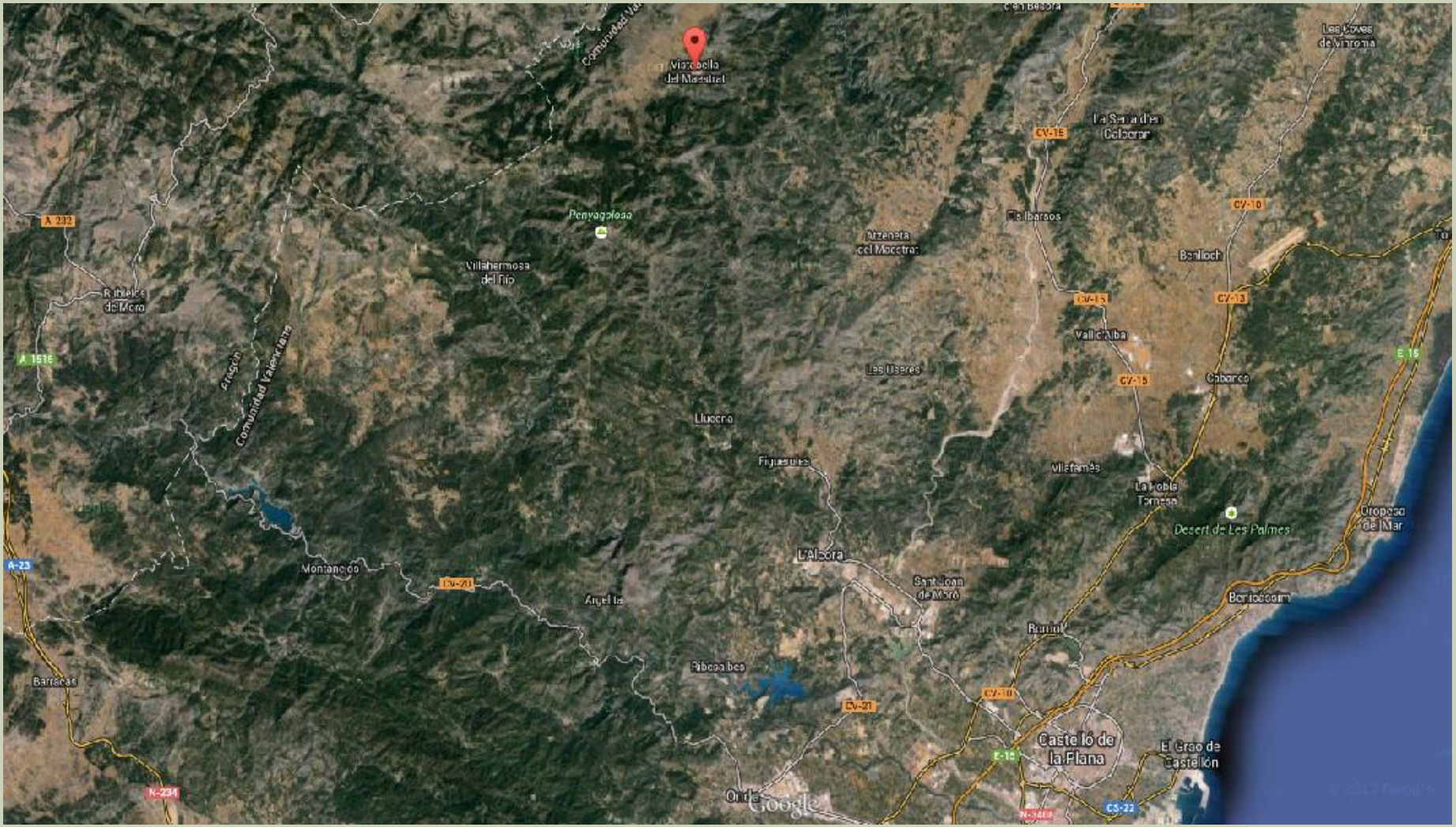
BIOMASS IN PUBLIC HEATING SYSTEM

If we want to use the biomass for heating in public buildings we have to:

- check energetics parameters of public houses,
- determine the demand of the biomass,
- defining of the proper heating system.

1. LOCAL CONTEXT

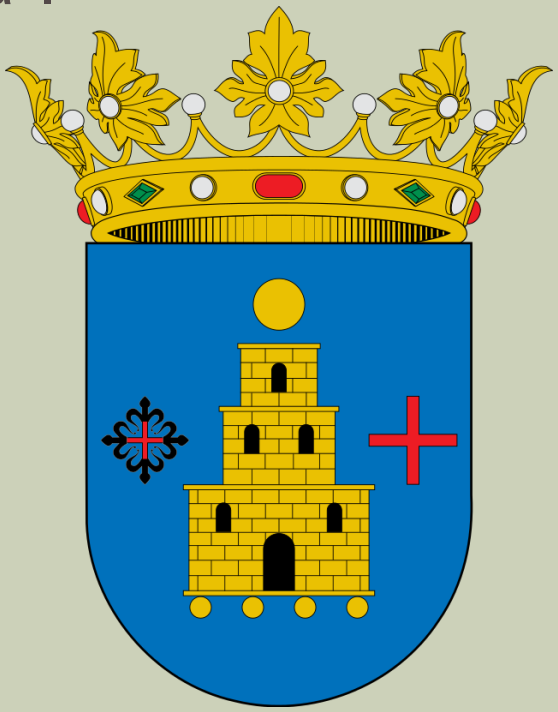
GLOBAL LOCATION OF VISTABELLA



THE VILLAGE

HISTORY

- First inhabitants were the iberians, romans and muslims.
- The XIII century conquered by christians.
- 1251 getting the “ Carta Pobla “.
- 1345 takes part in “ La Setena de Culia”.



LOCATION

- It is situated in the province of Castellon. In the region of Alcalaten.
- Climate :

  •Cold climate that is characterized by fresh summers and cold winters with T that can reach less than -12°C.

  •The annual average temperature is 9°C.

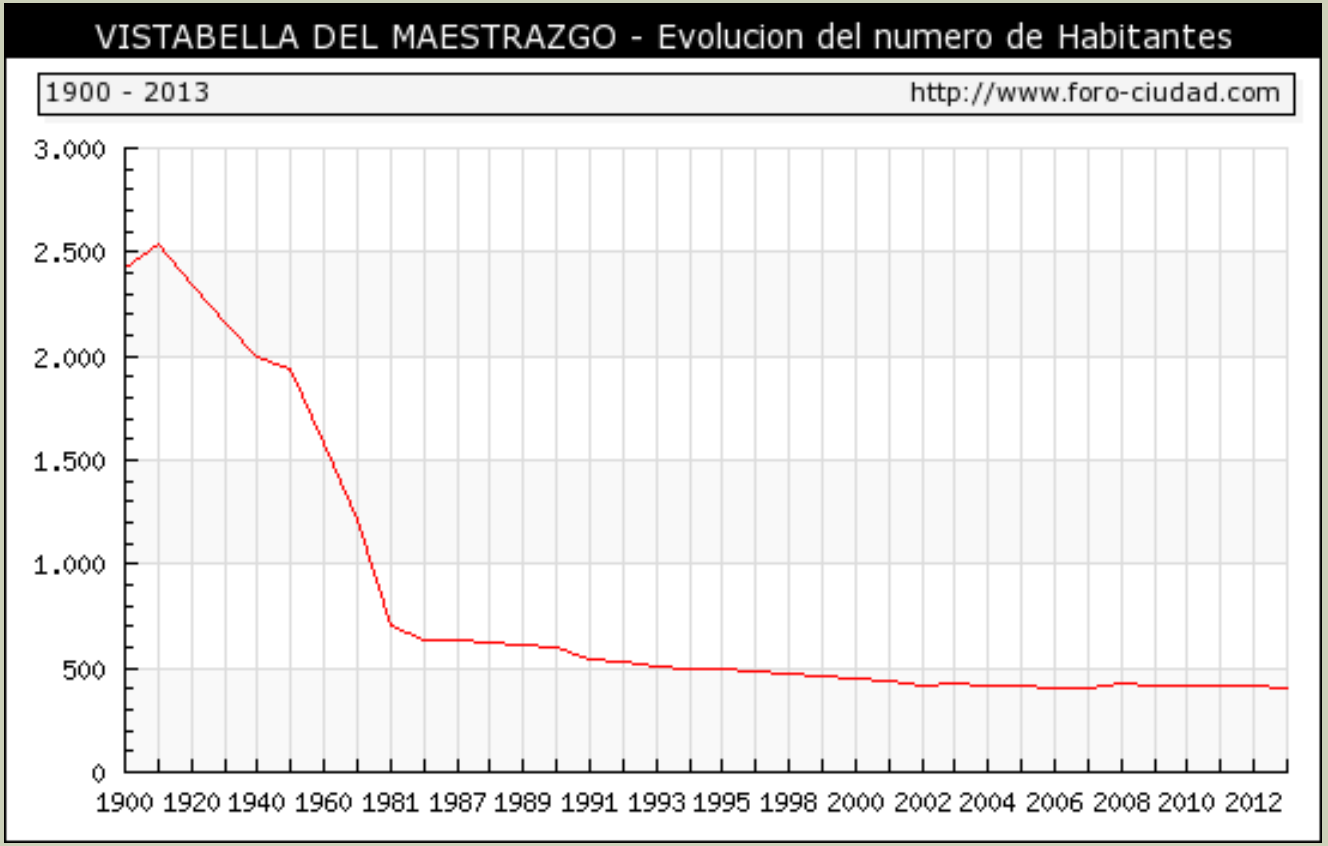
- Altitude: 1246 m.
- Area: 151 km².

ACCESS

- From Atzeneta del Maestrat: CV170
- From Puertomingalvo: CV170

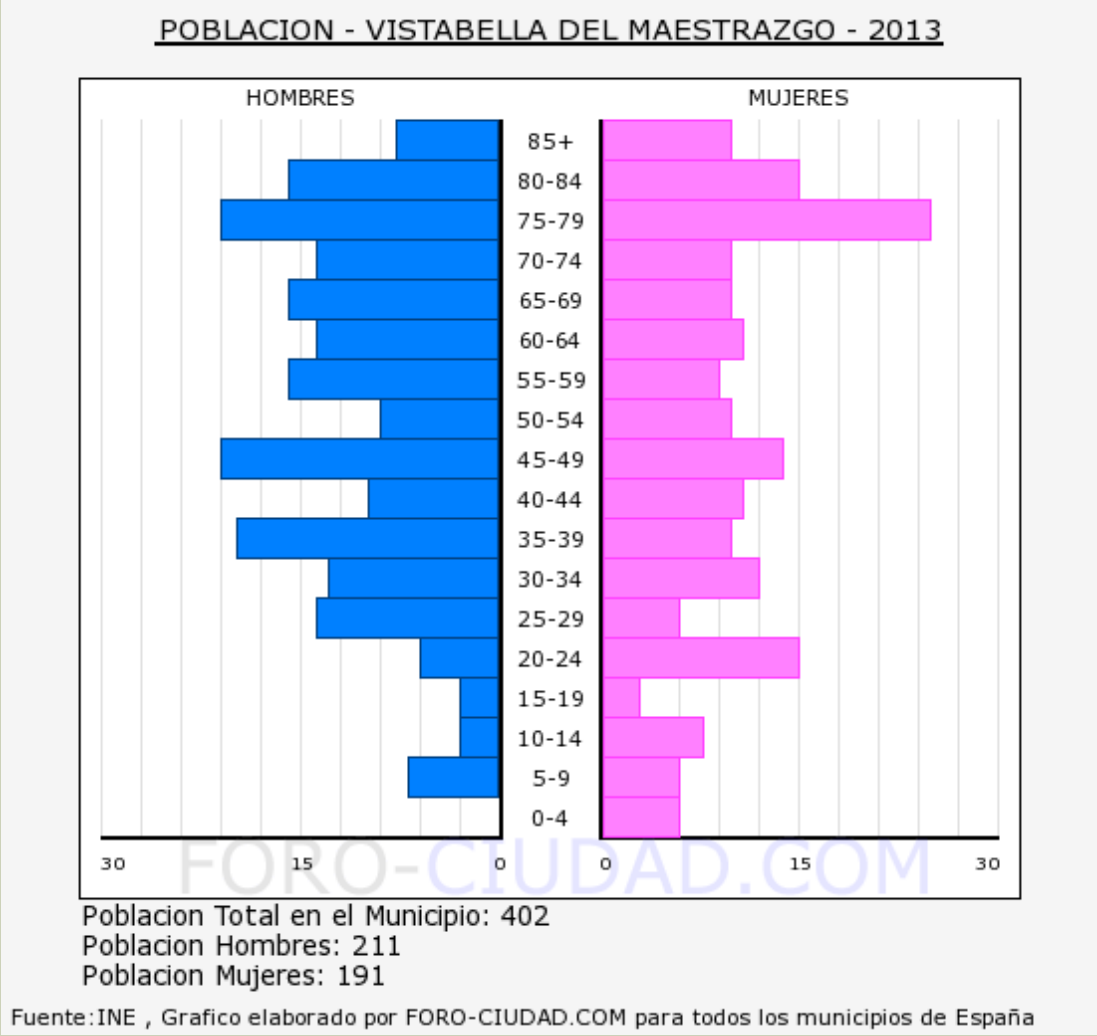
Difficult access by tracks.

DEMOGRAPHY



In 1910 → 2500 inhabitants.
In 2013 → 402 inhabitants.

DEMOGRAPHY


POBLACION - VISTABELLA DEL MAESTRAZGO - 2013
HOMBRES
MUJERES
85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
30
15
0
0
15
30
FORO-CIUDAD.COM
Poblacion Total en el Municipio: 402
Poblacion Hombres: 211
Poblacion Mujeres: 191
Fuente:INE , Grafico elaborado por FORO-CIUDAD.COM para todos los municipios de España

ECONOMY

- Based in :

Agriculture

- 300 ha
- 7 large farms
  - Potatoes
  - Cereals
  - Truffles

Farms

- 8 sheep farms
- 1 goat farm
- 7 bulls and cows farms
- 1 horse farm

Tourism

- Gastronomic days
- Mycologic days
- Rural turism
- Sports activities

ECONOMY

SERVICES

- 6 bars-restaurants
- 1 pub
- 2 bakeries
- 2 butchers
- 2 grocery stores
- 1 pharmacy
- 1 truffle products
- 1 banc
- Doctor and urgencies

UNEMPLOYMENT

May-14	UNEMPLYMENT
TOTAL	29
MEN	17
WOMEN	12
LESS THAN 25	1
MEN	1
WOMEN	0
BETWEEN 25 UNTIL 44	20
MEN	12
WOMEN	8
MORE THAN 45	8
MEN	4
WOMEN	4
Agriculture	12
Industry	4
Construction	3
Services	9

THE FOREST

- 80% of the area is covered by forest.
- Main species are: oaks, holm oak, pinus, etc.



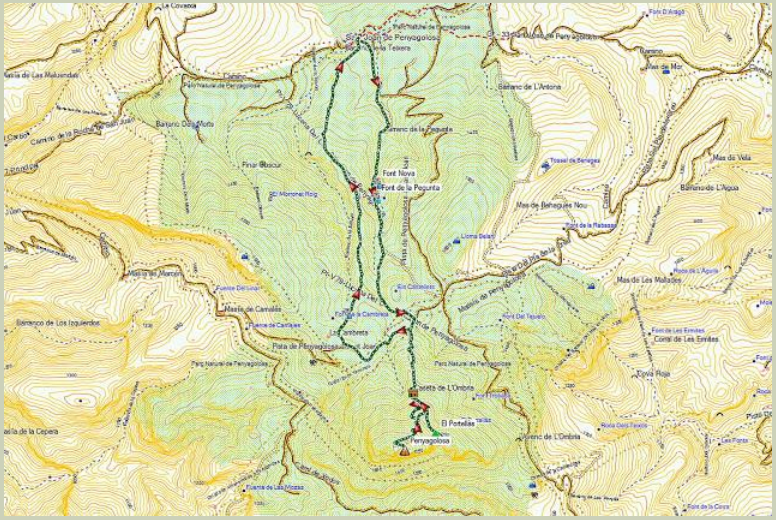
- Fauna: golden eagle, bonelli's eagle, wild goats.



- There is a Natural Park called "Parc Natural de Penyagolosa".

NATURAL PARK

- In 2006 the Nature Reserve was declared a Natural Park.
- Area: 1094 ha
- Highest peak: 1814 m
- It combines continental and Mediterranian climates.
- There isn't any specific legislation, but it's necessary to obtain permissions for hunting, cutting trees, etc.



ASSOCIATIONS

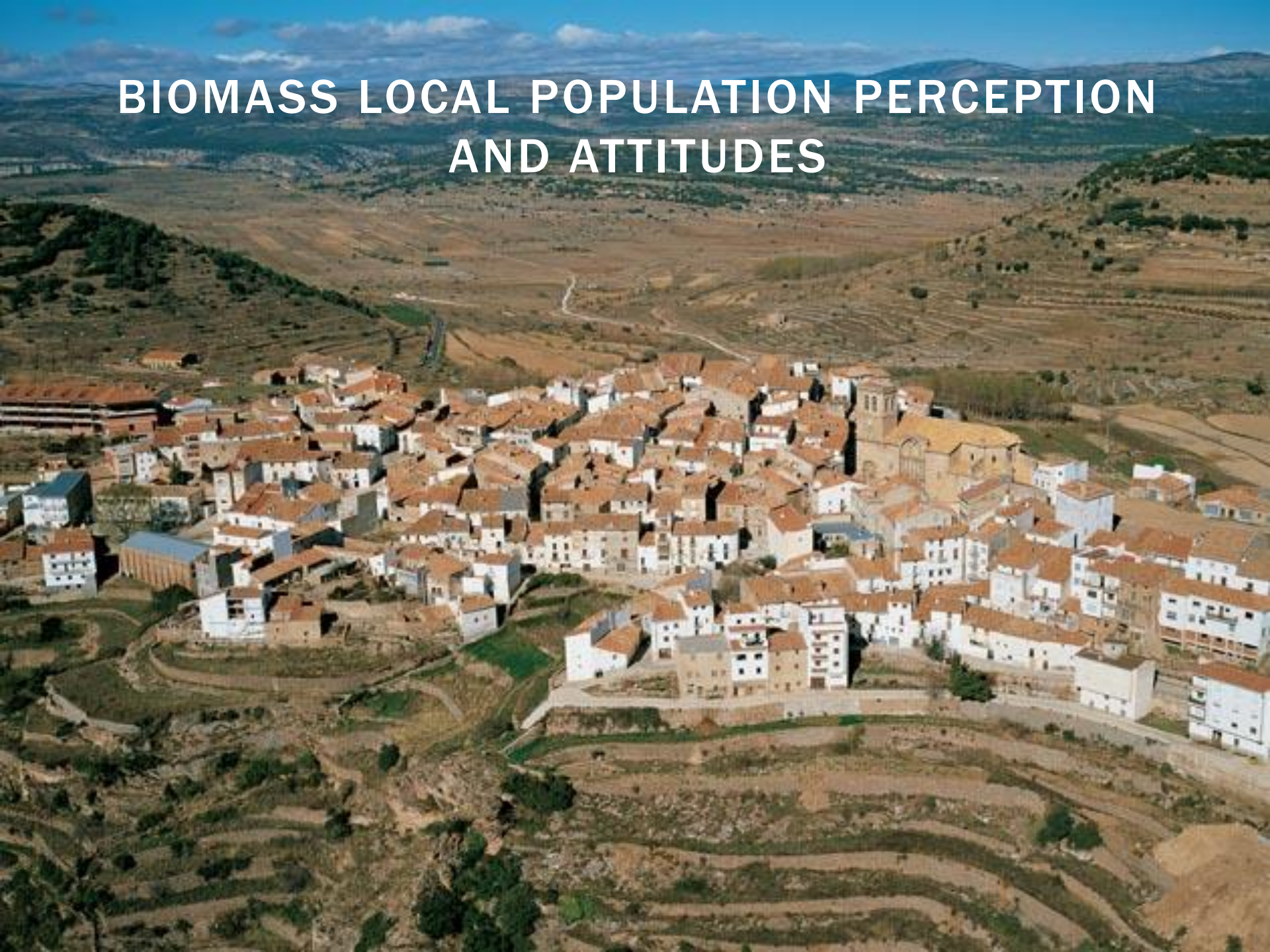
- MAESTRUF
- Associació Cultural “Grèvol” (**DRY STONE**)
- BioPenyagolosa
- Societat de Caçadors “La Jabalina” (**HUNTERS**)
- Club de Muntanya Vistabella (**MOUNTAIN CLUB**)

bio Penyagolosa
Qualitat autèntica

BIOMASS PLAN

2. PERCEPTION AND ATTITUDES TOWARDS BIOMASS

BIOMASS LOCAL POPULATION PERCEPTION AND ATTITUDES



BIOMASS LOCAL POPULATION PERCEPTION AND ATTITUDES

Steps:

- Tool and Technique
- Method
- Sample
- Results

TOOL AND TECHNIQUE

- We tried, as much as possible, to do a professional survey, which can describe the perception of the people from Vistabella regarding biomass energy.

- The structure of our questioneer:

Content	Number of questions
Demographics	4
Knowledges about biomass	4
Atttitude towards biomass	5

PICTURES TAKEN DURING THE INTERVIEWS

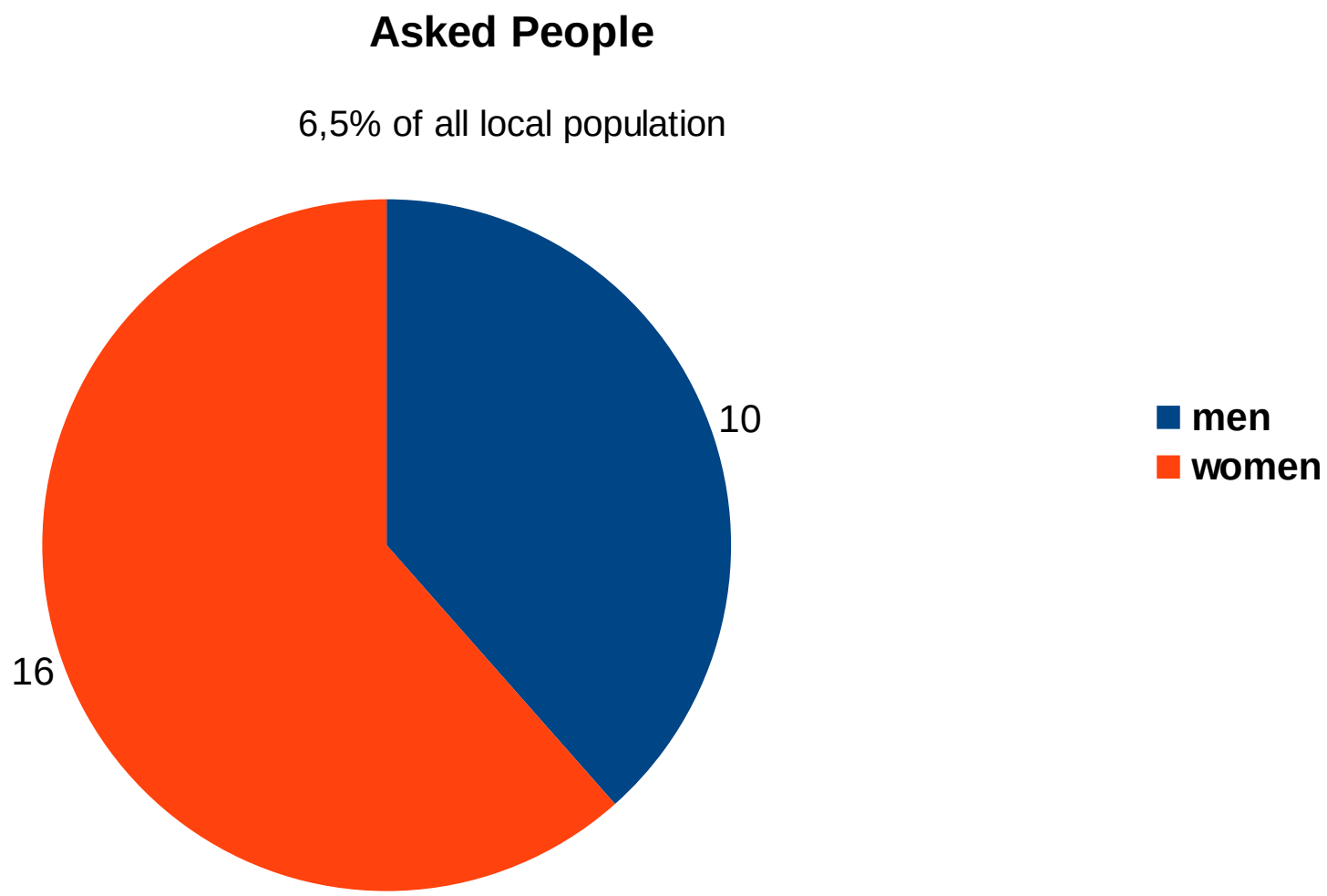
METHOD

- Before we arrived here, we had a training in Castellon, where we discussed with teachers and other persons who are involved in the renewable energy field about the advantages and disadvantages of using biomass as a substitute for the traditional sources of energy.
- Our first version of this survey had 17 questions. Our group of 5 students has discussed about how can we include in one question many information that we wanted to extract from the people which we are talking to. The final version had 13 questions, which we consider are relevant for our study.

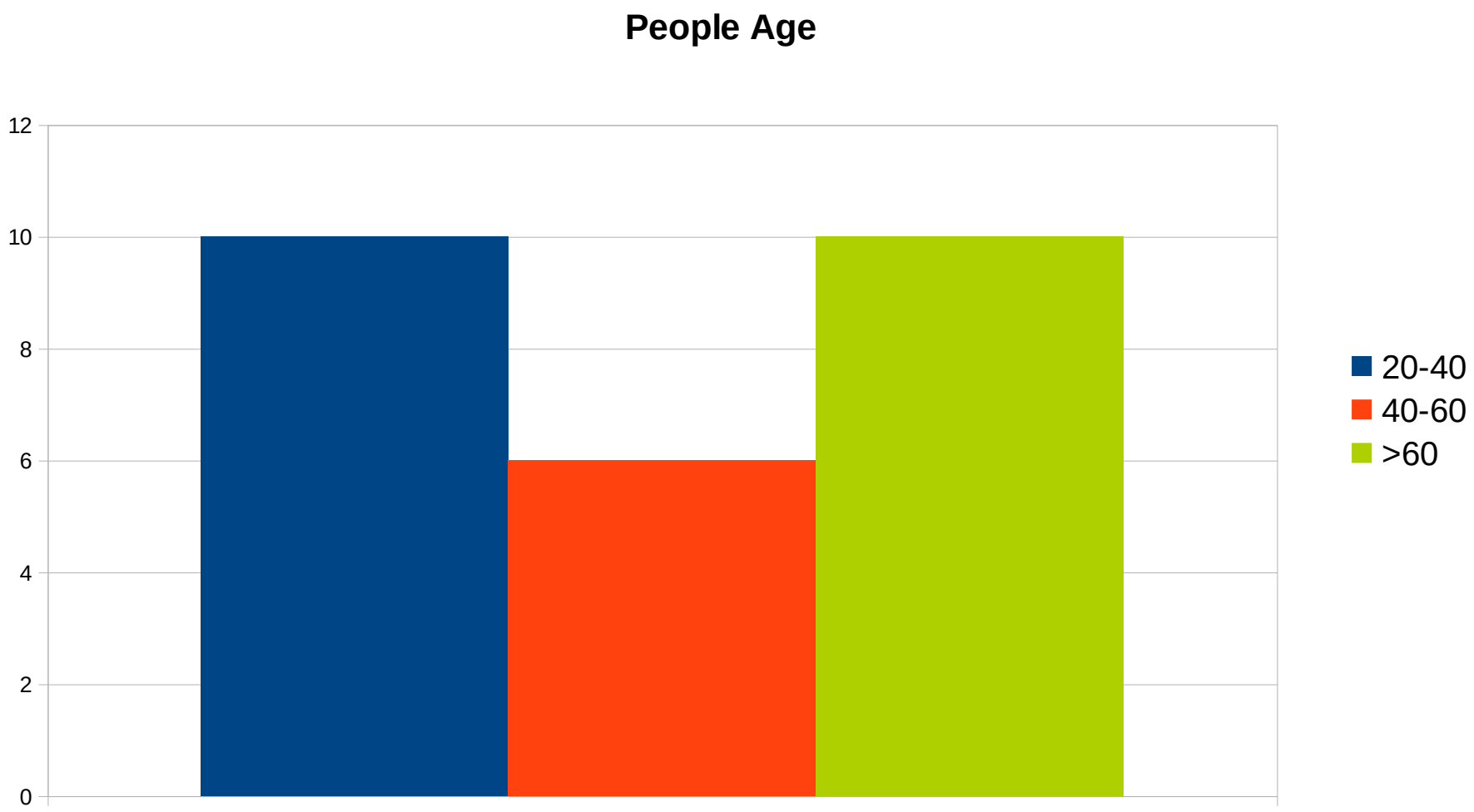
SAMPLE

- Number of people that we have been talking to - 26
- Among them, 16 was women, and 10 men.
- 17 live in Vistabella, and 9 are temporary residents.
- Regarding the age, we divided the people in 3 categories: 20-40, 40-60 and above 60.
- They are working in a diversity of branches: constructions, education, administration, agriculture, tourism, forest industry as well as food industry.

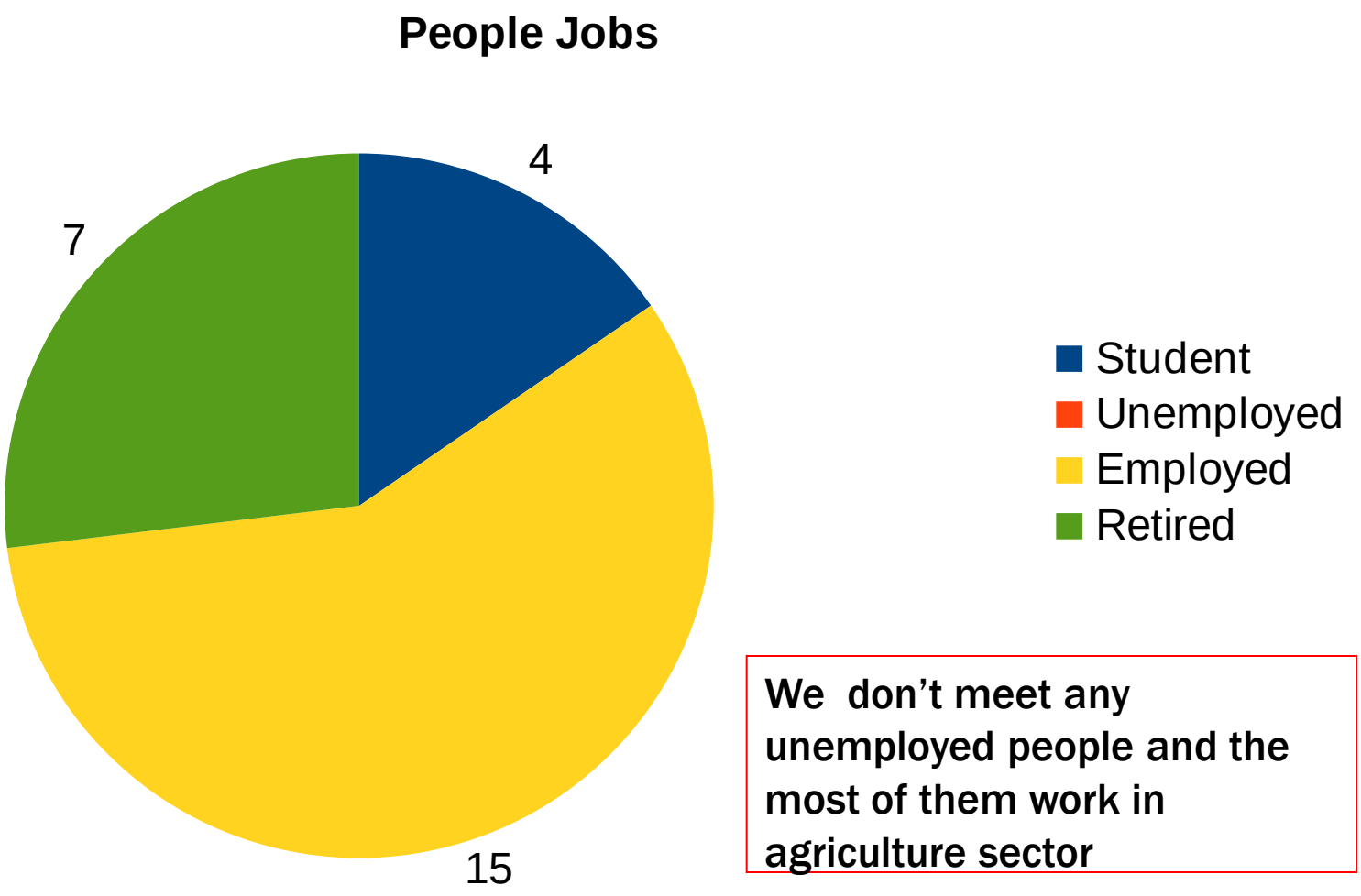
SAMPLE



SAMPLE



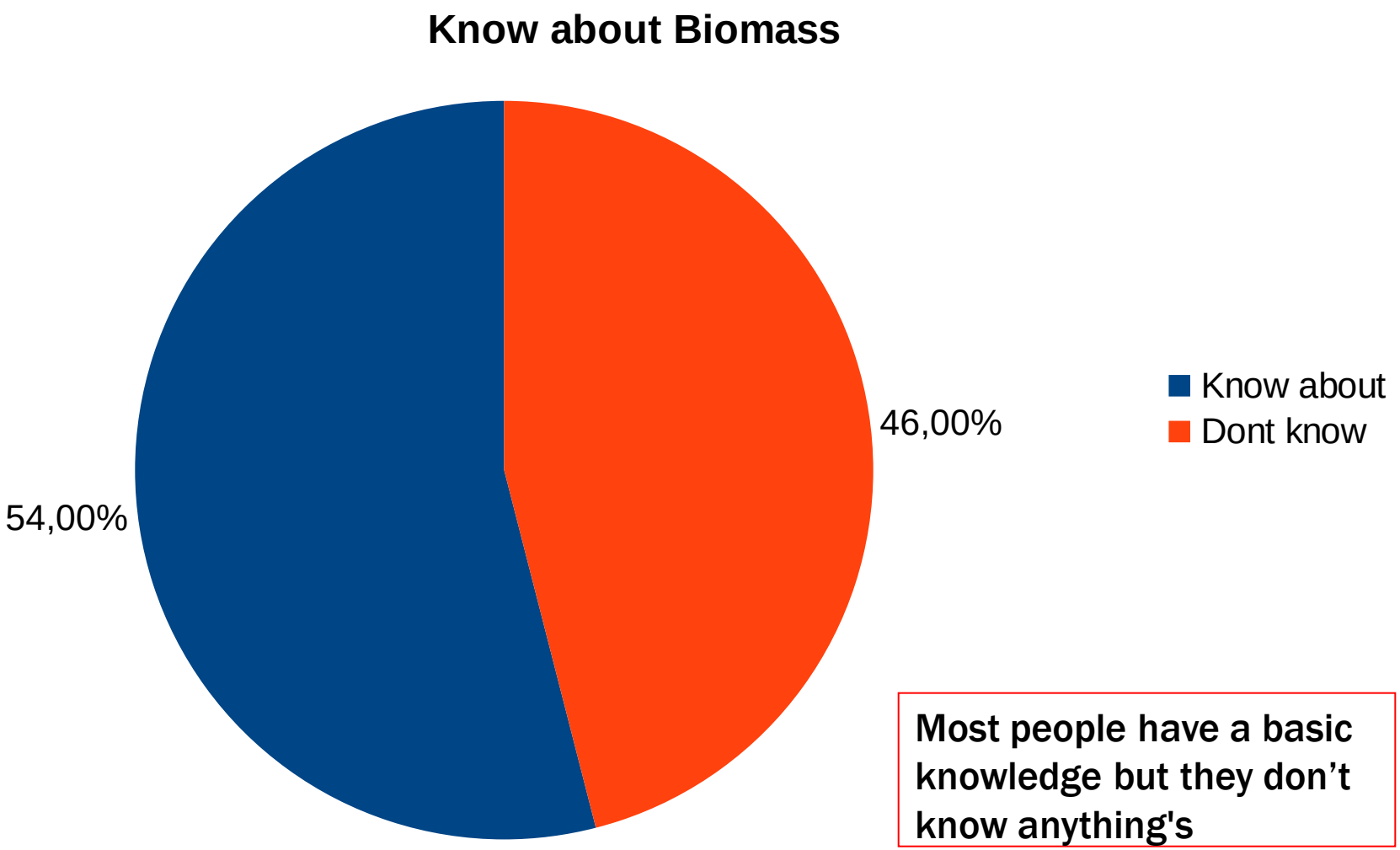
SAMPLE



We don't meet any unemployed people and the most of them work in agriculture sector

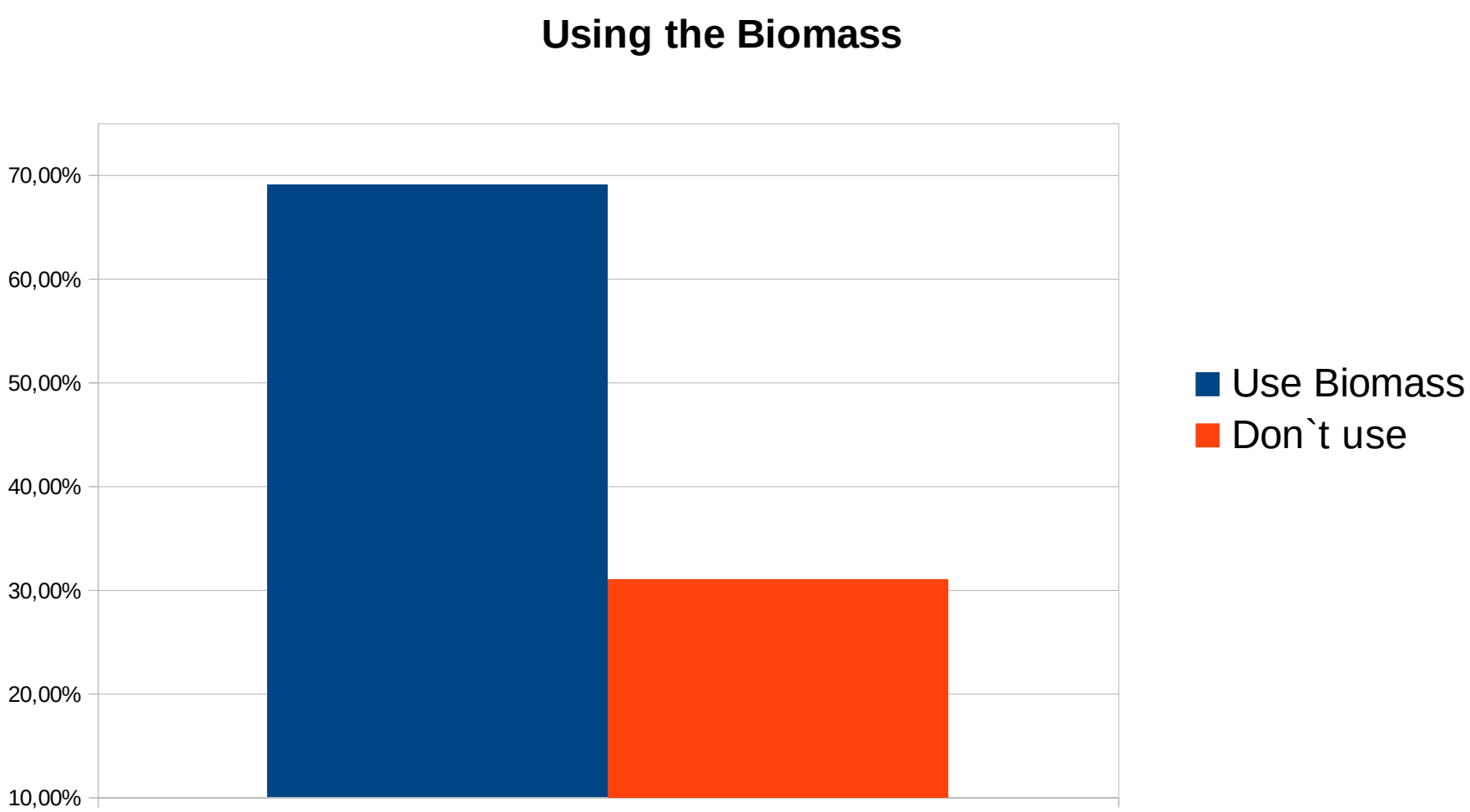
RESULTS

RESULTS

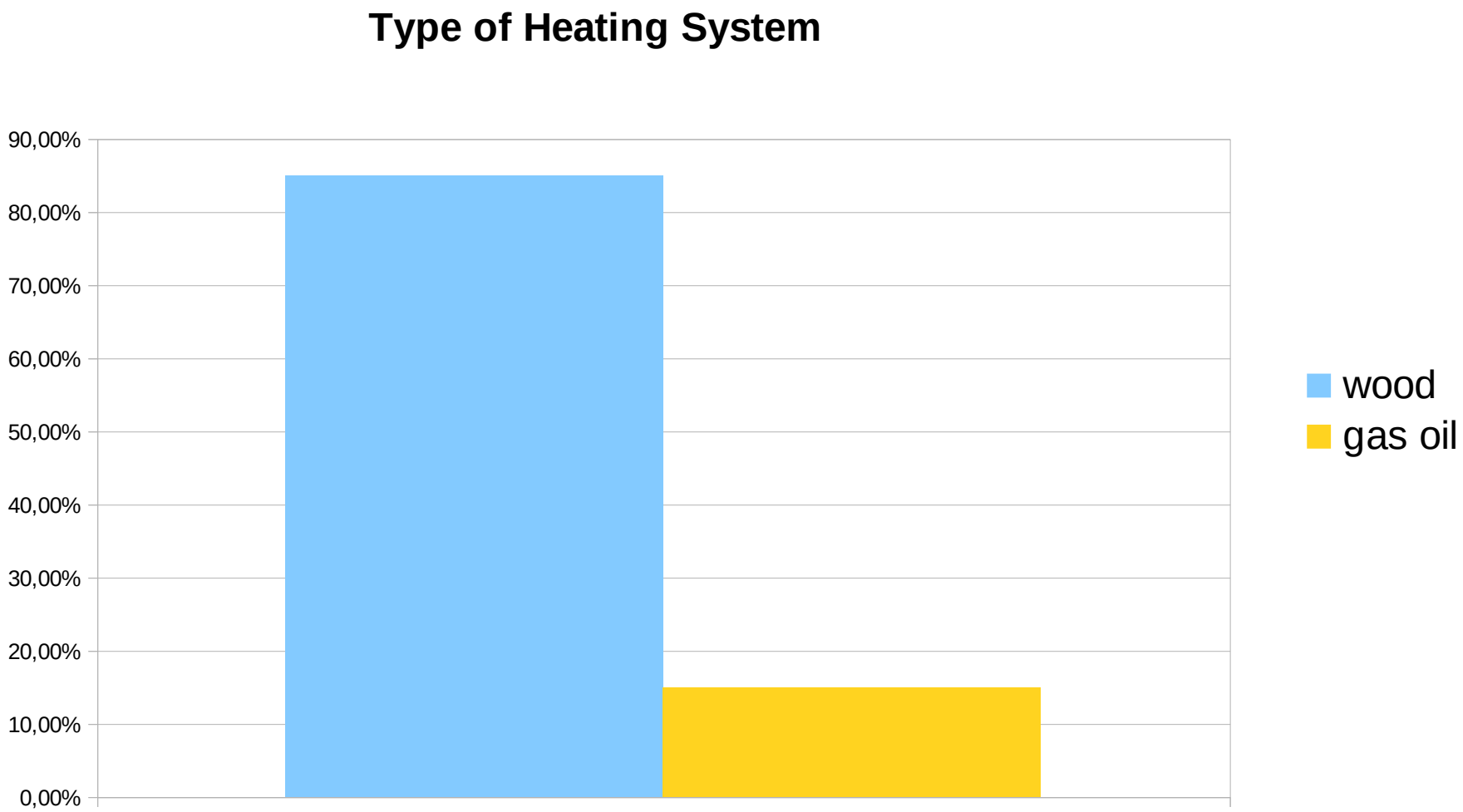


Most people have a basic knowledge but they don’t know anything's

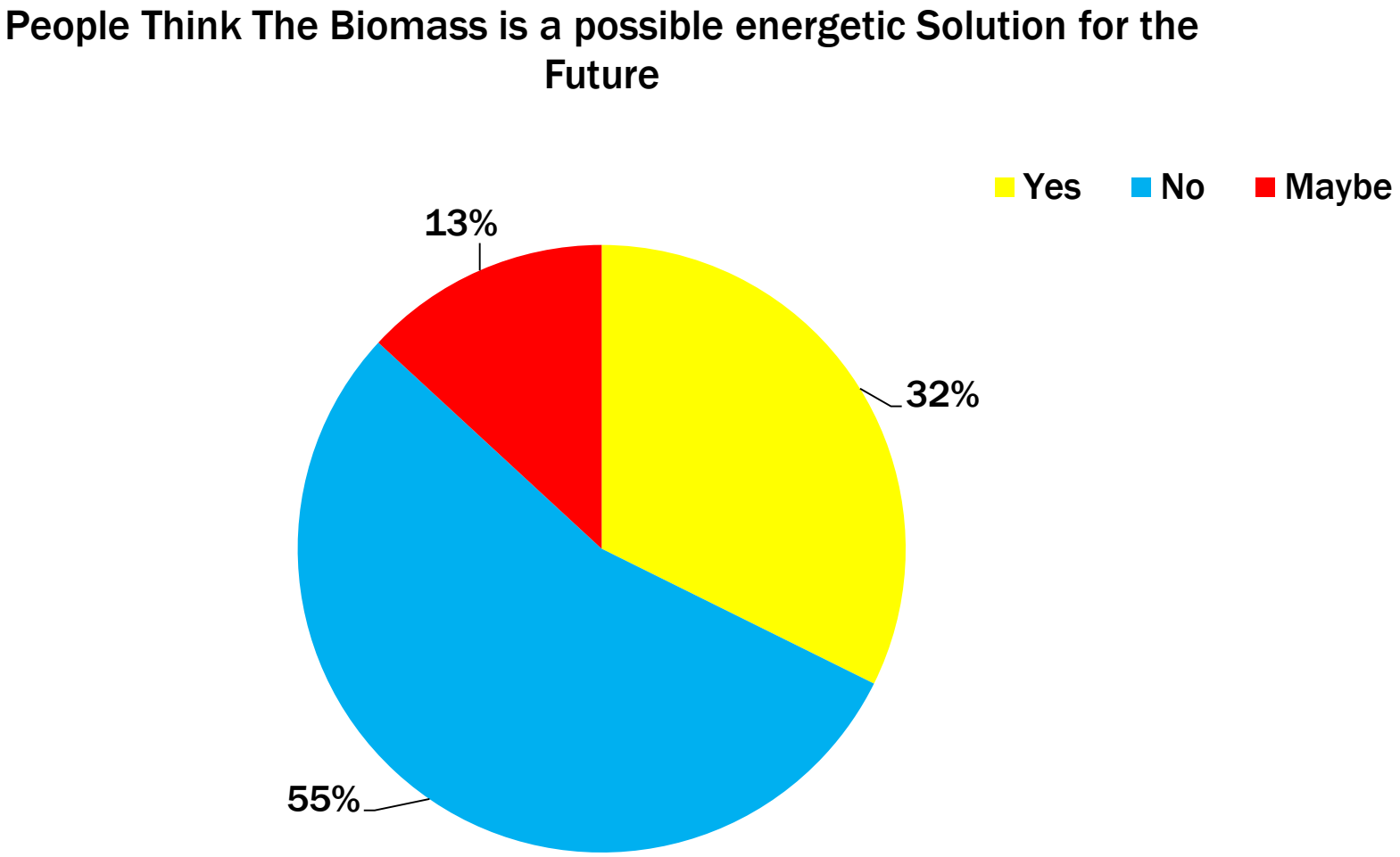
RESULTS


Using the Biomass
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
Use Biomass
Don`t use

RESULTS


Type of Heating System
90,00%
80,00%
70,00%
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
wood
gas oil

RESULTS


People Think The Biomass is a possible energetic Solution for the Future
Yes
No
Maybe
13%
32%
55%

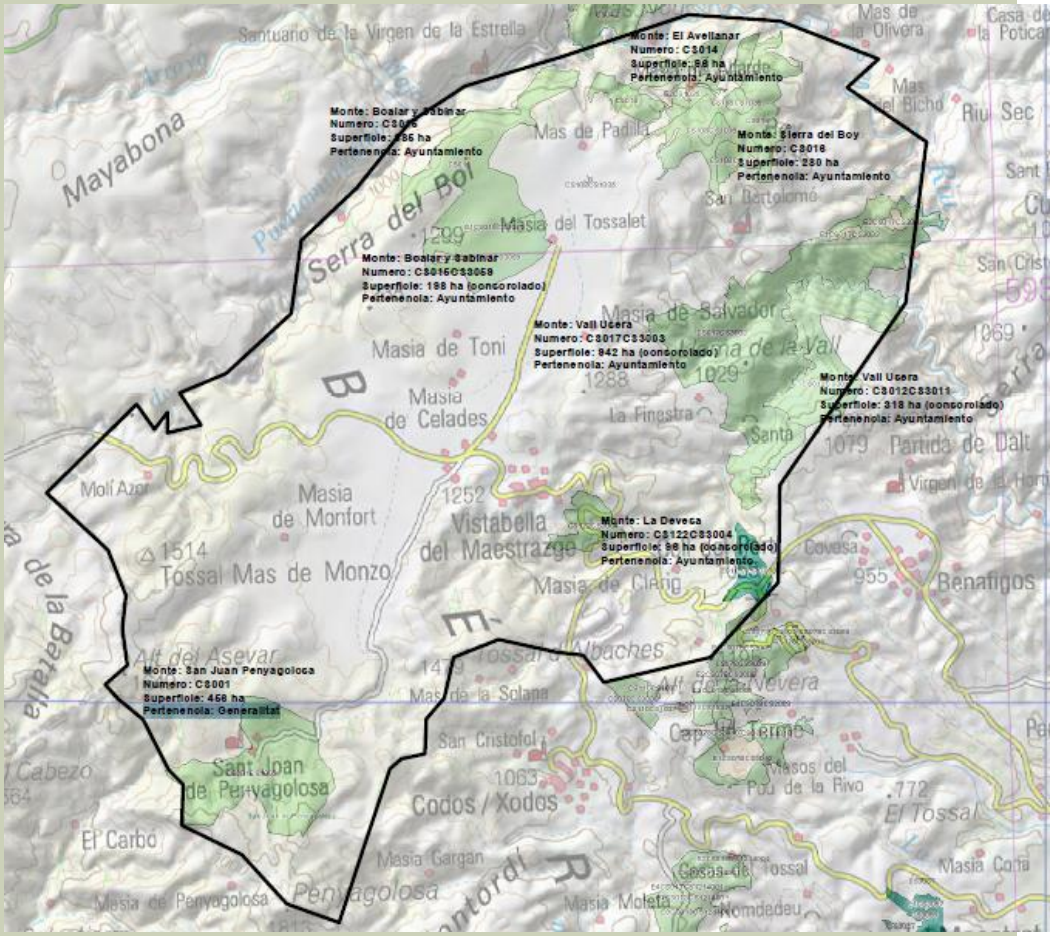
3. BIOMASS SUPLY

BIOMASS TYPES IN VISTABELLA

- Forest biomass
- Agricultural biomass

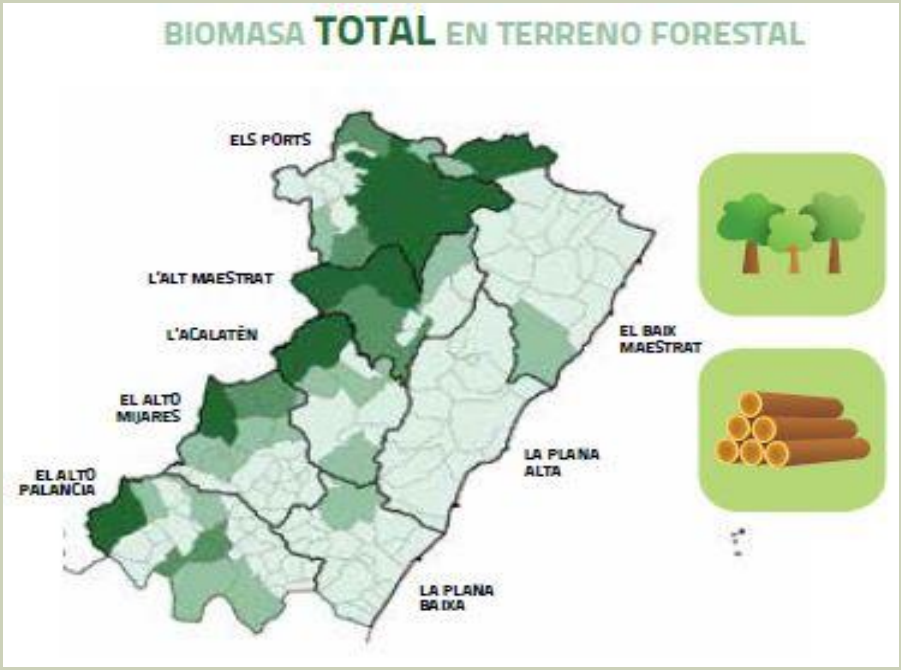
FOREST BIOMASS

- In Vistabella the major part of the surface is covered by forest. Of this forest around 20 % is public and the rest private.
- The public surface is 2547 ha



FOREST BIOMASS

- 43% of biomass in Valencian community is available. Cleaning the forest, whitout any enviromental damage, in Vistabella is 5000 Tn per year.



Comarca	Biomasa residual (t/año)	Biomasa de fustes (t/año)	Biomasa forestal total (t/año)	Biomasa agrícola (t/año)	Energía equivalente total (tep/año)
L'Alcalatén	6.411	7.718	14.129	10.689	10.800

FOREST BIOMASS

- The main type of the trees are pines.
  - Red pine (*Pinus sylvestris*)
  - White pine (*Pinus halepensis*)
  - Black pine (*Pinus nigra*)



FOREST BIOMASS

- To work in the forest to extract and collect the biomass and for the transport the slope need to be less than 30% to be able to use the machines.

- Therefore it is available to extract the biomass in some parts of the forest.

FOREST BIOMASS

FOREST BIOMASS

FOREST BIOMASS

- The forest included in the natural park requires a special permissions of the regional government, to extract the biomass as well as to use machines inside it.

- In the natural park depending of the permission it is allowed to use machines or animals for the transport.

FOREST BIOMASS

BIOMASS MANUFACTURE

- Wood chips
  - Wood chip G30
  - Wood chip G50

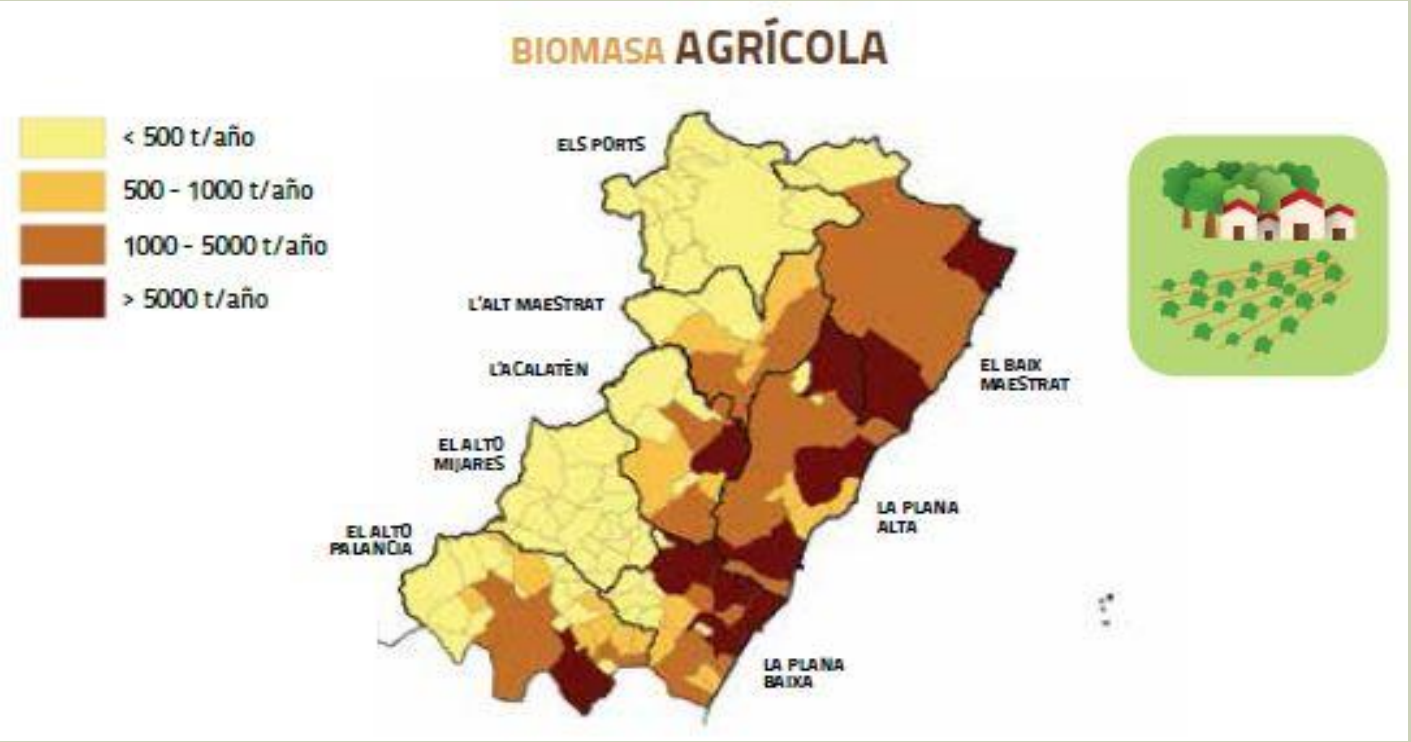
BIOMASS MANUFACTURE

- Pellet

https://www.youtube.com/watch?v=g37Wba2U49I

AGRICULTURAL BIOMASS

- Another possibility of biomass in Vistabella is the agricultural waste. However the people use agriculture waste to fertilize their own fields and feed the livestock.



URBAN WASTE

- Another possibility is the solid residues from water depuration, that can be use for biomass. But we can reject because another uses of this kind of waste wasn't well welcomed by the population

CONCLUSION

- The exploitation of biomass is a resource in the Vistabella's forest with a big energetic potential.

- To update permissions and laws good promote the biomass exploitation

4. BIOMASS DEMAND

ITforest Erasmus Intensive Programme

BIOMASS DEMAND

Vistabella

GREEN POWER

ALBA MARTÍNEZ JORDÁN

GABRIELLA NAGY

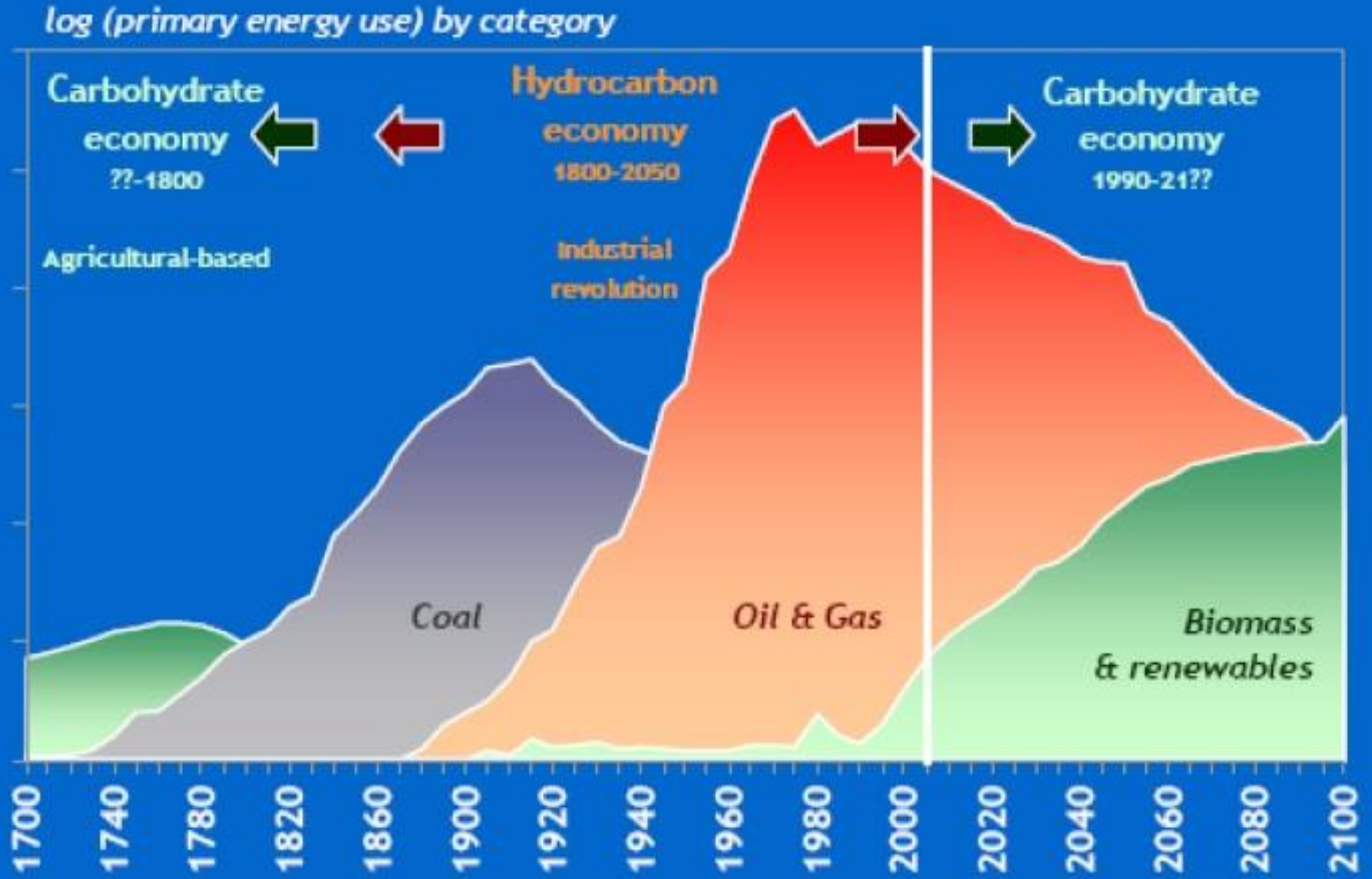
FRANCISCO VIDAN FALOMIR

ADRIAN-VALENTIN BARBUTA

GERGELY ASZTALOS

2014.07.24.

Looking back and forward...



BIOCOMBUSTIBLES SÒLIDS

Wood chips

Pellets

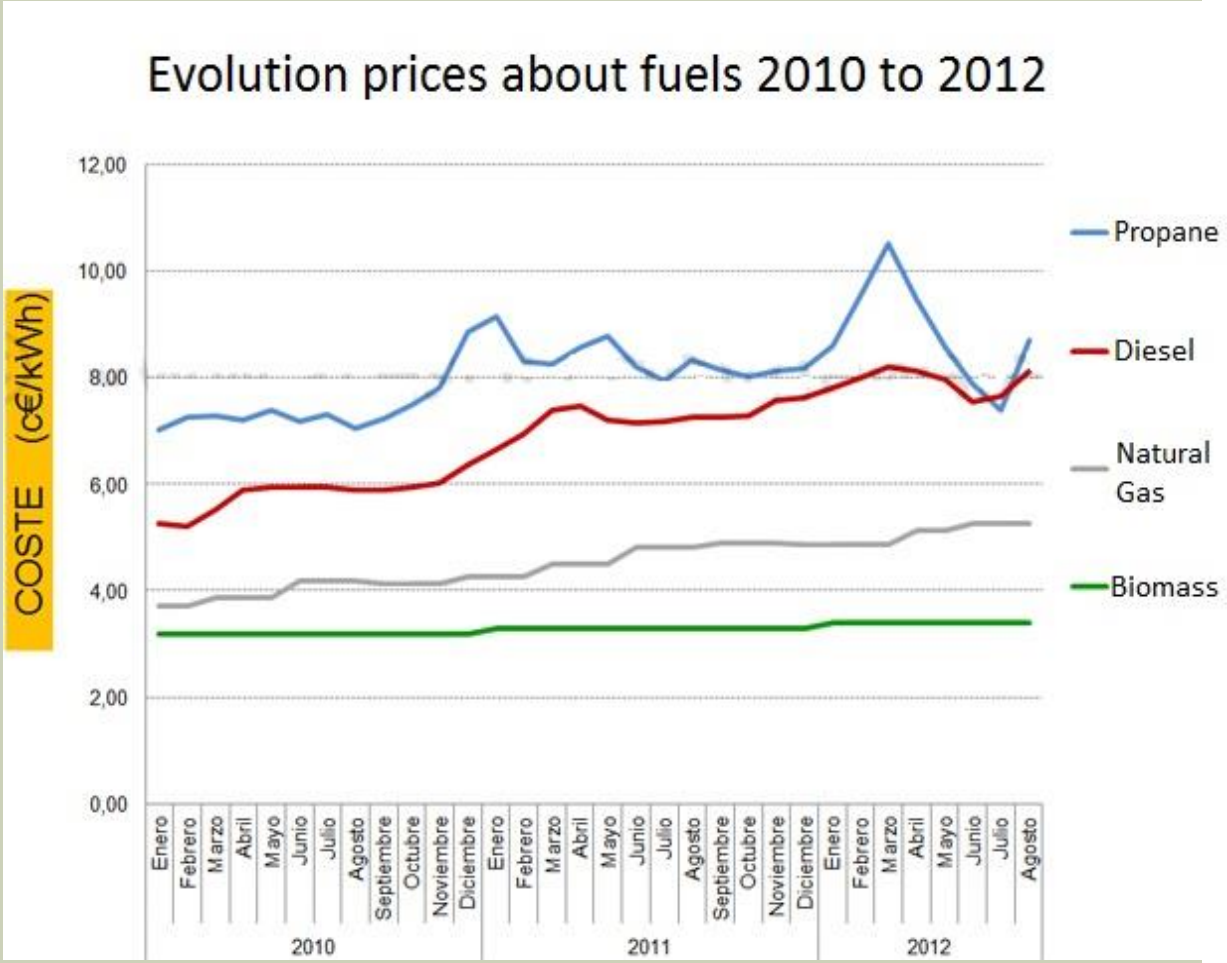
Wood

Almond Shell

Olive's stone

DIFFERENCES BETWEEN PRICES

Combustible	Cost c€/kWh
Gasoil	9,25
Gas natural	6,93
Electricity	14,58
Biomass:	
Pellets	3,38
Almond shell	2,22
Woodchips	1,39
Olive stone	2,78



POWER

COMBUSTIBLE	PCI
Gasoil	10,4 kWh/litres
Almond shell	4,6 kWh/kg
Wood chips	3,1 kWh/kg
Pellets	5,0 kWh/kg
Olive's stone	5,2 kWh/kg

1 liter Diesel ≈ 2 kg Pellets
1 liter Diesel ≈ 3 kg Wood chips

PUBLIC BUILDINGS

Buildings	Electricity (€/year)	Gasoil (€/year)	Wood chips (€/year)	Pellets (€/year)	Energy (kWh/year)
Town hall	2.000	-	480	1150	3.400
Home for the eldery	700	-	180	470	1.400
School	-	3.900	581	1.419	41.920
Medical centre	-	7.043	1.054	2.570	76.144

COMPARISON FOR 1000 L GASOIL

	Energy (kWh)	m^3	Price (€)
Gasoil	10.400	1	962
Pellets	10.400	3,2	351,52
Wood chips	10.400	16,7	144,56

Gasoil boiler

Pellets boiler

Wood chips boiler

PRIVATE BUILDINGS

- Domestic use:
  - 50-60 gasoil boilers
  - 1000-1200 litres/year
- Business use:
  - 2000-3000 litres/year

	Gasoil	Wood chips	Pellets
Cost (c€/kWh)	9,25	1,39	3,38
Bill (1000 litres)	962 €	144,56 €	351,52 €

WOOD VS PROCESS BIOMASS

Using process biomass:

Advantages	Disadvantages
Automatically	Need to buy process biomass
Programable	Expensive system
Comfortable	
Emission, less gases	

FINANCING

- Program from renewable energy and biofuel from valencian institute from business competitiveness:
- Premiums for the enhancement from the forest biomass in forest areas from regional government as infrastructures, territory and environment.
- Biomass
- Found Jessica Fidae
- Help program for energetic rehabilitation for existing buildings in the residential sector (PAREER)

FINANCING FROM EUROPE UNION

- LIFE program (2014-2020):
  - Endowment: 3.456,7 million €
- Territorial cooperation program:
  - Total endowment : 10.228,81 millions €
    - Interreg europe
    - Med
    - Sudoe
- Rural development program:
  - Endowment: (year 2007-2013) 486.393.024 €
- Marco H2020 I+D+I
  - Endowment: 77.000 million €

5. BIOMASS TECHNICAL ALTERNATIVES

INTRODUCTION

What I am going to talk about:

- Biomass technical alternatives for public buildings and domestic houses heating and hot water
- Sustainable energy production
- Safe money for local people
- Environmental friendly solutions

PUBLIC BUILDINGS

Building	Heating system	Alternatives
City Hall (100m^2)	Electricity	Wood chips installation
School (340m^2)	Diesel boiler	Biomass boiler
Library	Electricity	Biomass stove
Old Prison	Electricity	Biomass stove
Culture house	Electricity	Wood chips installation with air conduction

PUBLIC BUILDINGS

City Hall

Electricity heating system

Actual cost: 2.000€/year

School

Diesel heating system

Actual cost: 3.900€/year

PUBLIC BUILDINGS (CITY HALL)

Boiler characteristics (20.500€)

Boiler power: 25KW
Automatic provide of biomass

Radiator characteristics and installation (6.500€)

Maximum pressure: 6bar
Power: 119,8 W

Total cost: 27.000 €

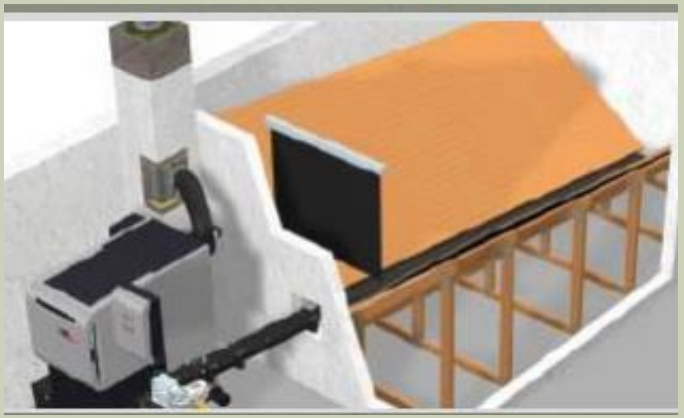
PUBLIC BUILDINGS (SCHOOL)

Boiler characteristics (8.000€)

Boiler power: 45KW
Automatic provide of biomass

Inertial tank characteristics (1.300 €)

1500 litters buffer tank
Thermal losses <5%



Fuel storage characteristics (2.500€)

Volume: 5 m^3
3 filling in a year

Total cost: 11.800€

DOMESTIC HEATING

- We recommend use biomass boilers and specific pellets boilers because they produce less asses than other biomass options.
- Other reason is that the biomass boilers or heating systems is more cheaper than other kind of fossil energy.

DOMESTIC HEATING

Biomass boiler characteristic

Wood chips
100 m^2
Annual biomass cost: 750€
Total cost with taxes: 26.000 €

Biomass stove

Pellets
100 m^2
Annual biomass cost: 100€
Total cost with taxes: 5.000€

THE IMPORTANCE OF CLEANING FORESTS

CORTES DE PALLARS AFTER THE FIRE

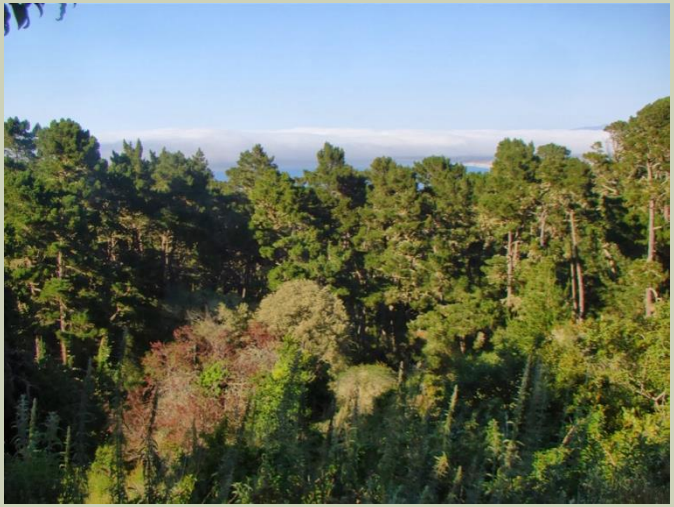
BIOMASS FACTORY

- CASE OF SERRA

- Population: 3313 INHABITANTS
- Municipal area: 57,3 Km^2
- 80% of the area is forest

BIOMASS FACTORY

- Domestic and forest wastes



After cleaning the waste from the public and private gardens the municipality collected 1200 tons of organic waste.

Starting use of forest material for biomass production

Price for the treatment: 60.000 €

BIOMASS FACTORY

- Conversion of the organic waste to energy

The collected organic waste

Wood chips machinery, INVESTMENT: 16000€

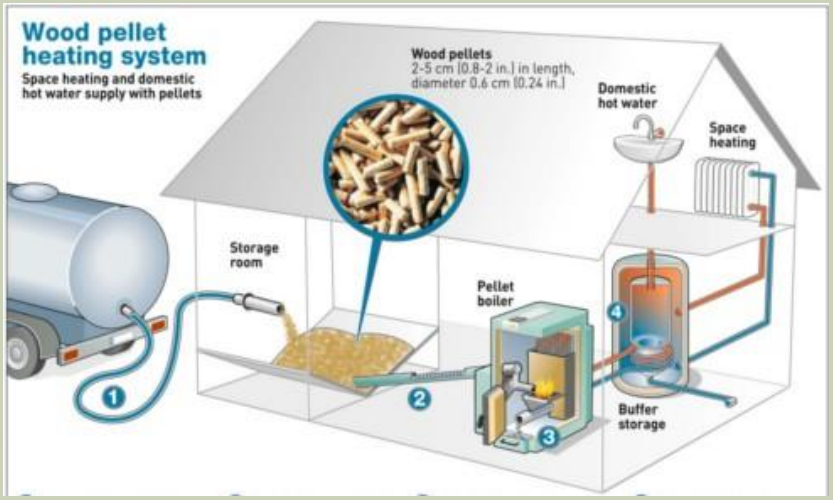
Wood chips

Pellets machinery, INVESTMENT: 8000€

HEATING SYSTEM FOR TOWN HALL

Pellets storage

Boiler (5.000€)



TOTAL COST: 25.000€

SAVING MONEY WITH BIOMASS

- Results of the global project

Balance global proyecto	
Inversión total proyecto (planta tratamiento biomasa, calderas e in	80.000,00 €
Perido de amortización total	5 años
Potencia Total Instalada Biomasa (kW)	100
Superficie a calefactar	785 m^2
Combustible	Pélet
Toneladas anuales de Residuo Verde tratado	515
Reducción del coste de Gestión del Residuo Verde	24.181,50 €
Ahorro anual en energía eléctrica	15.700,00 €
Kg de pélet empleado como combustible	22.000
Coste de fabricación combustible	2.640,00 €
Total ahorro	37.241,50 €

Create 3 new jobs for the town hall

75% of investment finance by regional government

Reduce the risk of forest fire

Total saving of the project 37.000€/year

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS FOR THE LOCAL CONTEXT

- The improvement of the conditions of the road would facilite the transport of biomass.
- The ellaboration of a biomass action plan with the participation of the inhabitants of Vistabella could contribute to the socio economic development.
- The presence of local associations help to develop the village.

CONCLUSIONS FOR THE LOCAL PERCEPTIONS

- We are thankful for the citizens of Vistabella that have colaborated with us in the research
- Local people are open to anything new, that can improve their lifestyle
- It could be implemented an information system to keep the citizens up to date about the new technologies
- Due to the demographical characteristics of Vistabella is important to promote local jobs to facilitate that the number of young people increase
- The people think the Cooperative and the Town Hall can be active factors in the promotion for future projects

CONCLUSIONS FOR THE SUPPLY

- The exploitation of biomass is a resource in the Vistabella's forest with a big energetic potential.
- For a biomass exploitation should be more facilities to work in the forest, from the regulations or laws.

CONCLUSIONS FOR THE BIOMASS DEMAND

Advantages	Disadvantages
The pellets or the wood chips is cheaper	The biomass boilers are more expensive than diesel boilers
Moreover there are lot of forests	The biomass boilers are bigger.

First start to accommodate the public building with biomas and after in a few years continue with the private houses.

CONCLUSIONS FOR THE TECHNOLOGICAL ALTERNATIVES

Conclusions

- The technology for biomass are more develop now that some years ago
- The biomass is environmental friendly than fossils energy, pellets and wood chips is more comfortable than wood and is more cheaper than use fossils energies
- Biomass can be connect with generation of new opportunities for rural areas

Recommendations

- For a sustainable development biomass can be an alternative for social, economic and environmental improvement

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VA MULTUMIM!

KÖSZÖNÖM SZÉPEN!

MOLTES GRÀCIES!

THANK YOU VERY MUCH!