Sustainable Cities
VISIONS & CHALLENGES

Ecological Transition of Basque Territory:
Municipality of Amorebieta-Etxano

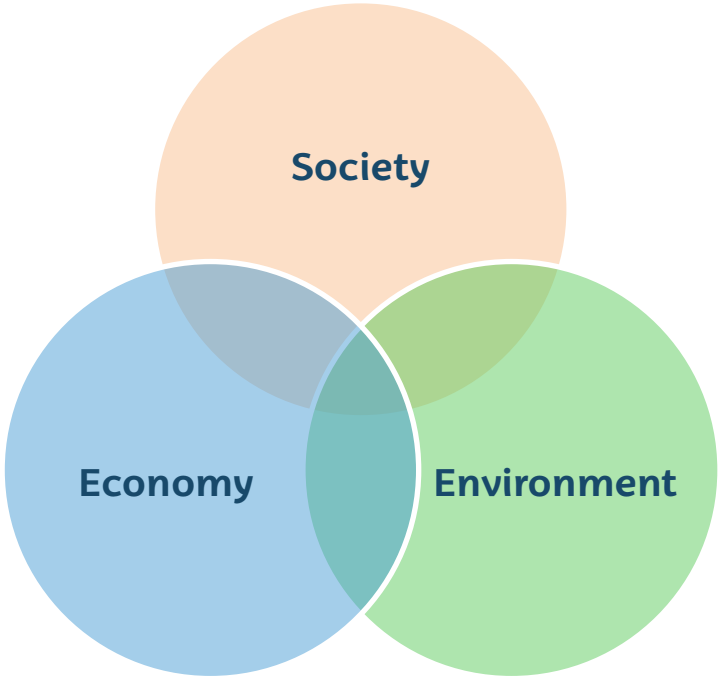
UPPSALA UNIVERSITET

SCHOOL OF ARCHITECTURE
UNIVERSITY OF THE BASQUE COUNTRY

ENLIGHT

Ecological Transition

What does the ecological transition of a municipality mean?



Basics of Sustainability

Population: size
Well-being: health
Resources: local and foreign
Environment: ecosystems

Ecological Transition

What does the ecological transition of a municipality mean?

Case Study

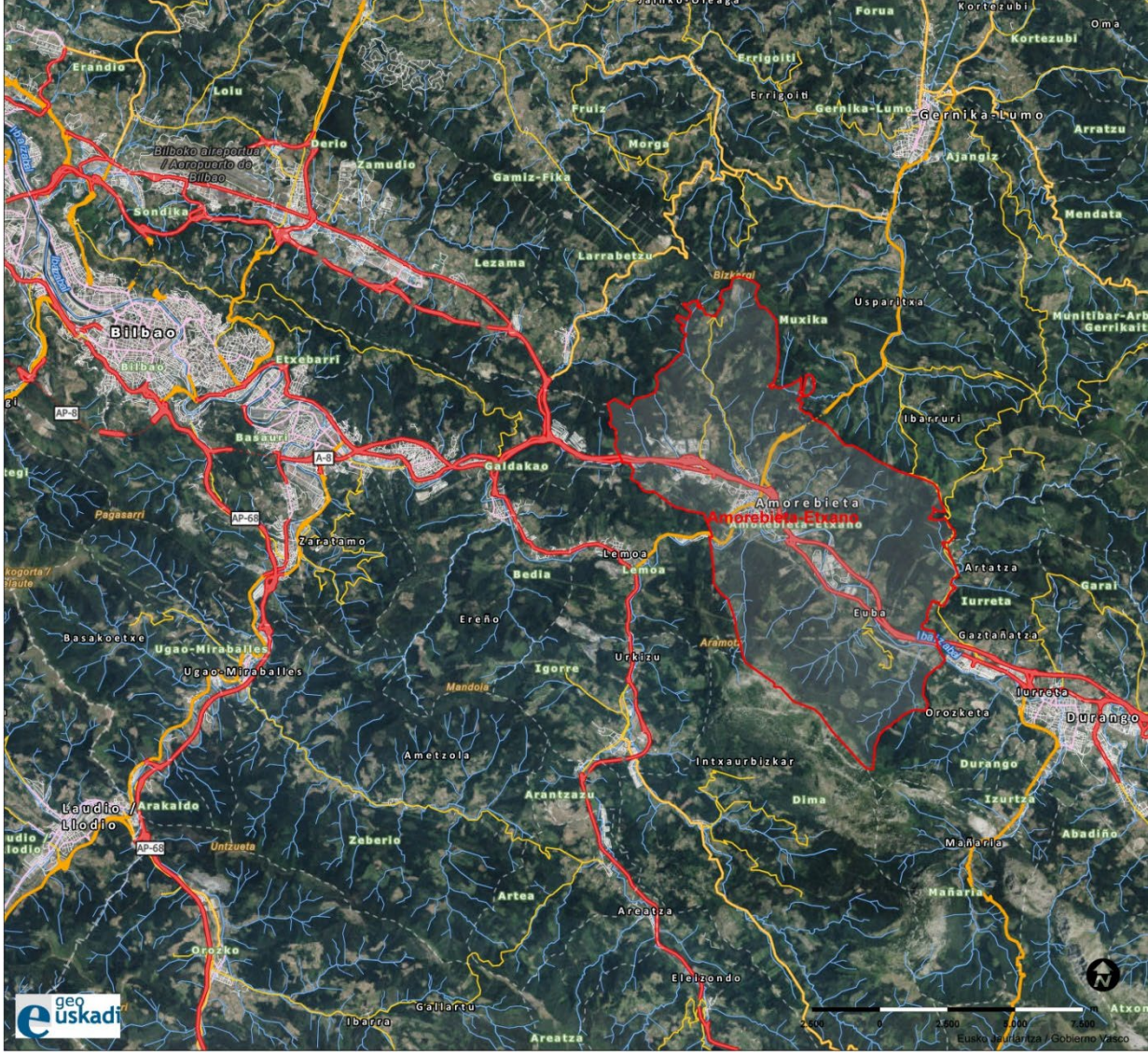
Municipality of Amorebieta-Etxano

Case Study

Surface area of 60 km^2

Population of 20.000 inhabitants

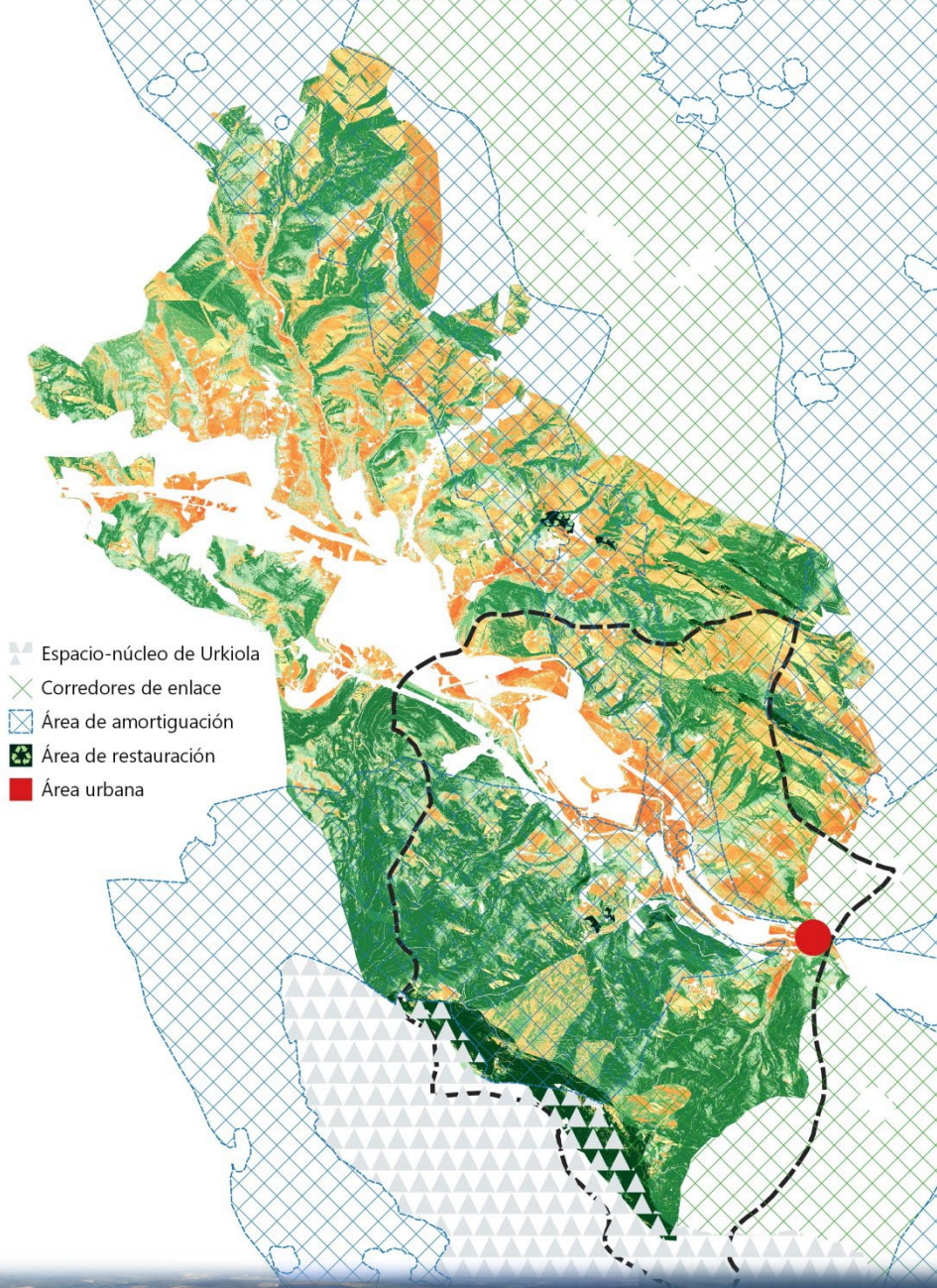
Population density 325 inhab./km^2




Amorebieta-Etxano
geo euskadi
1.000 0 1.000 2.000 3.000 m
Eusko Jaurlaritza / Gobierno Vasco

Case Study


NÚCLEOS RURALES
Diputación
Tradicional
PROPUESTA FORESTAL
Bosque de conservación
Bosque de ribera
PARCELARIO
Artificializado
PGOU_Inicial_Ordenacion
ZEP_aguas superficiales
ZEP_bosques de especies autoctonas o asimilados
ZEP_espacio natural protegido
Zona de mejora ambiental
SG_zona equipamental
SG_zona espacios libres
SG_bidegorri
SG_cauces
Especial proteción_area paisajística
Reserva Biosfera
Captación de aguas
POTENCIAL INTEGRADO
Agrícola
Forestal


Espacio-núcleo de Urkiola
Corredores de enlace
Área de amortiguación
Área de restauración
Área urbana


geo euskadi
180 0 180 360 540 m
Eusko Jaurlaritza / Gobierno Vasco

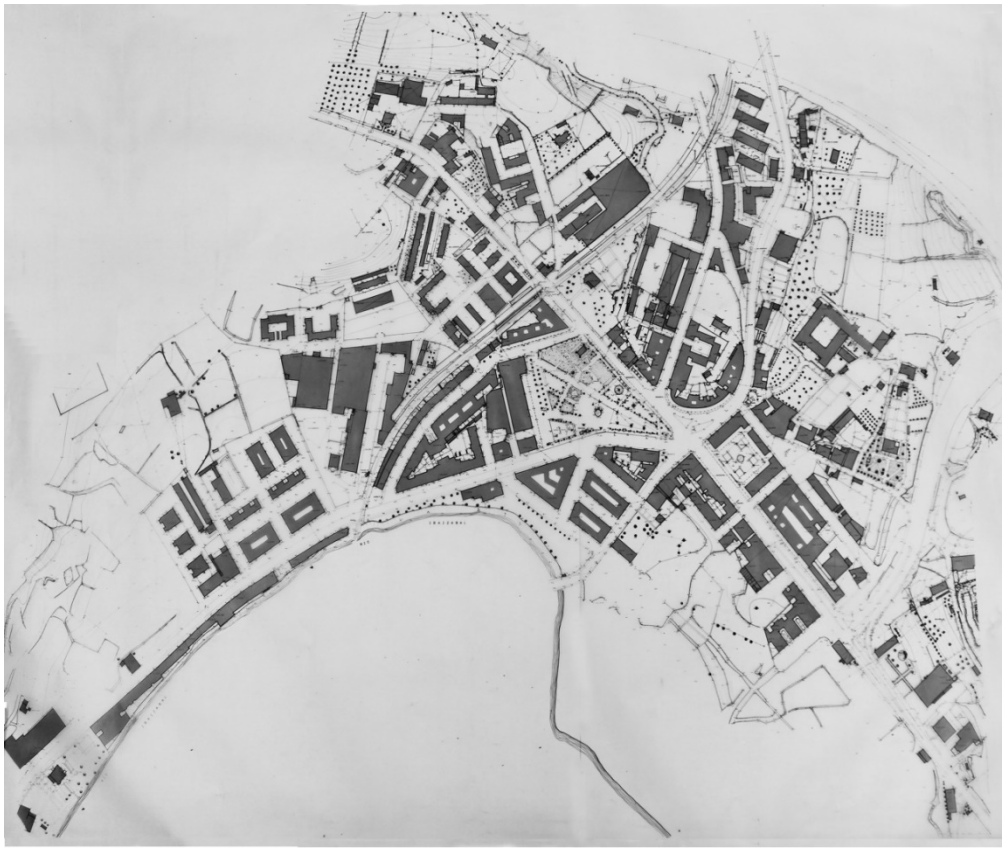
Identity

Productive landscapes

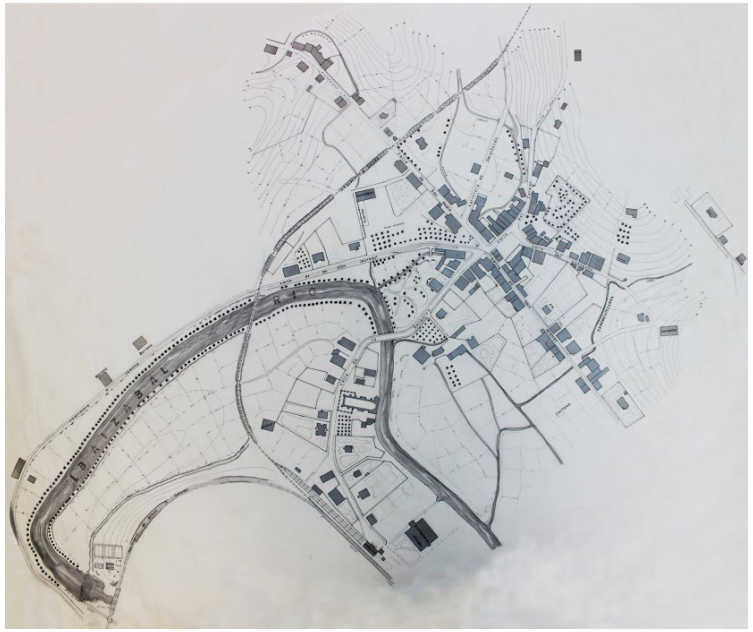
Development throughout history

1884

1980



1921



Development throughout history

1956

2011

GureGipuzkoa.net
Nekazariak hamarretakoa egiten

Gipuzkoako Foru Aldundia
Gipuzkoako Artxibo Orokorra

Lunch atop a Skyscraper
New York, 1932

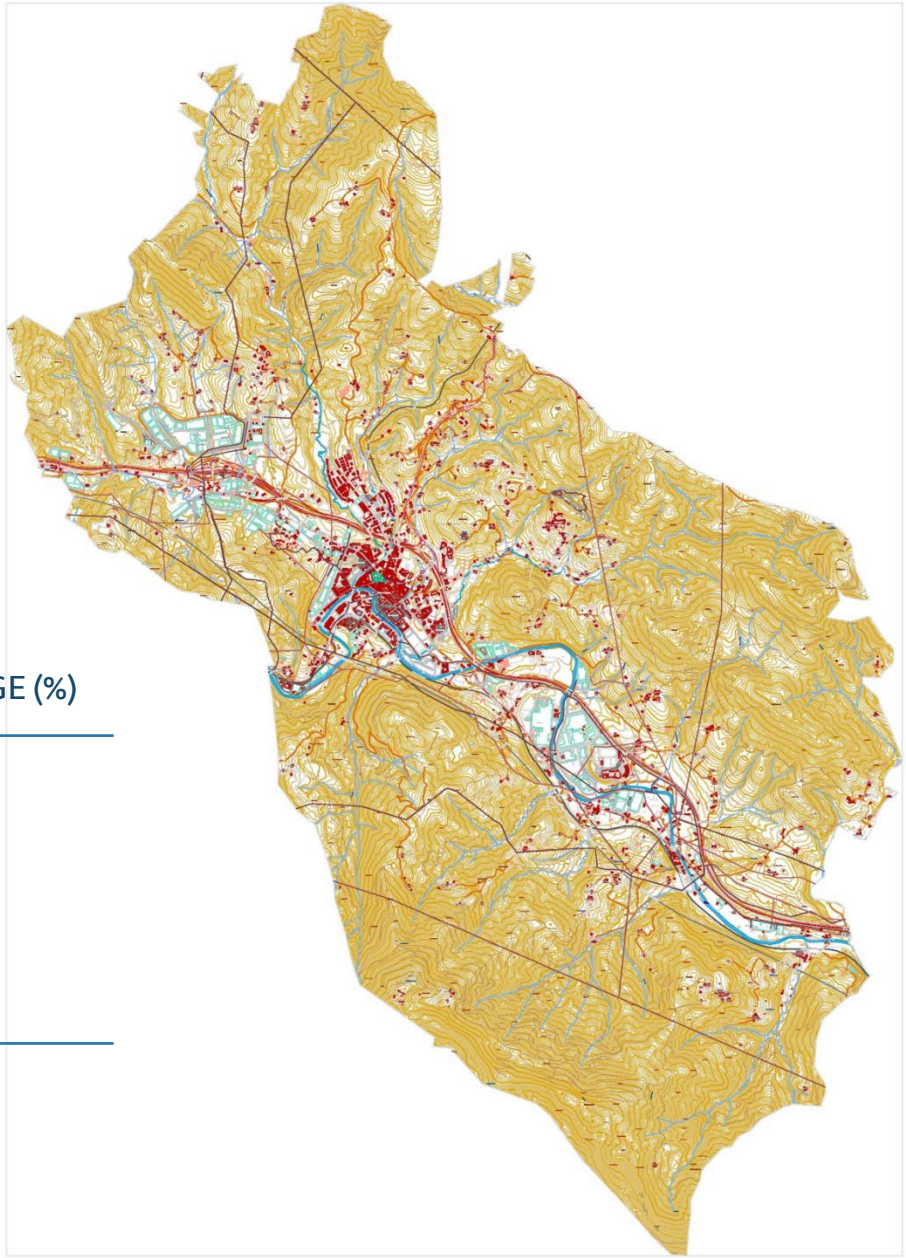
Natural Resources

1,63 global hectares (gha) per person

Biscay ecological footprint: 2,94 ha/inhab
(2011)

Amorebieta-Etxano: 0,31 ha/inhab

	USES	AREA (Ha)	PERCENTAGE (%)
Fruit trees	Producer	≈ 52	≈ 1
Urban	Consumer	≈ 691	≈ 12
Pasture	Producer	≈ 693	≈ 12
Forestry	Producer	≈ 4 410	≈ 75
TOTAL		5 846	100



Natural Resources

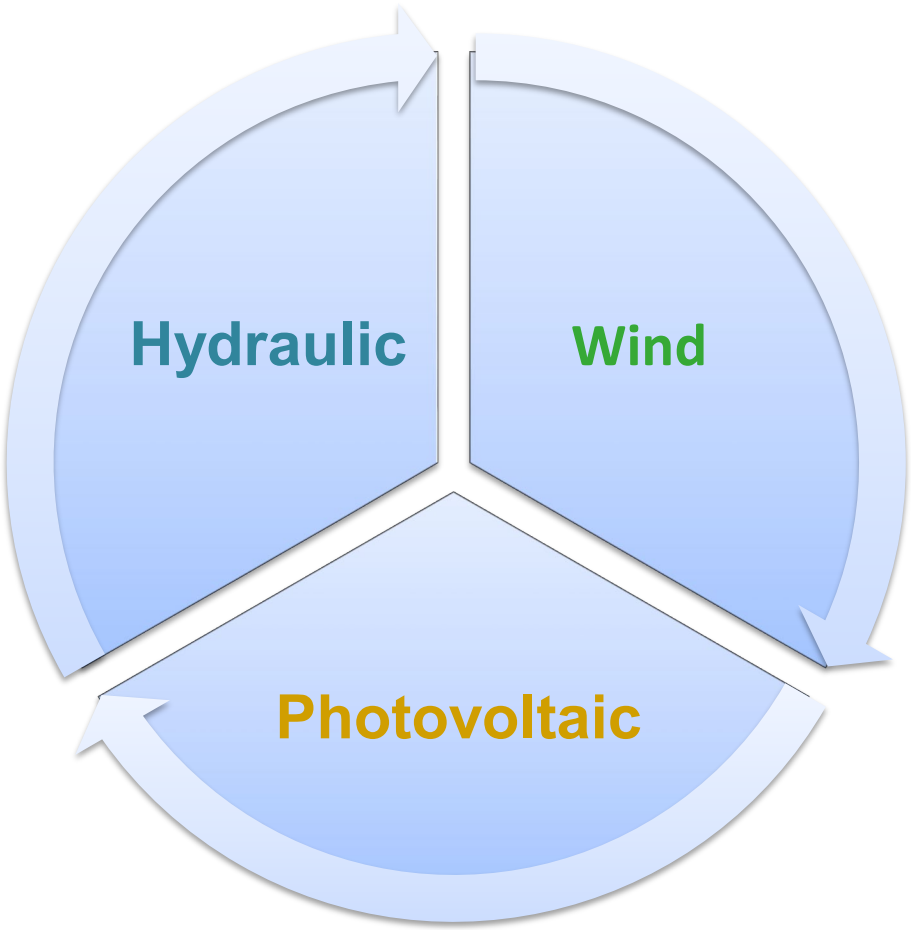
- AG, Corrientes Y Superficies De Agua
- CA, Viales
- ED, Edificaciones
- FL, Frutos Secos Y Olivar
- FO, Forestal
- FS, Frutos Secos
- FV, Frutal
- IM, Improductivo
- Invernaderos Y Cultivos Bajo Plastico
- OF, Olivar-Frutal
- OV, Olivar
- PA, Pasto Con Arbolado
- PR, Pasto Arbusivo
- PS, Pastizal
- TA, Tierra Arable
- TH, Huerta
- VF, Vinedo-Frutal
- VI, Vinedo
- VO, Vinedo-Olivar
- ZU, Zona Urbana

Renewable Energy Resources

Taking into account that:

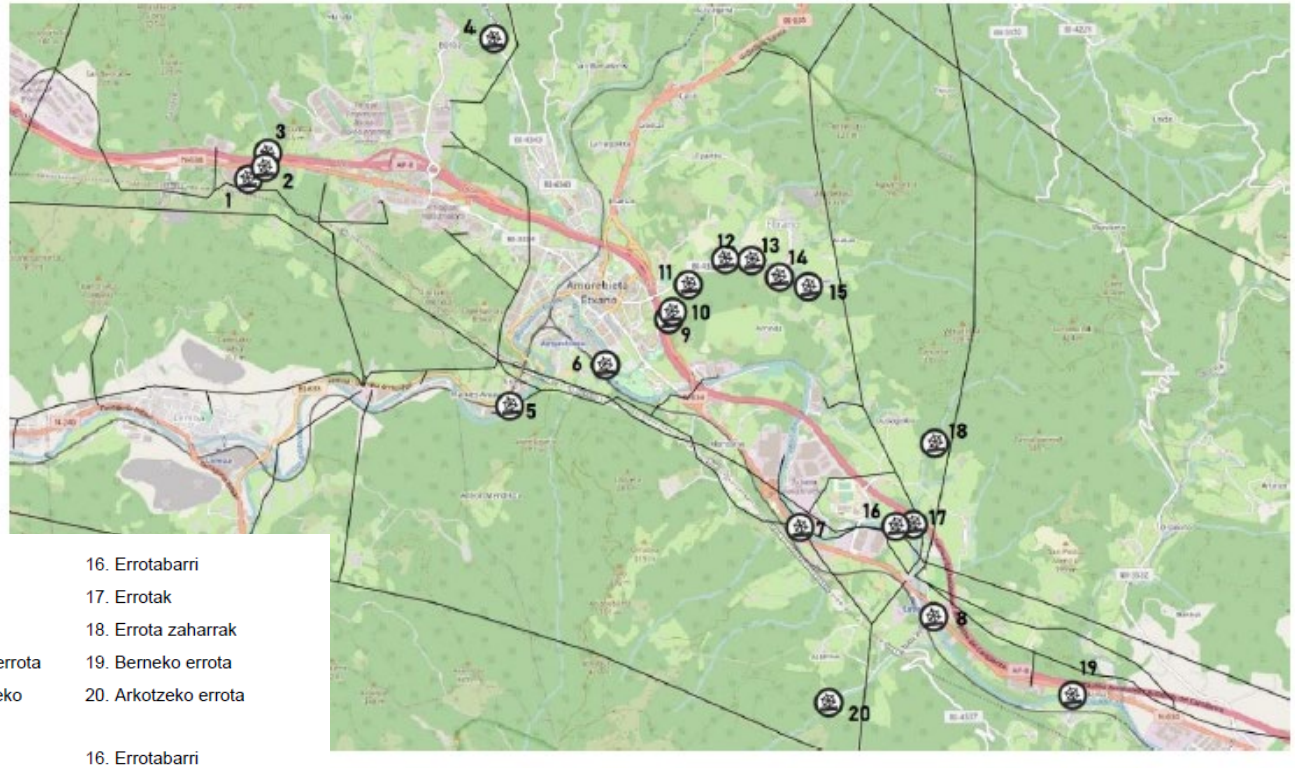
Each Basque family on average consumes 2.692 kWh/year

The Basque energy price rate is: 0,250458 €/kWh



Hydraulic Energy

Existing infrastructure throughout history



1. Errotazahar	6. San Martin presa	11. Txolone	16. Errotabarri
2. Errotabarri	7. San Antonioko presa	12. Trokarro II	17. Errotak
3. Errotabarri	8. Eubako presa	13. Trokarro	18. Errota zaharrak
4. Olabarri I	9. Eriz	14. Aretzagako errota	19. Berneko errota
5. Astepeko presa	10. Bikandi	15. Altzibar beheko errota	20. Arkotzeko errota

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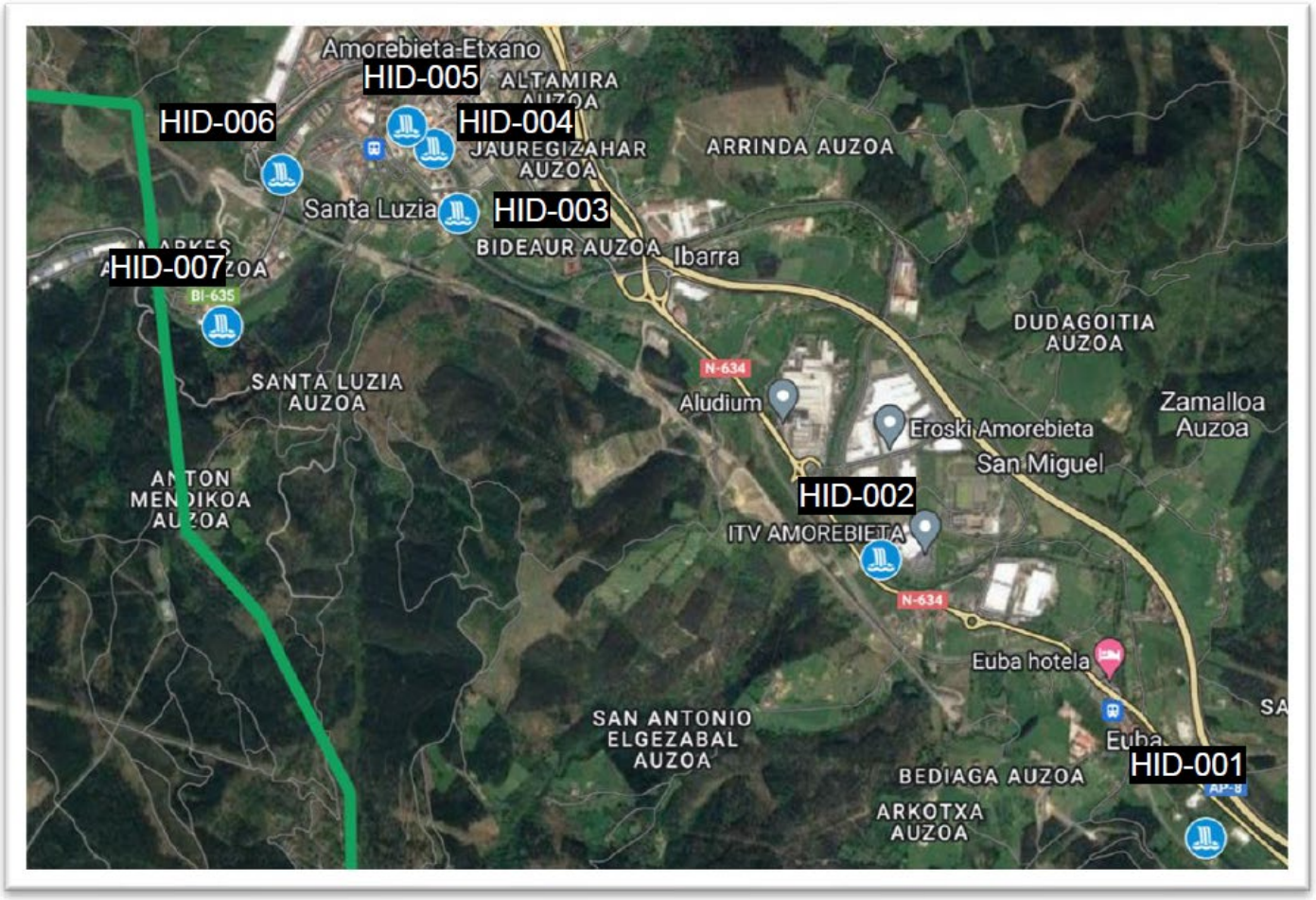
Hydraulic Energy

Current existing infrastructures



Hydraulic Energy

HID-002 Ibarguren plant from San Antonio

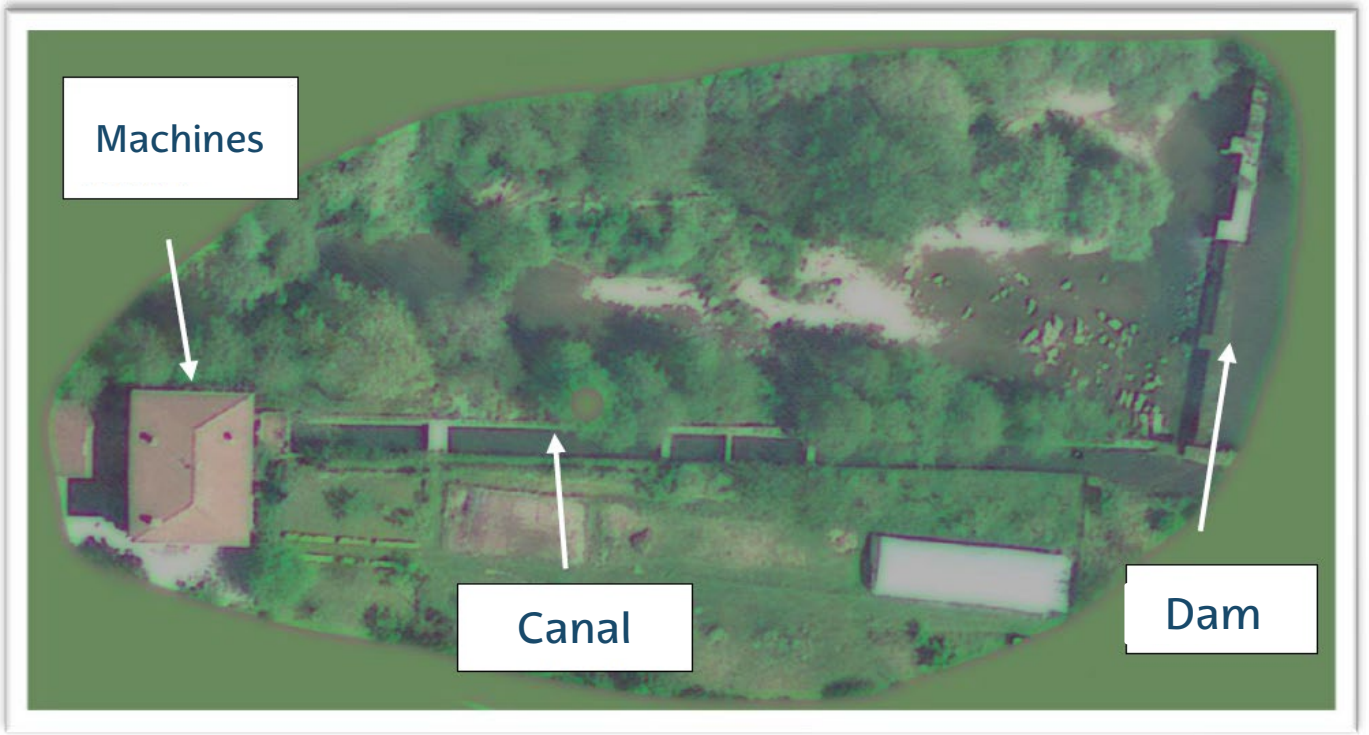
Machines in the Household

Kaplan single regulation turbine 125 kW

Needs cleaning and maintenance

Water use concession: 4.000 L/s

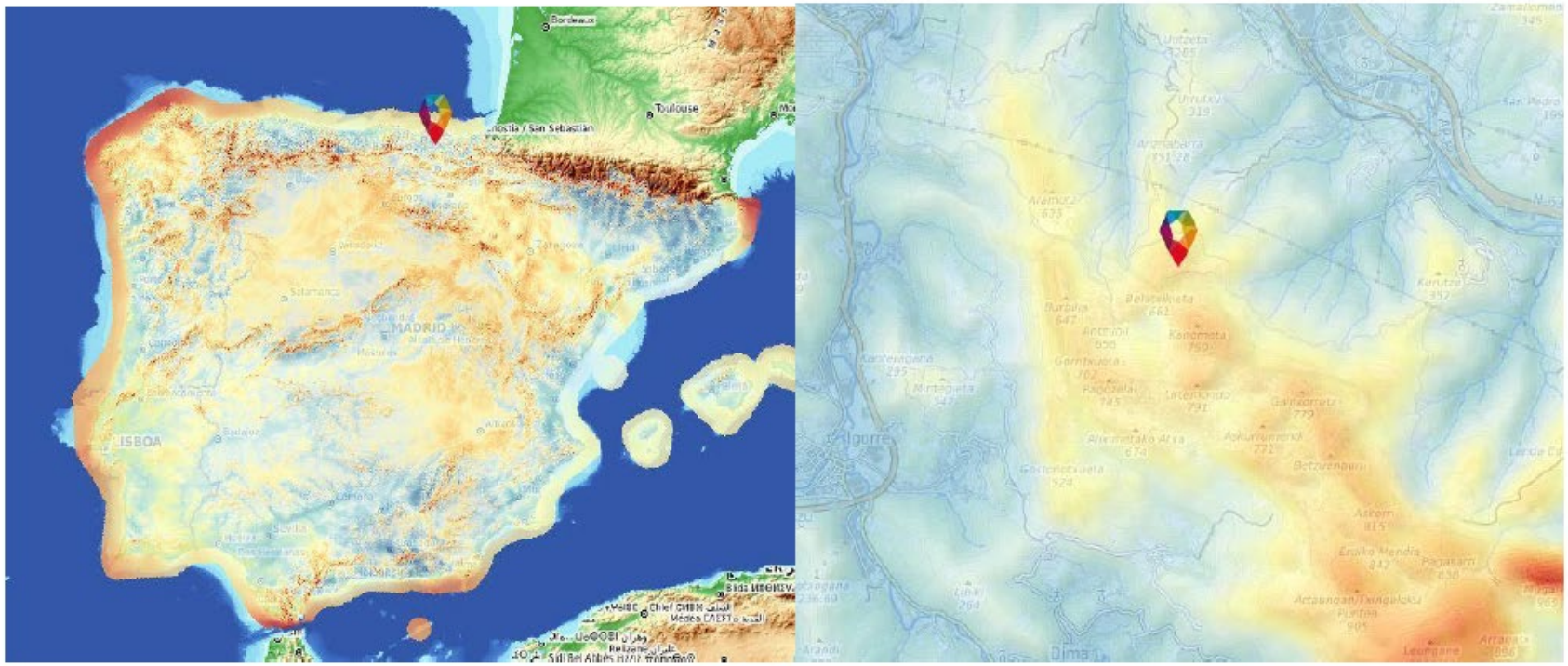
Average energy production: **263.757 kWh**



264 MWh ≈ 100 families

Wind Energy

Speeds distribution of the location



Low wind speeds predominate in the municipality of Amorebieta-Etxano

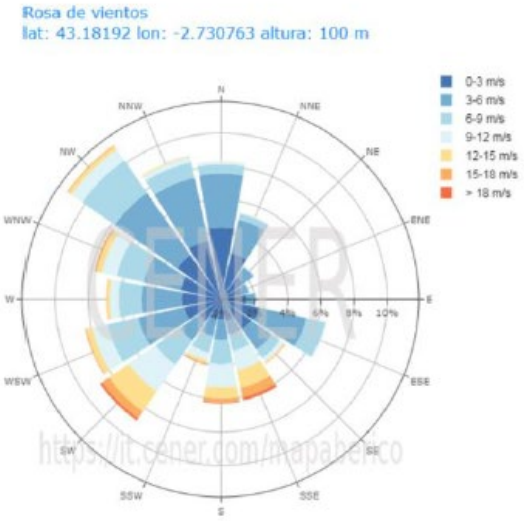
Wind Energy

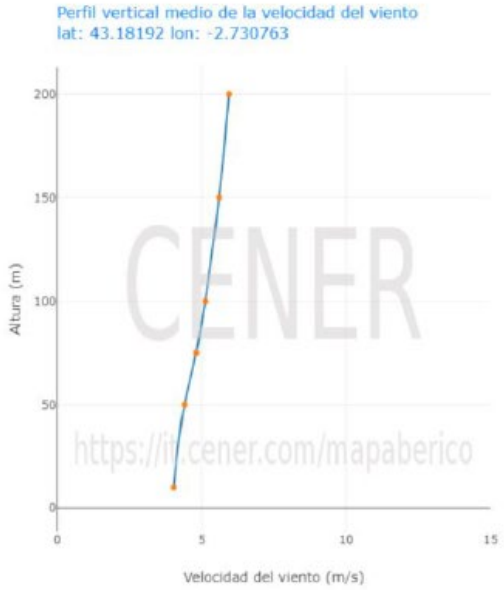
Prevailing winds: northwest

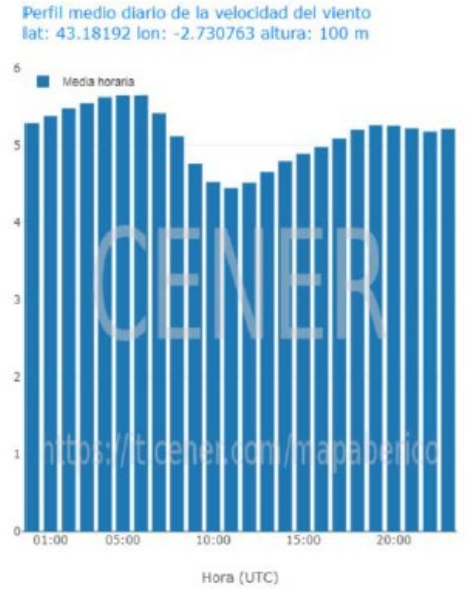
Highest speeds: southwest

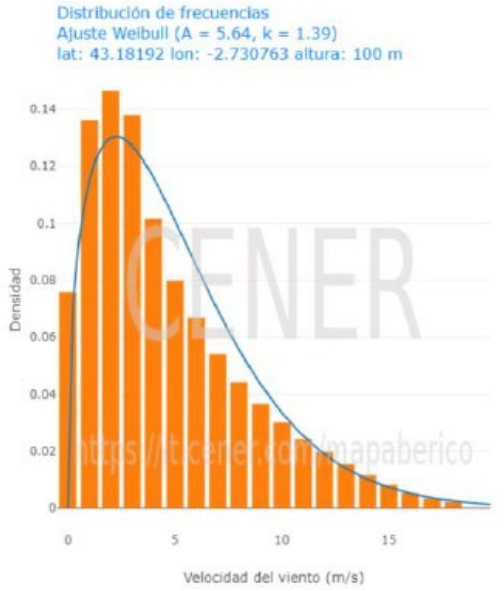
At higher points:
speed increases somewhat

During the day:
in the early and late hours the speed increases



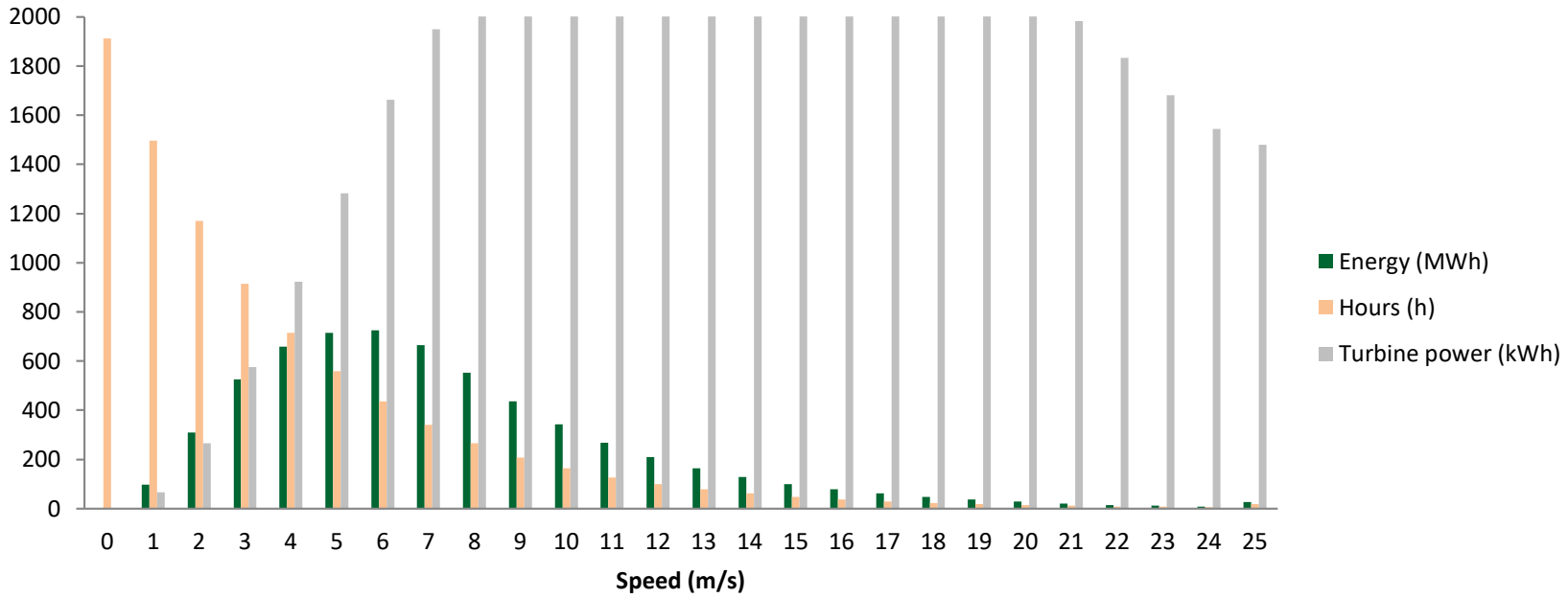






Wind Energy

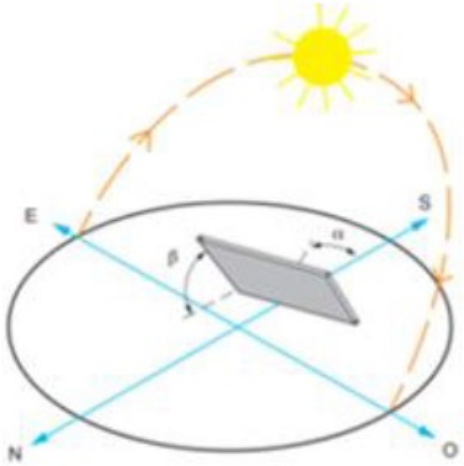
2.1 MW wind turbine

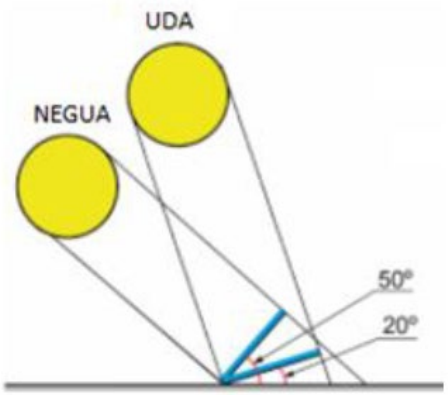


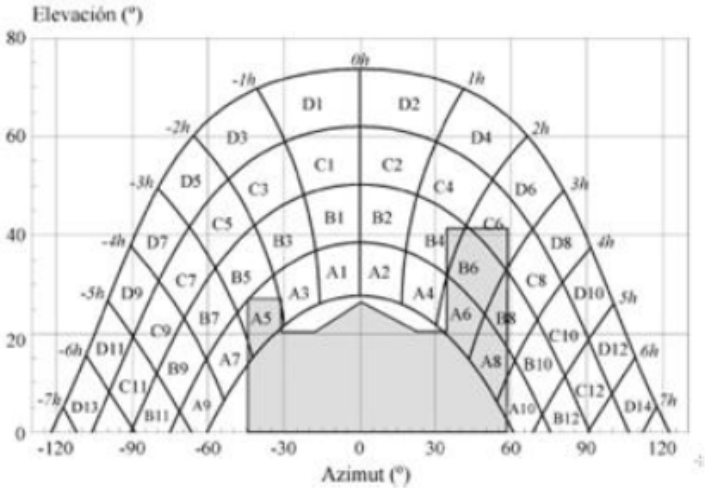
5.606 MWh ≈ 2.082 families (≈ 50 %)

Photovoltaic Energy

Performance metrics







ORIENTATION

0º S; 90º OE; -90º E

Ideal: -45º _ 45º

TILT

Ideal: 33,5º

OBSTACLES AND SHADOWS

Discard 50 %

Photovoltaic Energy

HIGH POTENTIALITY

Azimuth: -45º _ 45º

No Obstacles and Shadows

MEDIUM POTENTIALITY

Azimuth: -45º _ 45º

With Obstacles and Shadows

LOW POTENTIALITY

Azimuth: ‹ -45º _ › 45º

With Obstacles and Shadows

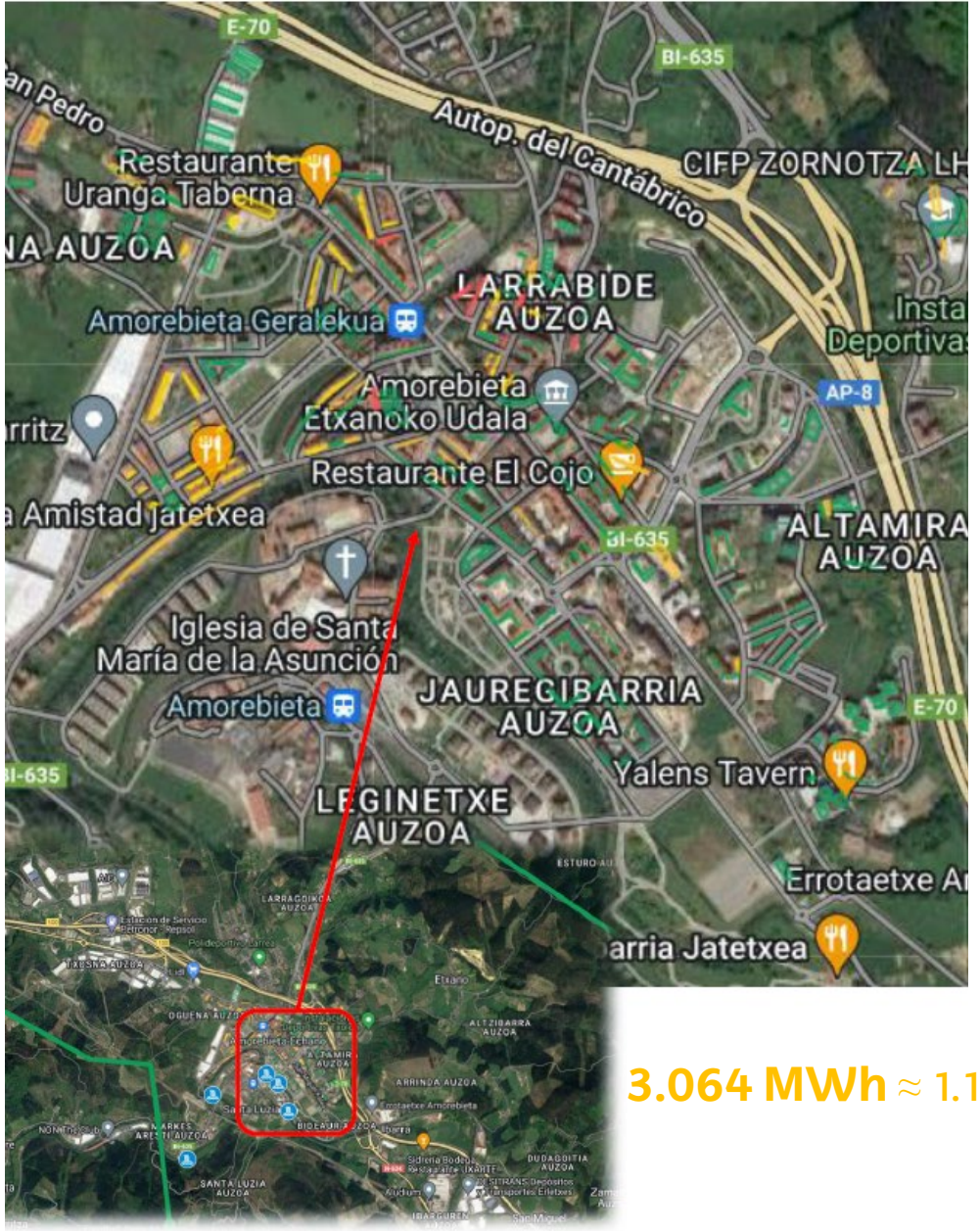
Photovoltaic Energy

Boroa **Industrial Park**

7.875 MWh ≈ 2.925 families

Photovoltaic Energy

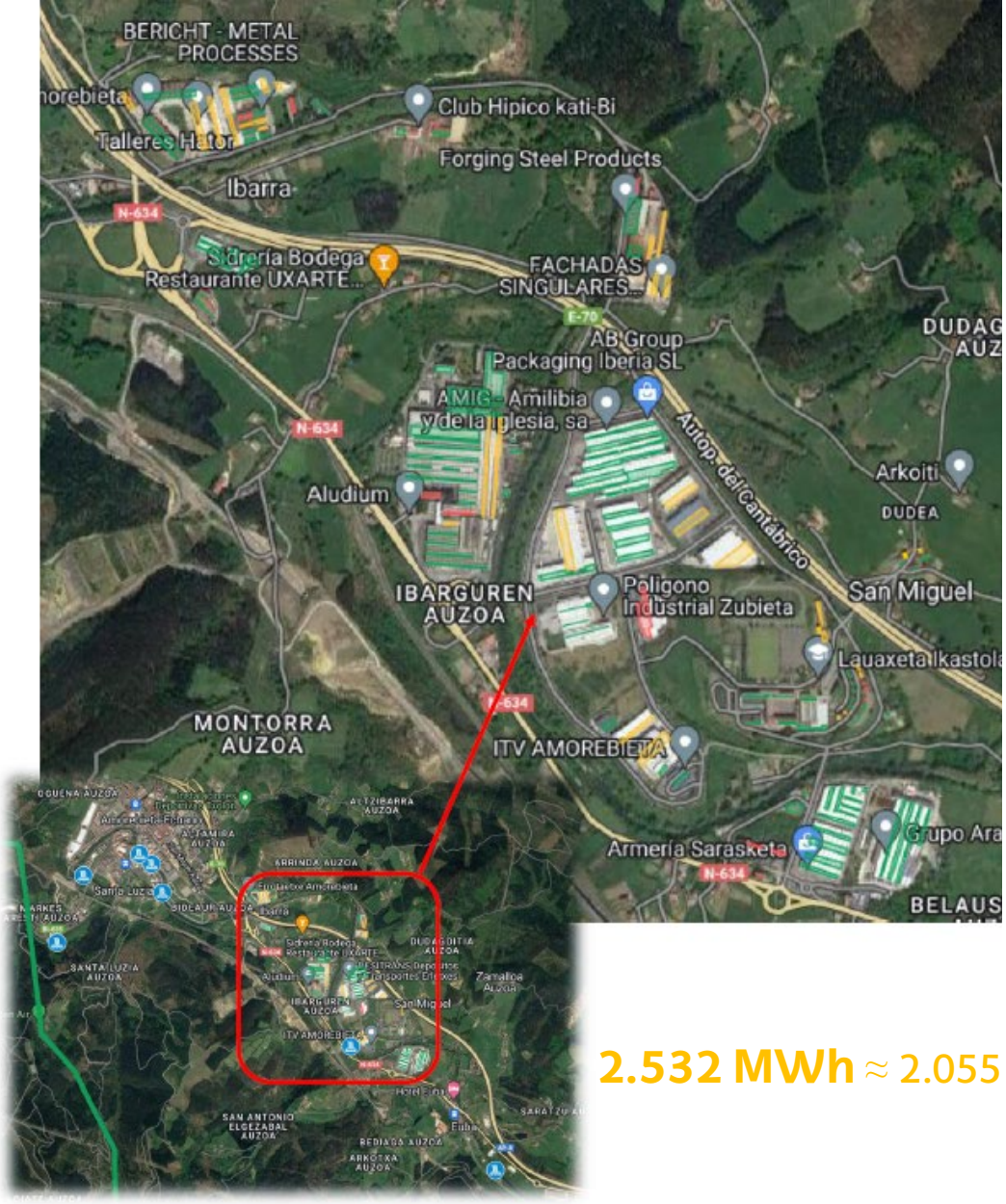
Urban Center



3.064 MWh ≈ 1.138 families

Photovoltaic Energy

Zubieta **Industrial Park**



2.532 MWh ≈ 2.055 families

Renewable Energy Production

Interactive Viewer

	Estimated Energy Production (MWh)
1 Hydraulic Plant	264
1 Wind Turbine	5.606
Photovoltaic Panels	19.050.591
TOTAL	**19.056.461**

	Inhabitants
Families	7.078
4 members/family	**28.315** (> inhabitants of the municipality)

Renewable Energy Production

Real data of a dwelling

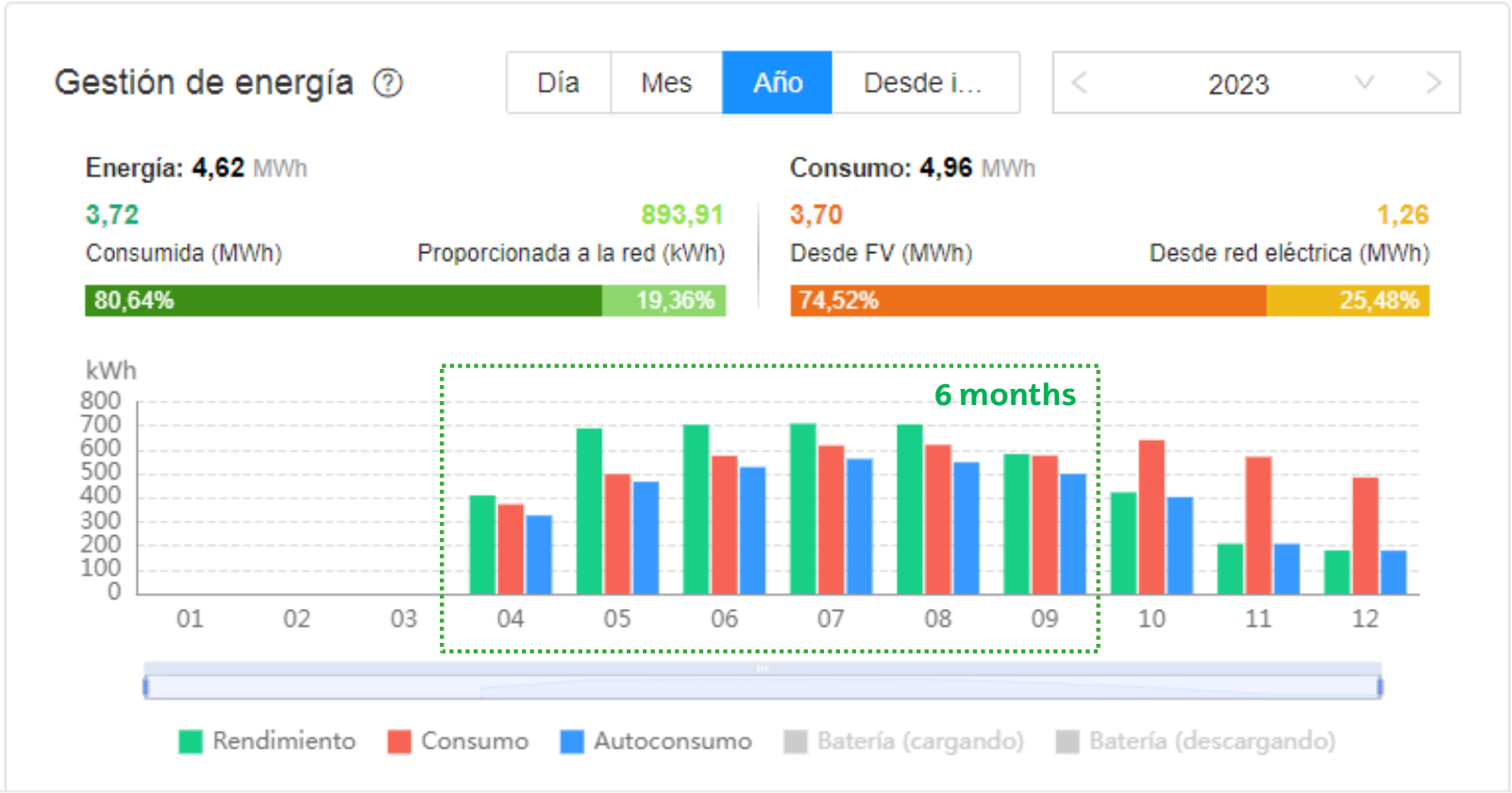
Principal House
Studio

4 persons, consumption:
· Electrical equipment
· Heating in Winter: biomass boiler
· Hot Water in Winter: biomass boiler
· Hot Water in Summer: electric boiler
· Electric car

14 photovoltaic panels

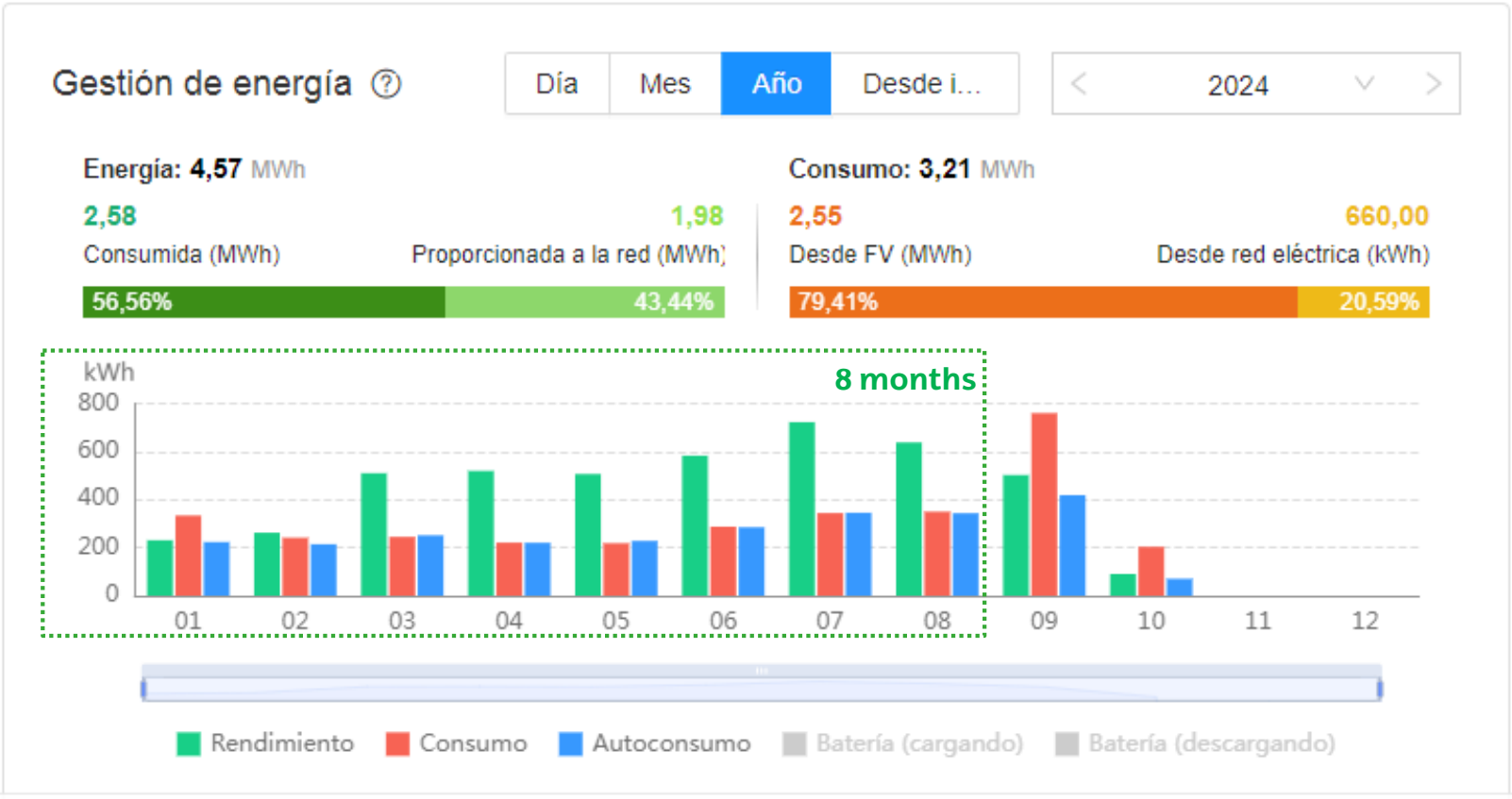
Renewable Energy Production

Real data of a dwelling



Renewable Energy Production

Real data of a dwelling



Exercise

Ecological Transition of Amorebieta-Etxano

How we can become ecological Amorebieta-Etxano?

Is the population too much?

Do you think there is social well-being? Comfort in dwellings, greenery, pollution...

Could a self-sufficient supply be guaranteed?

Feeding?
Energy? Industrial Plants Consumption? Electric Mobility?
Water?
Waste?

What would you remove or add to the orthophoto?

Exercise

New Project

Kalelagun: Urban Comfort-Wellbeing

Thank you!