

La vida no es la que uno vivió,  
sino la que uno recuerda y  
cómo la recuerda para contarla.

# Vivir para Contarla

Gabriel García Márquez



# Strength in Diversity

ENCUENTRO  
**IALU** >> XII

Confronting  
global challenges  
*through education*

**La**  **Salle**  
León, Nicaragua  
Universidad Tecnológica

ENCUENTRO  
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La  Salle.

INTERNATIONAL ASSOCIATION  
**La Salle**  
UNIVERSITY

**The role of ULSA Nicaragua in the face of environmental sustainability and the promotion of renewable energies.**

**Delvin Díaz**

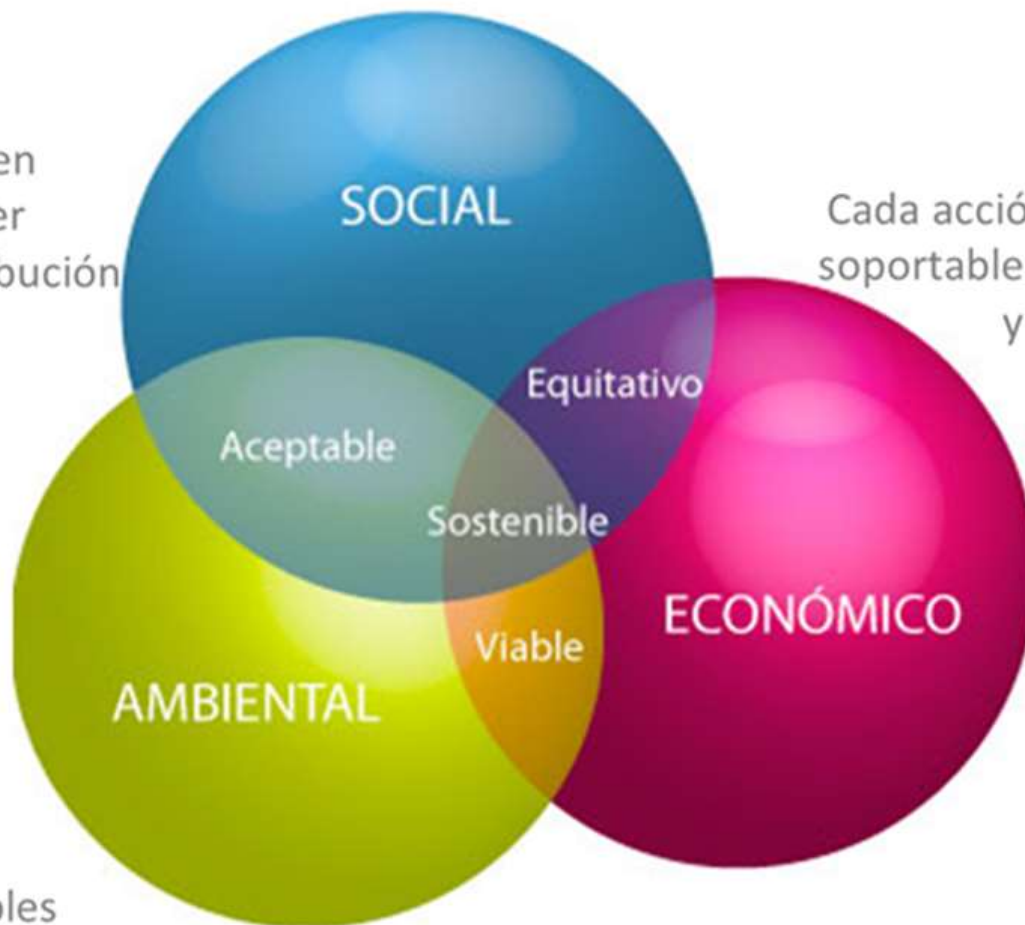


## EQUIDAD SOCIAL

Las acciones deben dirigirse al bien común de las personas y favorecer un correcto equilibrio en la distribución de la riqueza.

## VIABILIDAD ECONÓMICA

Cada acción tiene su coste que debe ser soportable. Debemos analizar el retorno y la capacidad de amortización de cada decisión

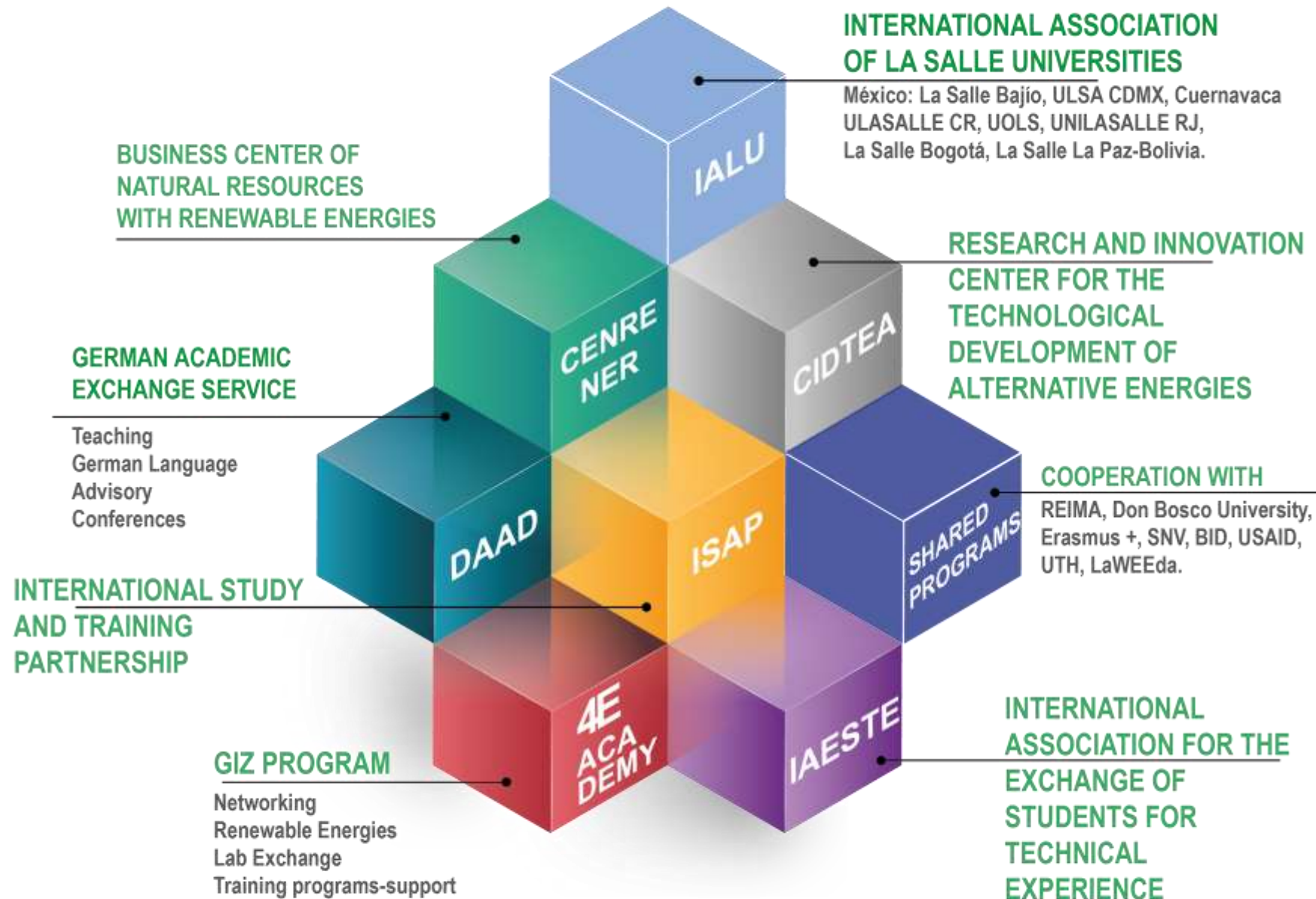


## EFICIENCIA ENERGÉTICA

Las acciones deben ser soportables por el medio ambiente, deben dirigirse a reducir el consumo energético, potenciar el uso de las energías renovables y reducir las emisiones de CO2.



# International Programs



## The CENRENER Center

Along to the academic services, ULSA implement development projects through its Business Center with Natural Resources and Renewable Energies Office (CENRENER), by this time a total of four projects has been developed, one has been completed and three are under the process of implementation:

Diagnosis of Family and Productive Units not Serviced by the National Electric Network in the Western Region of Nicaragua.  
(Completed Project).

Diagnosis of Family and Productive Units Not Serviced by the National Electric Network in Las Segovias Region of Nicaragua. (under implementation)

Smart Grid Analysis Laboratory (SGAL) Comprised of a Power Lines Laboratory and a Renewable Energy Laboratory (under implementation)

Software Development. (under implementation).



## Diagnosis of Family and Productive Units not Serviced by the National Electric Network in the Western Region of Nicaragua.



In **2017** La Salle University of Technology “ULSA” began actions oriented to **diagnose social, economic, and environmental conditions of households and farms**, that are not being attended by the national commercial electric network. **This labor aims to cooperate in structuring alternatives for technical, economic and environmental solutions**, doing a joint work with key actors of civil society, and local governments, whom have collective interests as integral human development, environmental protection and conservation, and the improvement of rural families’ living conditions.

## General View of Nicaragua

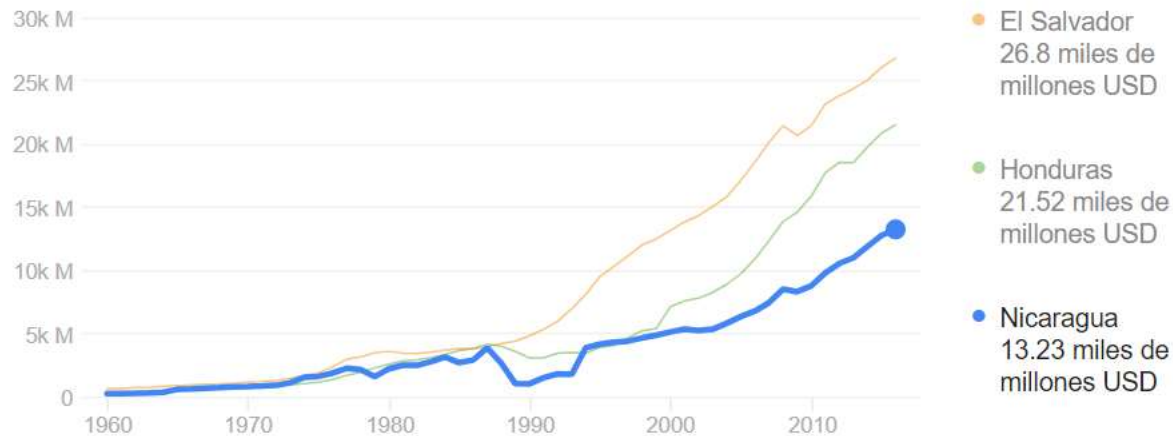


Population  
6 million



Annual GDP  
4.9%

13.23 miles de millones USD (2016)



Source: World Bank

Nicaragua's energy coverage is 90%, with rural communities receiving the least benefit.

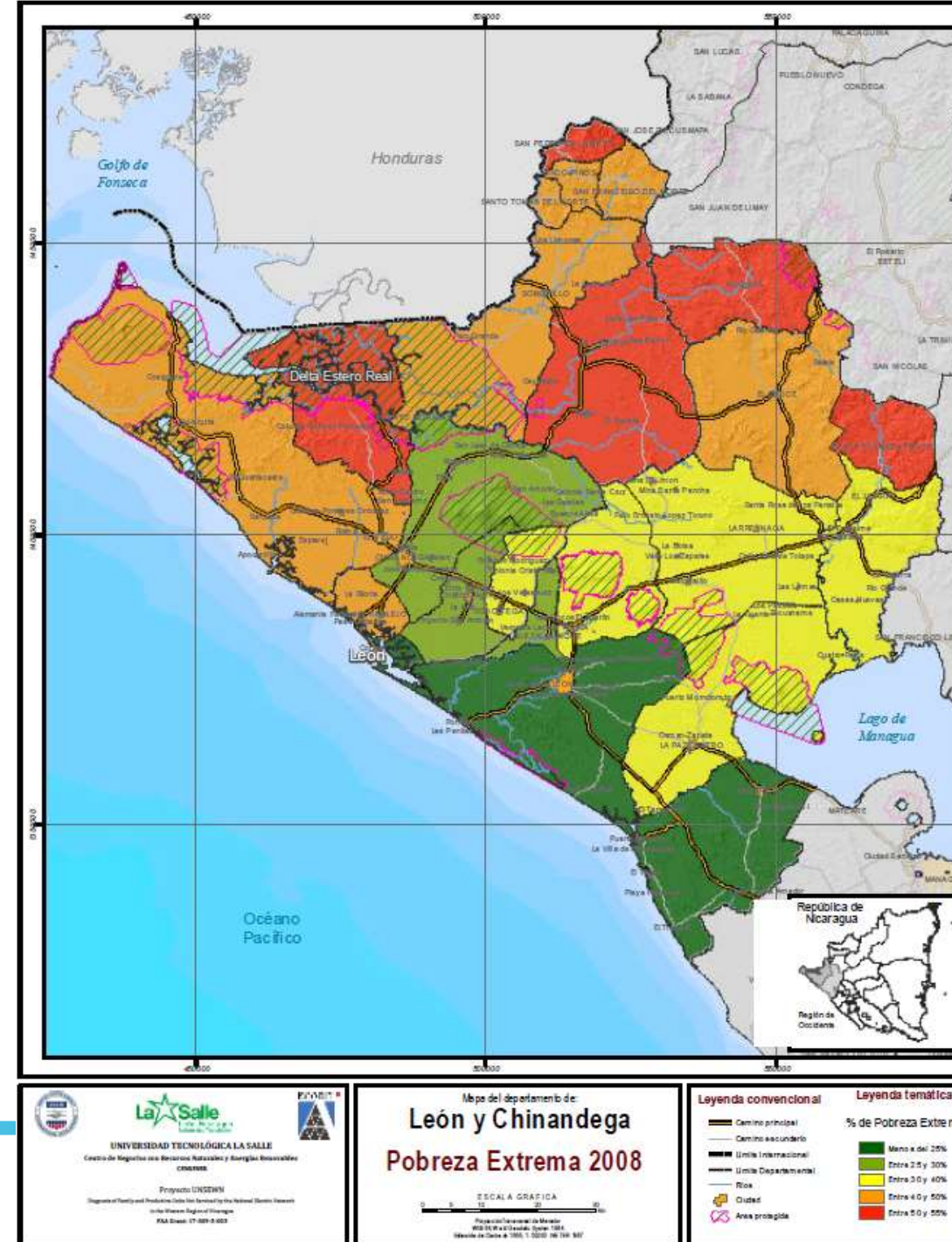
The rural areas of the country **mainly lack basic services such as education, health, energy, drinking water and transportation**. In addition, they develop **bad agricultural practices** that harm their own natural resources.

The Project **responds to one of the four pillars** of SeeForAll (sustainable sources, universal access, energy efficiency), which is the **universal access to electricity**.



## Study area

- 6,976 surveys carried out to rural productive units in the north-western part of the country.
- The survey found 3 population groups characterized by their access to electricity: a) **Legally Connected** (3,264 cases), b) **Irregularly Connected** (951 cases), c) **Disconnected from the Network** (2,761).
- Due to the characteristics of the property, 3 types of properties were found: a) **Houses** (4,399 cases), b) **Farms with Houses** (2,563 cases), and c) **Only Lots** (14).







# Findings



There is a significant number of families in the region that do not have access to electricity, there are farms that do not have this service either,

There is widespread concern among the population to ensure access to water for human, animal and productive consumption.

The economic capacities of these populations are limited,

It is a very big challenge to make these populations take off economically through the use of renewable generation systems.



## Findings

ULSA has started working to diagnose the conditions of access to energy in the rural areas of the north-west of Nicaragua, in this purpose different barriers were found such as:

- Pay the most expensive energy in Central America, **which opens the opportunity for the implementation of new alternative technologies in renewable energies.,**
- Deficiency in education and access to information on the efficient use of electric service.
- Renewable energies suffer from the stigma of destabilizing the electric transmission network, which is why we are currently working on the installation of the **Intelligent Networks laboratory to respond to this stigma by training simulating the integration of different energy sources into the energy sector. Nicaragua.**
- The government's efforts to reach its full coverage goals are creating distortions in energy costs for users, the rural user pays extremely low rates, and the urban population is extremely high, which has created a strong stagnation in development given the high cost of the tariff schedule, so **our projects are focused on studying alternative energy according to the real conditions of the communities in different areas of the country.**
- The use of electricity in the rural environment is entertainment and **lighting that is used for productive purposes, so that short-term investments in energy cannot be recovered.**

# Needs For the units productive

## Photovoltaic system

Electrification of housing  
Pumping water

## Hydraulic system

Water for human consumption (30 liters / person day).  
• Water for cattle consumption (20 liters / head per day).  
• Water for crop irrigation (depends on the extension and type of crop).

## Biogas system

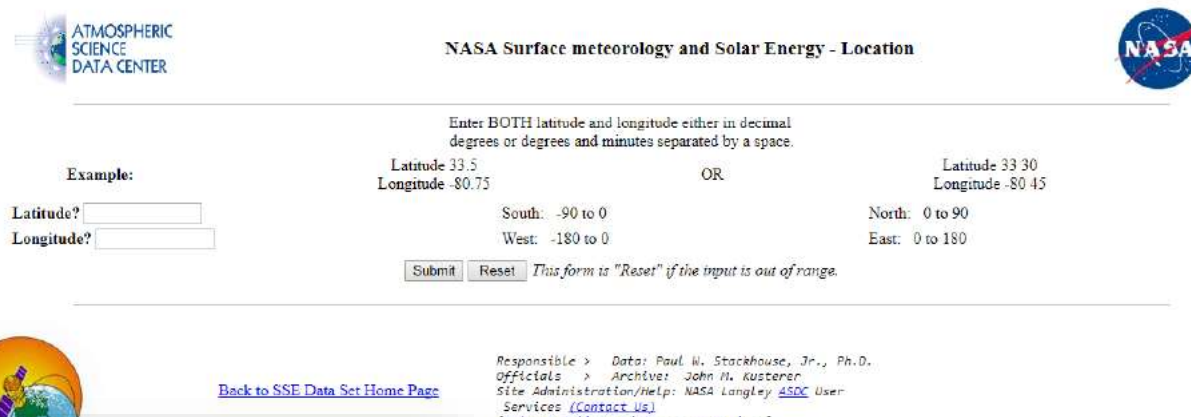
Housing electrification  
Use for cooking

# Generation of maps

## Use of GIS

<https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?email=skip@larc.nasa.gov>

Imagen 1. Perspectiva de la página de Meteorología de Superficie y Energía Solar



ATMOSPHERIC SCIENCE DATA CENTER

NASA Surface meteorology and Solar Energy - Location

Enter BOTH latitude and longitude either in decimal degrees or degrees and minutes separated by a space.

Example: Latitude 33.5 Longitude -80.75 OR Latitude 33 30 Longitude -80 45

Latitude?  South: -90 to 0 North: 0 to 90  
Longitude?  West: -180 to 0 East: 0 to 180

This form is "Reset" if the input is out of range.

[Back to SSE Data Set Home Page](#)

Responsible > Data: Paul W. Stockhouse, Jr., Ph.D.  
Officials > Archive: John M. Kusterer  
Site Administration/Help: NASA Langley [ASDC](#) User Services ([Contact Us](#))  
([Privacy Policy](#) and [Important Notices](#))  
Document generated on Wed Oct 18 16:11:09 EDT 2017

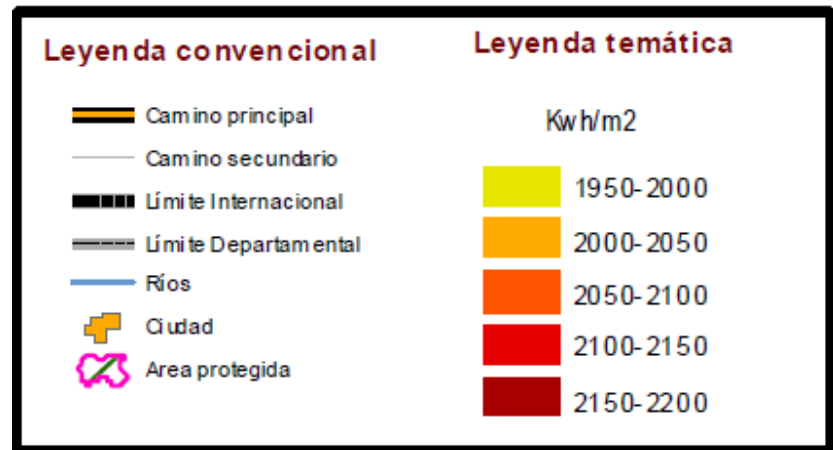
Lat 12.54 Lon -86.58	Ene	Feb	Mar	Abr	May	Jun	Jul	Ago	Sep	Oct	Nov	Dic	Promedio Anual
K	0.64	0.64	0.65	0.61	0.54	0.54	0.55	0.54	0.52	0.55	0.59	0.64	0.58
Difusa	1.32	1.51	1.67	2.00	2.20	2.16	2.15	2.20	2.15	1.88	1.53	1.27	1.84
Directa	7.11	7.09	7.33	6.41	5.10	5.11	5.22	5.03	4.61	5.15	6.10	6.98	5.93
Horizontal	5.50	6.00	6.61	6.42	5.66	5.57	5.66	5.65	5.29	5.21	5.19	5.29	5.67
Inclinada 12°	6.14	6.44	6.79	6.31	5.70	5.67	5.74	5.63	5.32	5.46	5.69	5.96	5.90

Tabla 1. Incidencia de radiación promedio mensual en (kWh / m<sup>2</sup> / día) en comunidad La Fuente, Municipio de Malpaisillo, Departamento León.

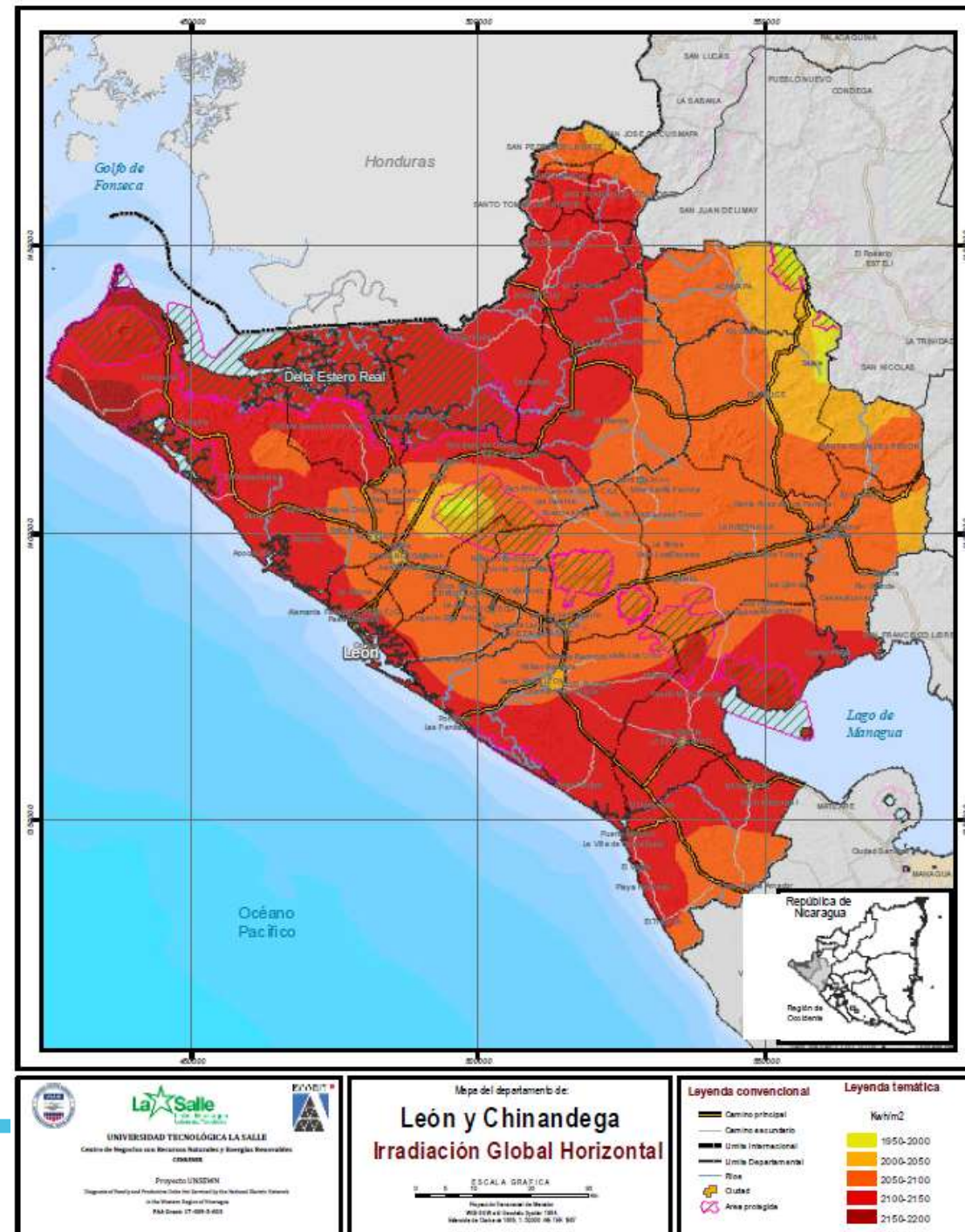


# Energy Potential Map

## Photovoltaic Solar Energy



Source: [cenrener.uls.edu.ni](http://cenrener.uls.edu.ni)

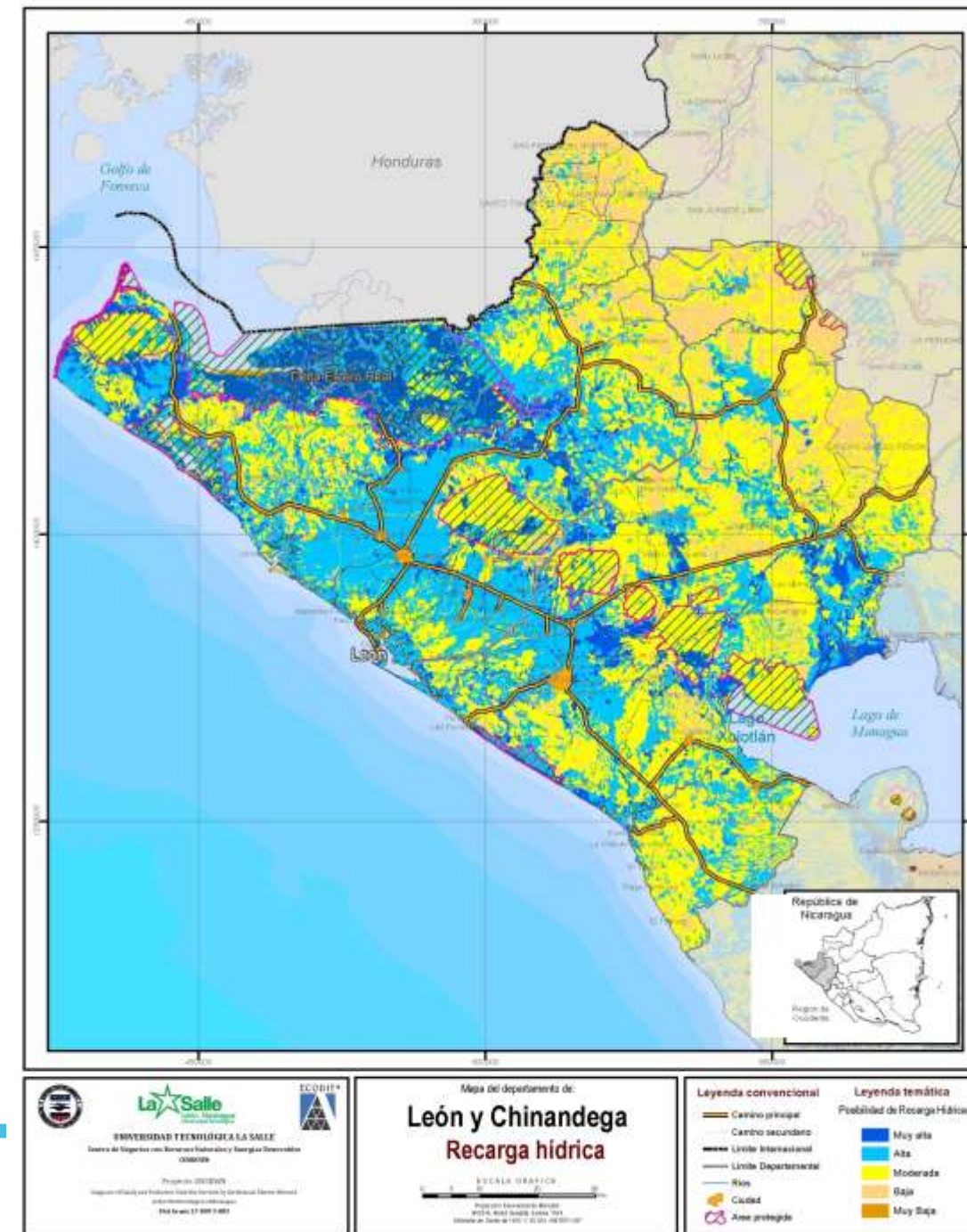


# Energy Potential Map

## Hydro power



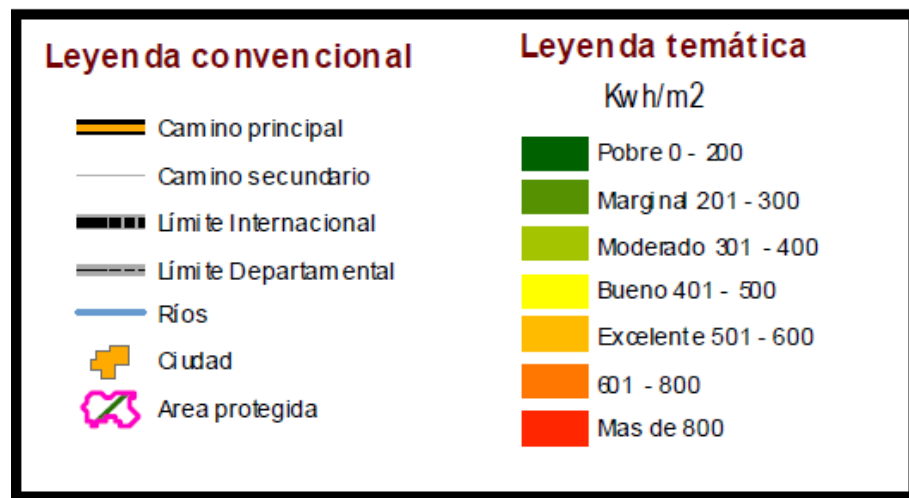
Source: [cenrener.ulsu.edu.ni](http://cenrener.ulsu.edu.ni)



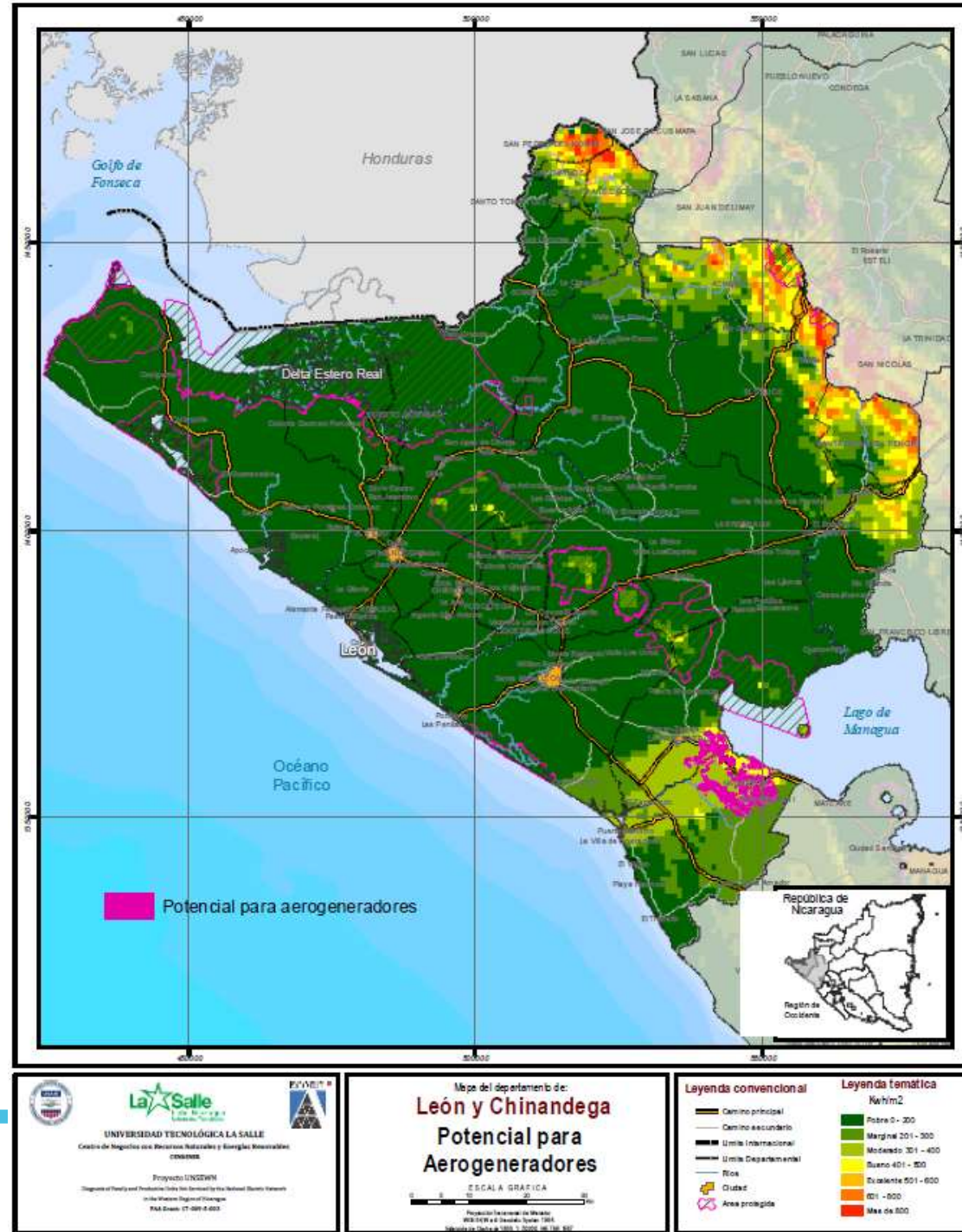


# Energy Potential Map

## Wind power



Source: [cenrener.ulsu.edu.ni](http://cenrener.ulsu.edu.ni)





# Other maps study

**Source:**  
*cenrener.uls.edu.ni*

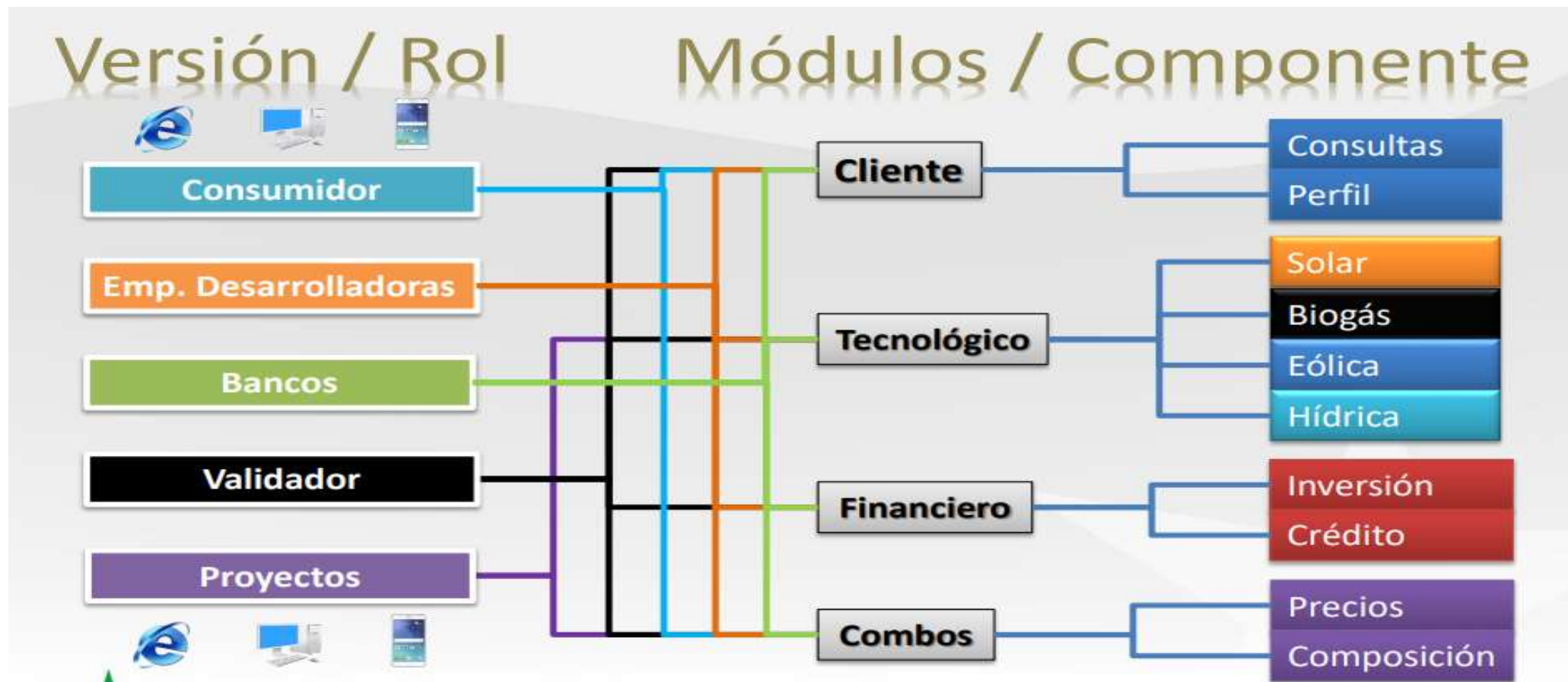


## New projects

To respond to the above, ULSA works on the execution of the following development projects:

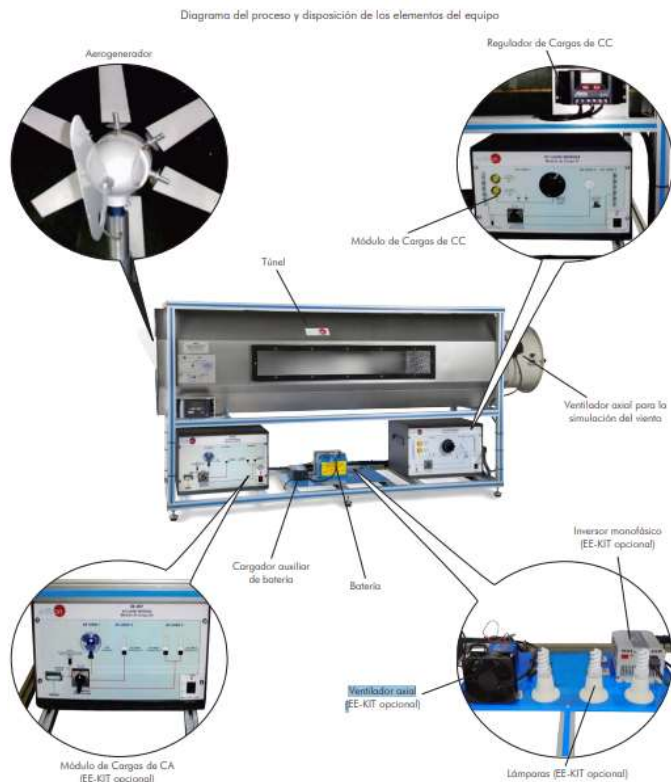
- **Democratization of knowledge** through access to electricity and training through **continuous training**.
- **Design and promotion of photovoltaic** projects accessible to all
- **Development of energy consumption analysis software** to reduce the costs of intermediation with service providers and banking.
- **Laboratory of renewable energies** to carry out diagnostics and capacities for different productive sectors of the country.
- **Smart grid, for the analysis** of the impacts of the incorporation of small renewable generation projects to the national electricity transmission lines.
- **Development of geothermal energy** storage initiative

# Valu-Sol Project

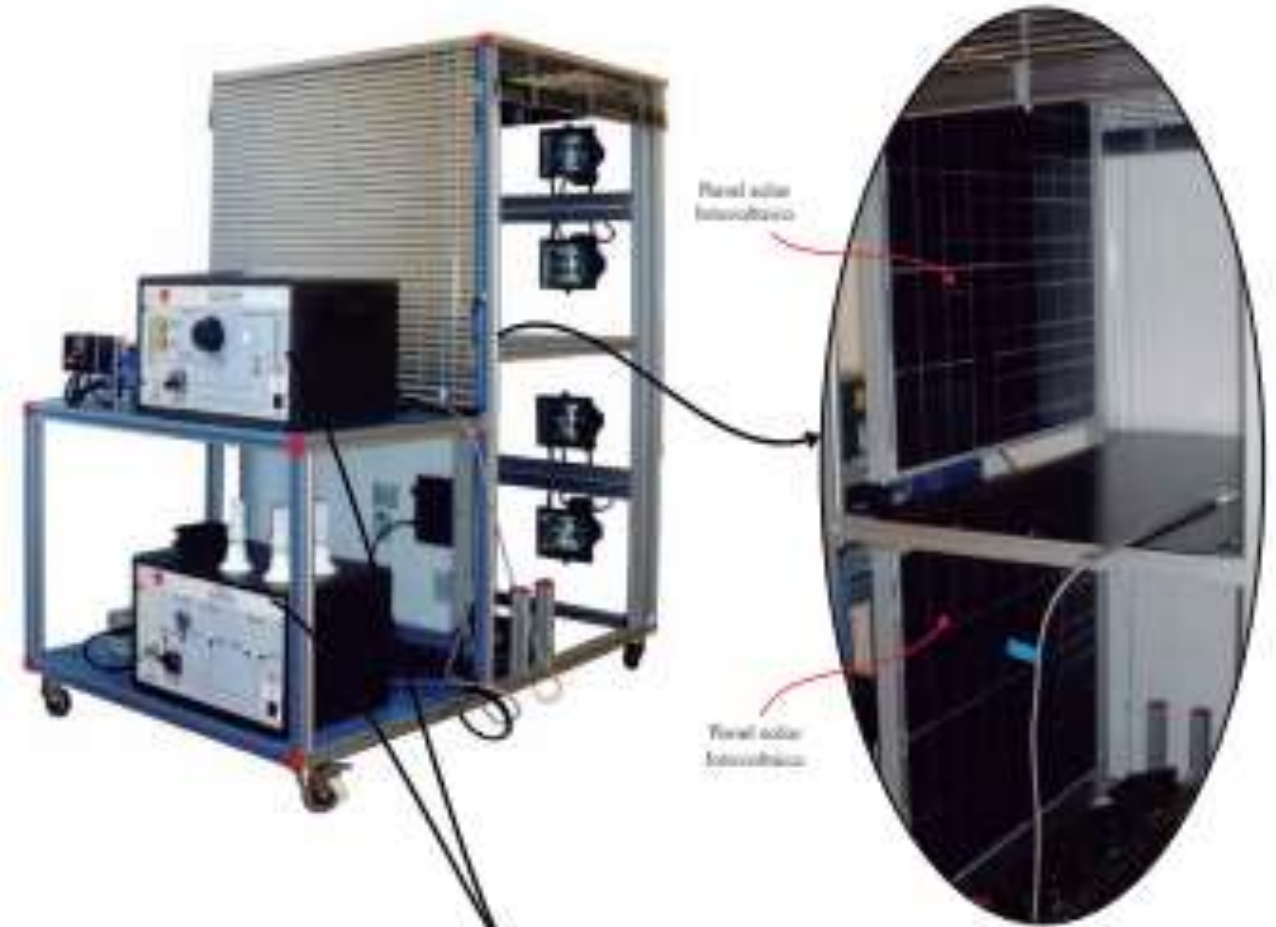




# Renewable energy simulation laboratory



**Wind power**



**Photovoltaic energy**

## Renewable energy simulation laboratory

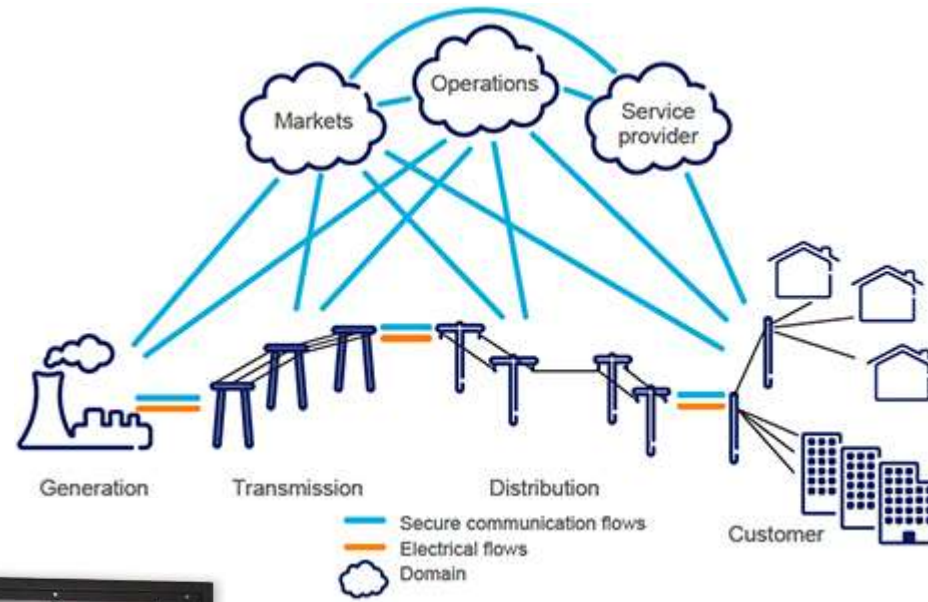


**Hydro power**



**Geothermal energy**

# Renewable energy simulation laboratory



Smart Grid



*Thank you very much!*

**SOMOS LASALLISTAS SIN FRONTERAS**

