Ingegneria Senza Frontiere - Milano

GREEN ENERGY PARK IN ALBANIA

The project “Albania Tomorrow”...

Cooperation program between Italy and Albania for the recovery of economic and social development key sectors

Financed by: Cariplo Foundation
Total: € 3.546.753,00
Duration: 3 years
Lead partner: CeLIM

The project aim to promote, in both territories Albanian and Italian, the concept of **cooperation in development** and the important **role of the diaspora in the socio-economic development of the country**, concentrating the efforts and the interventions in four strategic sectors:

- **social services and services for jobseekers,**
- **Renewable energies and new technologies,**
- **Agriculture,**
- **Tourism.**

Green Energy Park Feasibility Study

Albanian Identity Card

Capital Tirana

Government Parliamentary Republic

Currency Albanian Lek

Language Albanian

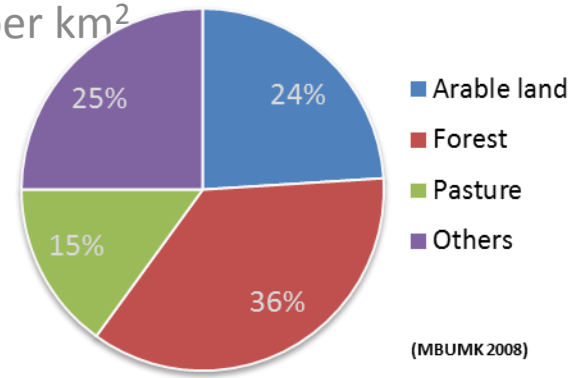
Religion 39% Muslim, 35% Christian

Population 3,162,000 inhabitants. (2010)

Total area of 28748 km^2

Population density 125 per km^2

Land use



Natural Resources Oil, natural gas, coal, bauxite, chromite, copper, nickel, salt, timber, hydro

Environmental problems Deforestation

Varie fonti

Socio-Economic Informations

- Albania a state historically closed and centralized, is making the difficult transition to an open and modern economy.
- The macroeconomic growth has been on average by 6% between 2004-08, but fell to around 3% in 2009-11.
- The government has taken measures to curb violent crime, and recently adopted a fiscal reform package aimed at reducing the large gray economy and attracting foreign investment.
- Remittances, a major catalyst for economic growth fell from 12-15% of GDP before the financial crisis of 2008 to 8% of GDP in 2010, mostly from Albanians residing in Greece and Italy.
- The agricultural sector accounts for nearly half of employment but only about one-fifth of GDP, is limited primarily to activities of small and subsistence farming because of lack of modern equipment and clear property rights, and the great fragmentation of the ground.
- the population of Albania is growing and is divided approximately in the middle between urban and rural
- The lack of energy due to a dependence on hydropower - 98% of the electric power produced in Albania - and antiquated and inadequate infrastructure contribute to a poor business environment and lack of success in attracting new foreign investment needed to expand the export base of the country.

CIA world facts book 2012

Socio-Economic Informations

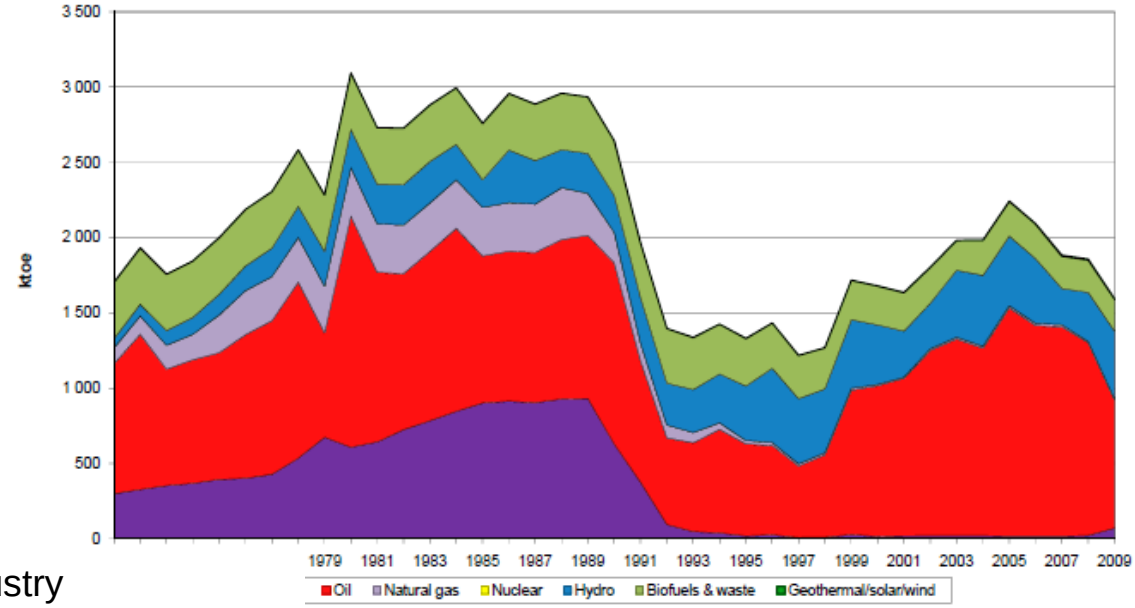
		Albania			Country comparison
		2009	2010	**2011**	
GDP (PPP) billions $ (2011)		23,9	24,7	**25,2**	117
GDP grow %		3,3	3,5	**2,0**	
GDP per capita (PPP) $		7500	7700	**7800**	128
GDP (labor force) per sector %	Agricolture			**20,7 (47,8)**	
	Industry			**19,7 (23,0)**	
	Services			**59,6 (29,2)**	
unemployement rate %			13,7	13,3	
population below poverty line %		12,5			
GINI index		34,5			88
Investment as GDP %				29,9	20
pupplic debit			57,1	59,7	42
inflaction rate %			3,6	3,5	83

CIA world facts book 2012

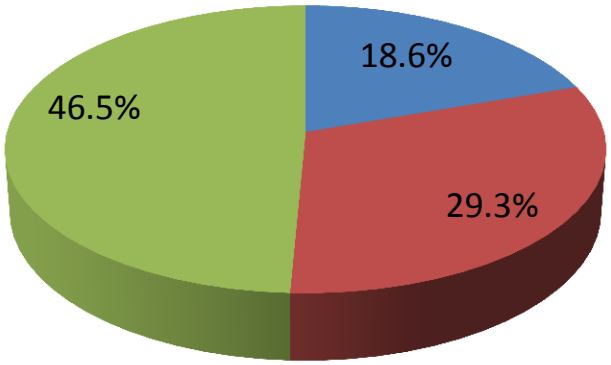
Energy Situation

Total Primary Energy Supply:

- Disappearance coal and gas since the early 90s
- To 2009 dominates the oil (53%) and hydropower (28%)



TFC by sector



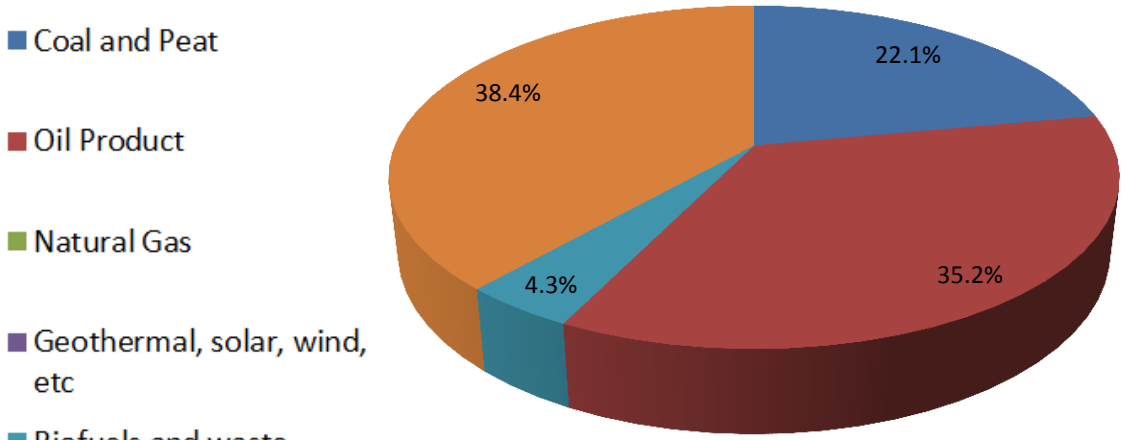
- Industry
- Trasport
- Other (commercial, residential, Services, Agriculture

Total Final Consumption:

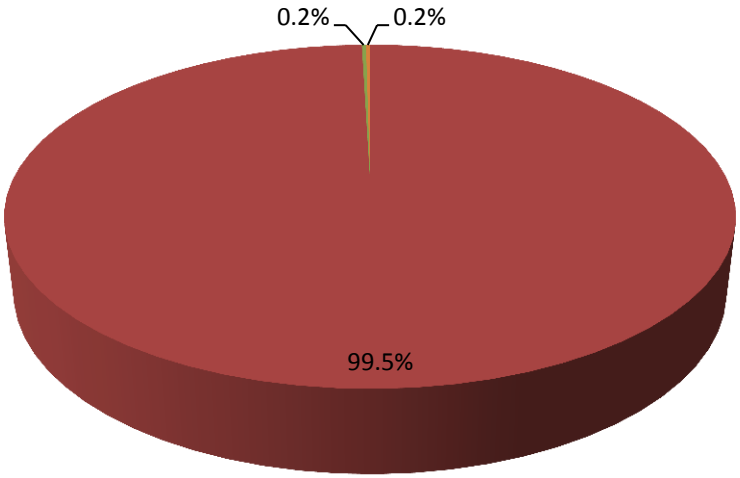
- On final consumption more than 80% of the sum of petroleum products and electricity
- Sector that consumes more energy is the residential / commercial followed by transport

- Sui consumi finali del settore dei trasporti interamente coperto dai prodotti del petrolio
- Dei consumi residenziali largo uso dell'elettricità e della biomassa

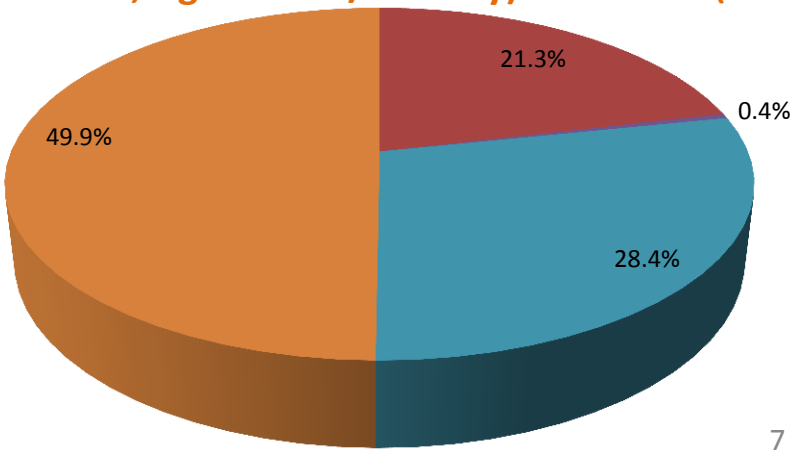
TFC industry 281 ktoe (2009)



TFC transport 444 ktoe (2009)



TFC Other (Residential,Commercial&Pubblic services, Agricolture/forestry) 704 ktoe (2009)

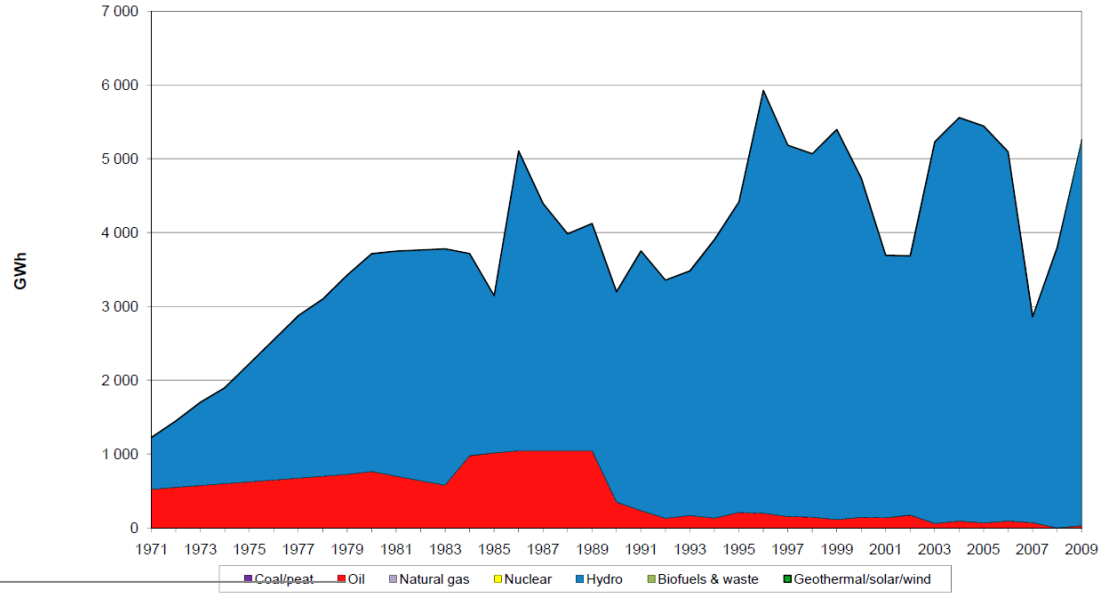


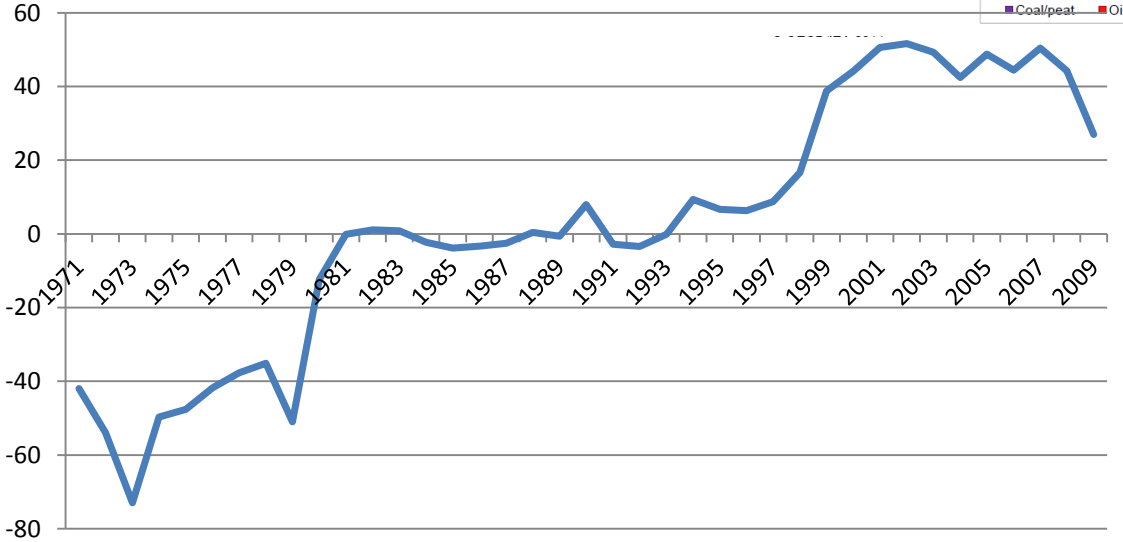
IEA statistics

Energy Situation

Electricity Production:

- Electricity production is 98% from hydro.
- No energy mix: instability and large annual changes





Energy Imports:

- Decreased early 90s domestic production of energy
- Start of imports in the same period

Energy Situation

- inadequate transmission network
- numerous hours of blackout, especially in rural areas

- government's desire to increase production to move towards energy self-sufficiency
- willingness to align with EU policies

Development of renewable energies

RES Potential

Hydro

- Teoretical potential: 4500 MW
- Actual Production: 1450 MW (6 big plant, and 40 SHPP)
- Feed-in tariff for new SHPP

Solar

- Good solar radiation (4,1 kW/m^2/d) and yearly sun hours (2200 h/y)
- Photovoltaic: actually not developed due to its costs and the lack of incentives
- Solar thermal: rapid grow with international projects

Biomass

- Use of traditional biomass combustion in the residential sector with low efficiency (especially in rural areas)
- No industrial production of woody biomass energy, No biogas plant, No biofuel production
- Great vocation and potential for sustanable biomass production (Short Rotation Forestry…)

Green Energy Park

Objectives

- disseminating and promoting the use of renewable energy sources in agriculture, agro-food and agro-touristic sectors n Northern Albania.
- improving the efficiency of agricultural activities through the innovative use of renewable energy, ensuring energy independence of companies and their eco-sustainability.

Activities

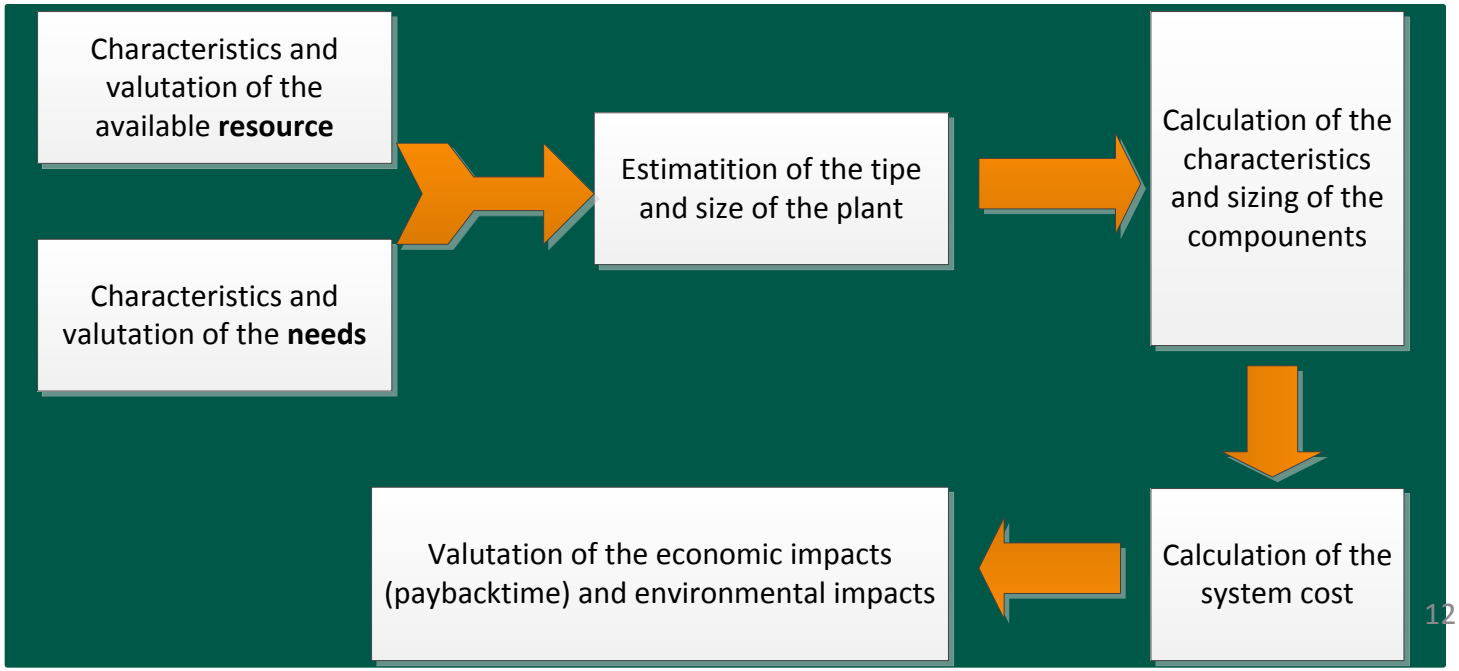
- **Training**: strengthening the Professional Training Centre of Shkodra.
- **Information**: creating an help desk dedicated to renewable energies that represents a meeting point between supply, represented by private companies, research centers, universities ... of the energy sector, and demand, farmers and ranchers, enterprises, local communities..
- **Promotion**: demonstrative pilot plant of appropriate technologies based on renewable energy sources for small and medium agriculture and tourism activities.

Feasibility Study: scientific validation of the approach and of the used technologies; creation of an exportable model

Green Energy Park

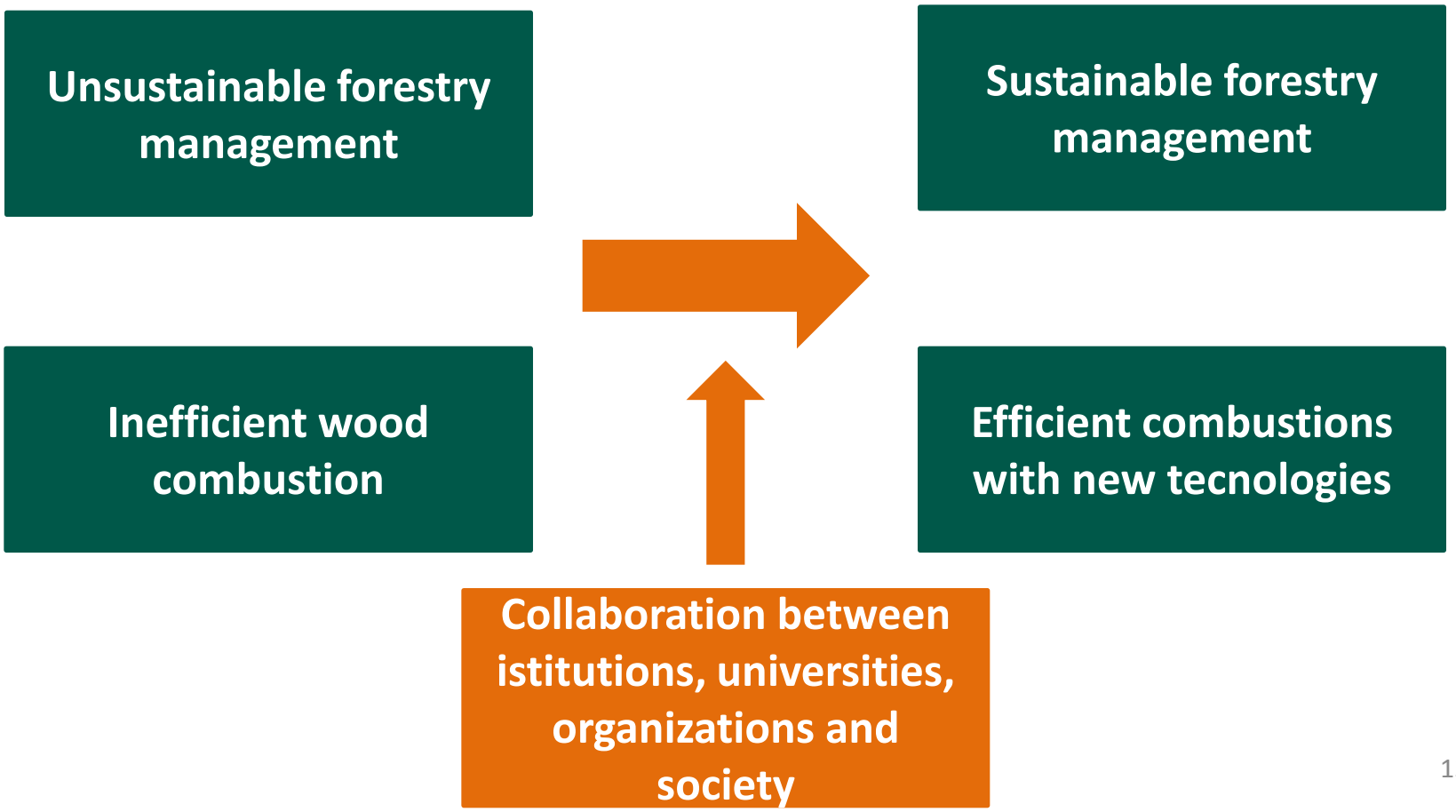
Feasibility Study

- Study of the Albanian Energy Context
- Definition of the GEP characteristics
- Theoretical description of the renewable technologies
- **Application and sizing in cases studies**



Case Studies

The sustainable use of Biomass



Case Studies

The sustainable use of Biomass

Opportunity of a sustainable short chain of production, supply, and consumption.

Productivity

Forestry cleanness	1 - 3 t/ha/y	Depending on tree type, land accessibility, land slope, mechanization rate of the process
Short Rotation Forestry (Poplar)	20 - 30 t/ha/y	
Wastes from wood industry	20-40 % of the worked	

Principal products for residential and commercial activities:

Wood	Forestry cleanness , SRF (> 5 anni)	Stoves and boilers (efficiency <85%), no automatic alimentation.	Low mechanization
Chips	Forestry cleanness , SRF	Boilers with minimum power >35kW.	Indispensable chipper. Low-medium mechanization
Briquette	Forestry cleanness , SRF Wastes from wood industry	Stoves and boilers efficiency till 95%.	Indispensable shredder and briquetting machine. Medium mechanization.
Pellets	Forestry cleanness , SRF Wastes from wood industry	Stoves and boilers efficiency till 95%.	Indispensable shredder and pellettizer. Medium- high mechanization

Case Studies

AMT-Puke

The center of food production is located in a rural area near the village of Kcira, in the administrative district of Puke. The center produces hams and sausages, dried herbs, dried mushrooms, various jams and vegetables, liquors.

Needs

- Heating for the rooms of the production workshop (not present)
- Heating for the birthing room for the pigs (not present)
- Heating for the drying room (electric heater)

Case Studies

AMT-Puke

Resources

- The center owns 15 ha of forest and 8,5 ha untamed

=>Wood from the cleanliness of the forest (1-3t/ha/y) and Short Rotation Forestry (20-30t/ha/y)

Activities and technologies

- Measures for thermal insulating of the buildings
- Installation of two high efficiency wood stoves (82%) in the workshop (15 kW) and in the birthing room (10 kW). The one in the workshop can provide the heat also for the drying room. It's also foreseen the pilot implementation of solar drier.

- Wood consumption: 30 kg/d workshop
  60 kg/d birthing room
  => 12 t/y

Case Studies

AMT-Puke

How to measure the thermal needs:

- Define the desired internal temperature
- Define the project temperature (external mean temperature during coldest month)
- Calculate the thermal dispersion (based on the building characteristics)

Thermal needs [W_{th}] = dispersion [W_{th} /m^3 /ΔT] * $\Delta T_{in\text{-}out}$ * surface [m^2] * height [m]

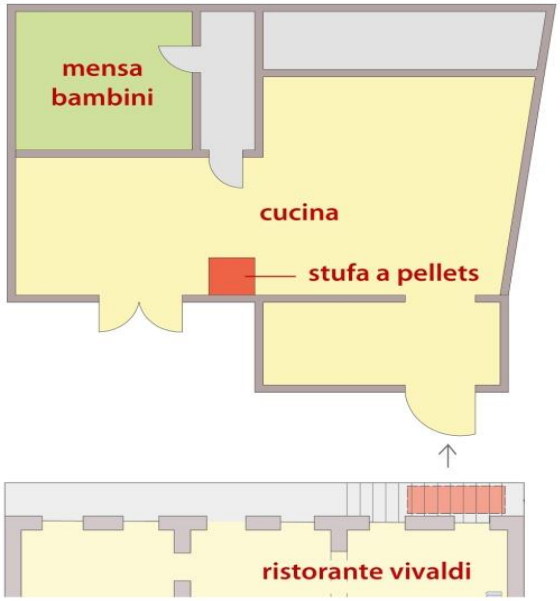
Case Studies

Vivaldi Restaurant

The Vivaldi Restaurant is located in the center of Shkodra. The current system of heating of the interior is made up of an old wood stove in the center of the room. The kitchens, along with the room used for the canteen of students from a nearby school are located in an adjacent building and have no heating system, only an electric heater is used during students lunchtime.

Needs

- Heating for the restaurant and the kitchen/canteen



Case Studies

Vivaldi Restaurant

Resources

- Pellets bought on the market. Opportunity to start a pellets production with the wood wastes of a near joinery.

Activities and technologies

- Measures for thermal insulating of the buildings
- Installation of an high efficiency pellets boiler (17 kW) and installation of radiators in the restaurant.
- Installation of high efficiency pellets stoves (8 kW) with a system of canalization for the hot air in the kitchen/canteen

- Pellets consumption: 11 kg/d restaurant
  8 kg/d kitchen/canteen
  => 1,6 t/y

Case Studies

Krajen oil mill

The Krajen center of oil production has a boiler capable of producing heat by the use of olive pomace. The thermal energy produced is used in the form of hot water for the operation of the oil mill. Near by the boiler there is a greenhouse, inside which means start the nursery production of seedlings of olive. Due to poor insulation in the walls of the greenhouse, temperatures inside can reach very critical values that can affect the health of plants.

Needs

- Heating system for the greenhouse

Case Studies

Krajen oil mill

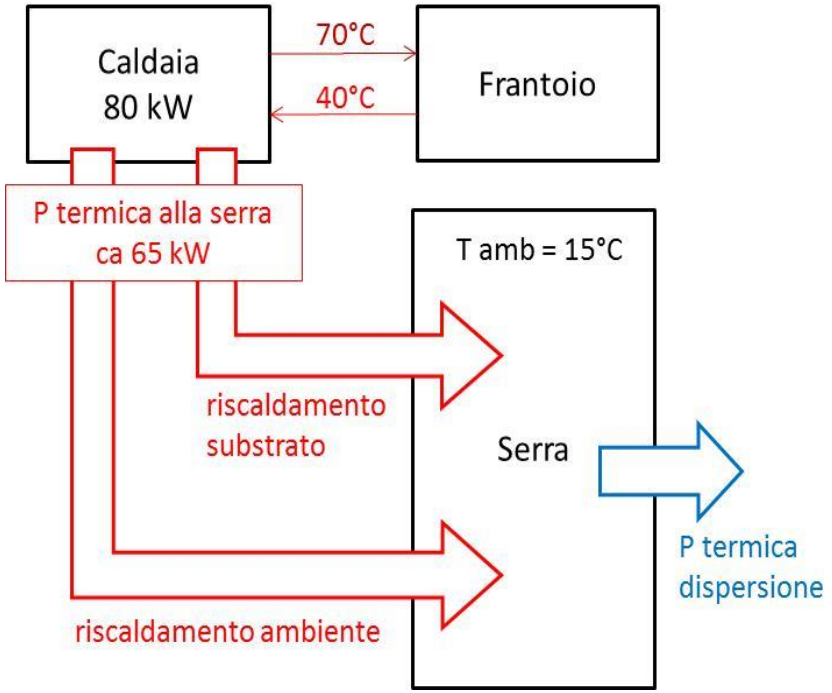
Resources

- Olive pomace

Activities and technologies

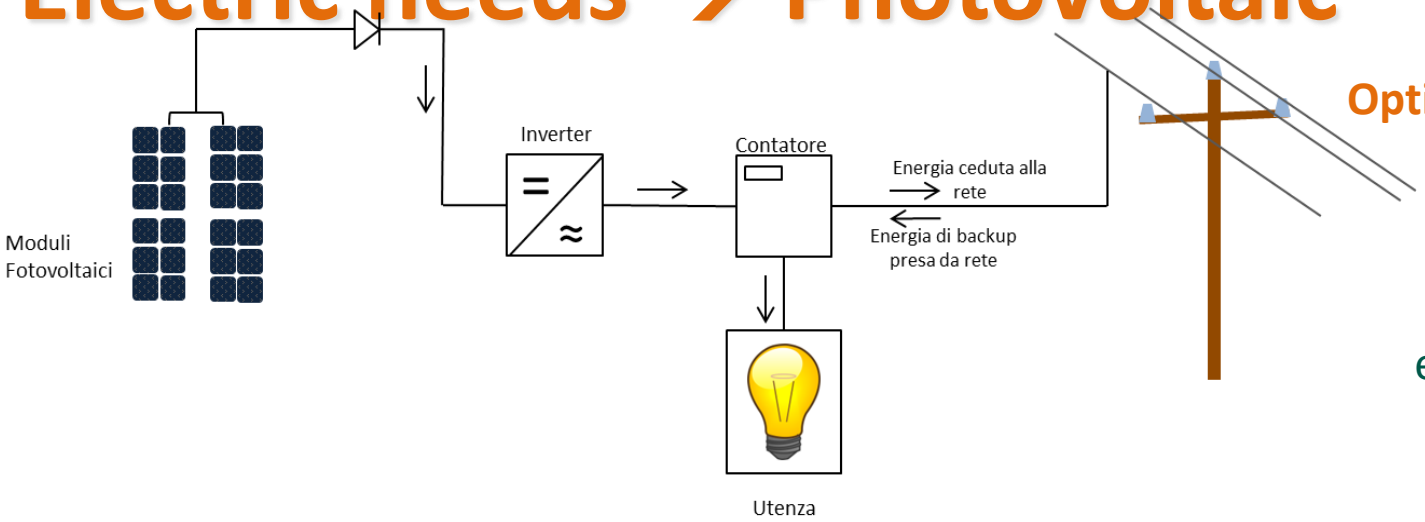
- Measures for thermal insulating of the greenhouse
- Installation of a substrate heating system

- Olive pomace consumption: 50 kg/d



Case Studies

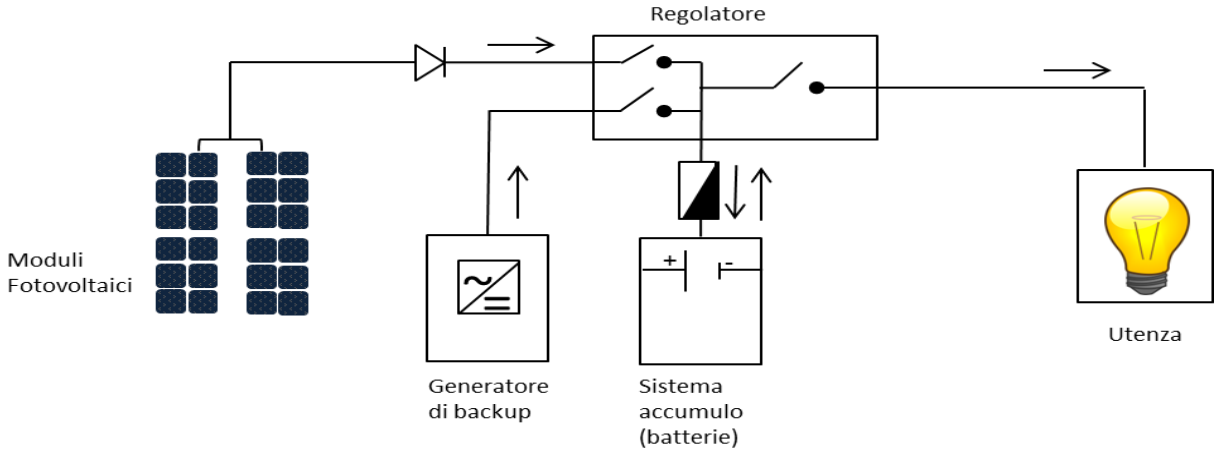
Electric needs → Photovoltaic



Optimize yearly production

constraint

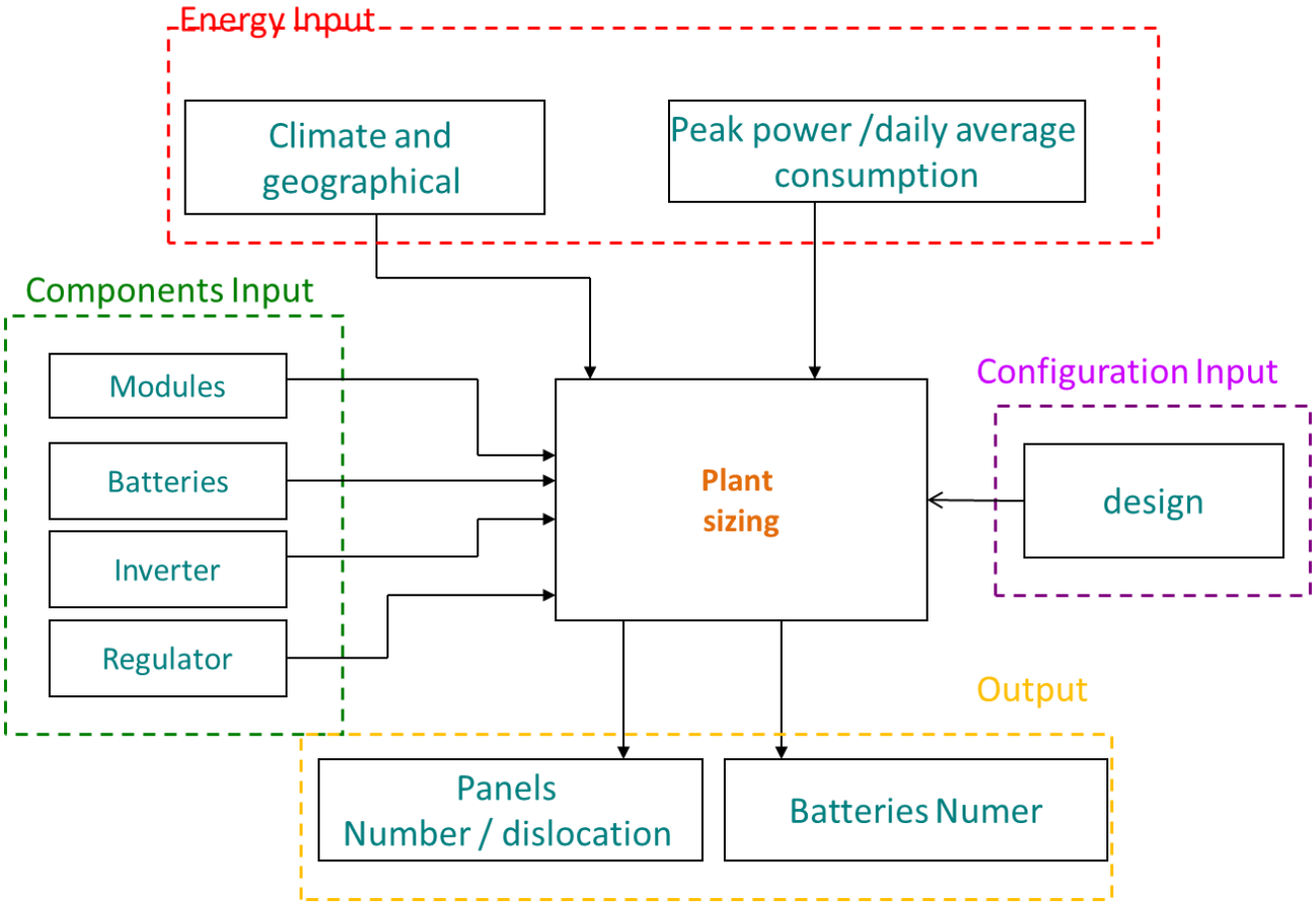
Available Surface or economic availability



Guarantee consumption coverage in the worst scenario (winter)

Case Studies

Electric needs → Photovoltaic



Case Studies

CTTA - Shkodra

The Center for Agricultural Technology Transfer (CTTA) of Shkodra has under construction a greenhouse of 2000 m2 which will be prepared for germination of seedlings herbs, and in particular the sage. Given the great demand in recent years of sage, CTTA resell at price cost the plants produced in greenhouses to local farmers in order to avoid the depletion of the local resource.

Needs

- Electric needs for night illumination, pumps, electric boiler, and electric engines.

	Number	Power	Hours working	Period working	Daily mean consumption
		W	h/d		Wh/d
engines	6	750	0,3	All year	1350
Pump	1	1500	0,3	All year	450
External illumination	8	30[1]	8,5-14,5	All year	2040 - 3480
electric boiler	1	1500	0-1,5	winter	0-2250
				TOTAL	**3840 - 7530**
Conditioner-nebulizer	1	2500	24	January -February August-September	60000

Case Studies

CTTA - Shkodra

Resources

- Solar radiation

	Radiation Wh/m2/day			
	0°	*30°*	*60°*	*Optimum inclination*
January	1740	2820	3290	64
February	2620	3800	4160	56
March	3870	4860	4830	44
April	5180	5700	5060	29
May	6470	6500	5230	17
June	7370	7060	5370	8
July	7610	7480	5790	13
August	6640	7100	6010	24
September	4760	5760	5520	39
October	3140	4360	4630	53
November	1930	3040	3490	62
Diciember	1490	2480	2940	65
Year	4410	5090	4700	35

Maximize winter radiation

Orientation: Sud

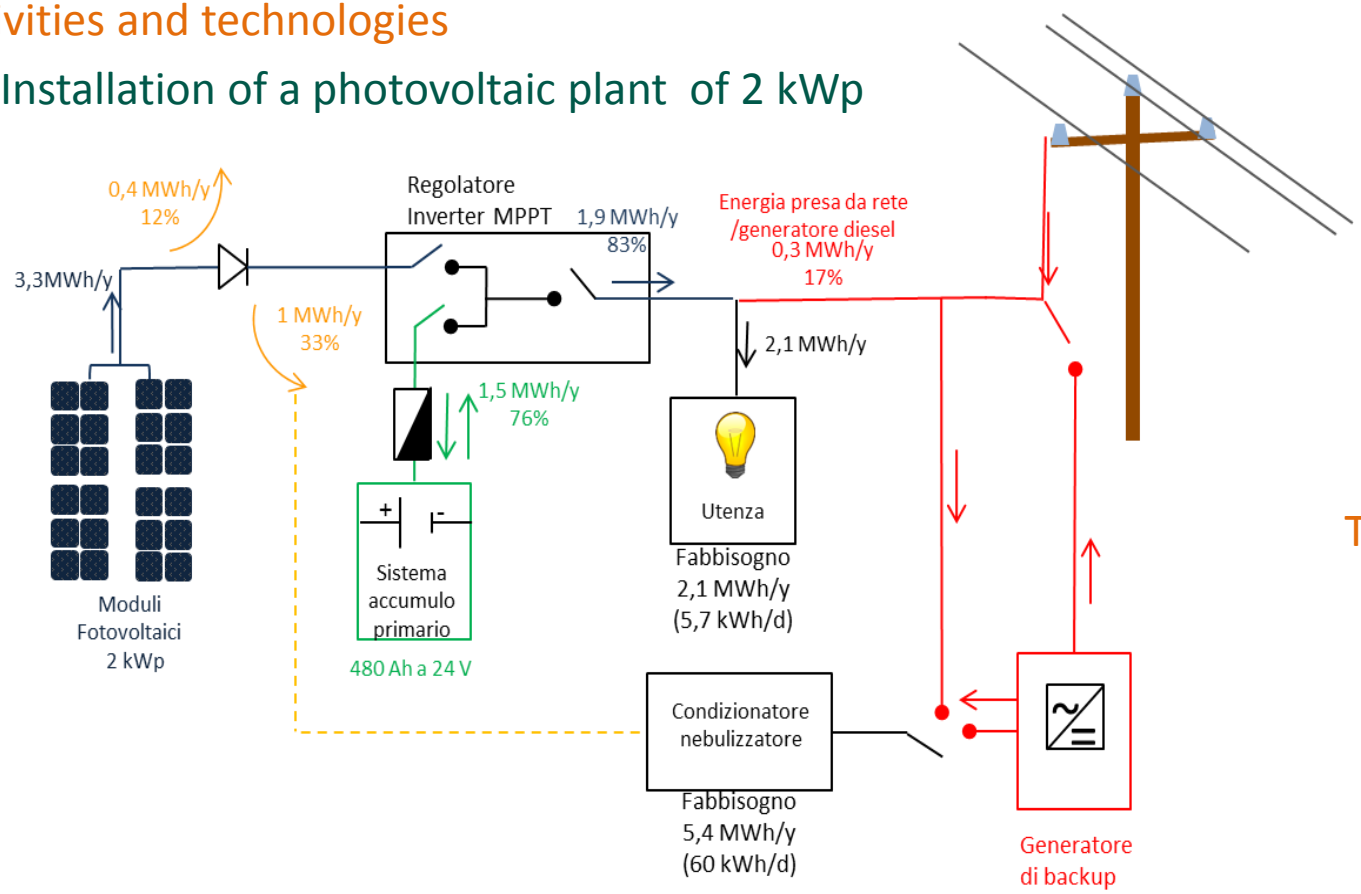
Inclination: 60°

Case Studies

CTTA - Shkodra

Activities and technologies

- Installation of a photovoltaic plant of 2 kWp



Panels cost: 1700€

Batteries cost: 2600€

Total Plant cost: 6800€

=>

Electricity cost
0,37€/kWh

Case Studies

Farmhouse-restaurant Mizri Zanave

The farmhouse restaurant Mrizi Zanave, located a few kilometers from Shkodra, offers a typical Albanian food with the use of seasonal and "km zero" product cultivated in the lands of the farm. The center has also recently opened a B & B with three guest rooms.

The farmhouse restaurant has also embarked on the path toward greater energy independence installing two solar thermal systems to cover the requirements of hot water of the rooms of the B&B and the restaurant, one high efficiency pellets stove for heating the restaurant dining room, and a integrated photovoltaic plant with small wind for illuminating the outside of the restaurant.