



Ministério da Economia
e Emprego

Direção Nacional de Energia Indústria e Comércio



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Energy Information System in Cabo Verde: Present Situation and Future Perspective

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- Current Situation on Energy Statistics (where we are)
- Development of an Energy Information Management System

Introduction – Country Profile



- **Area:** 4.033 km²
- **Region:** West Africa
- **Islands:** 10 (9 inhabited)
- **Capital:** Praia
- **Population 2016:** ~ 530 931 (source: www.ine.cv)
- **GDP 2016:** 1320,9 milhões de Euros
- **GDP/capita 2016:** 2,487 mil Euros
- **Indigenous Energy Resources:** Solar, Wind, Geothermal, Wave and Biomass
- **Life Expectancy:** 76 years
- **Literacy Rate:** 88% for adults, 99% for young
- **Active Population with Medium/Higher Education:** ~ 15%
- **Poverty Rate:** ~25%
- **9 micro Energy Systems**

Introduction – Energy Profile

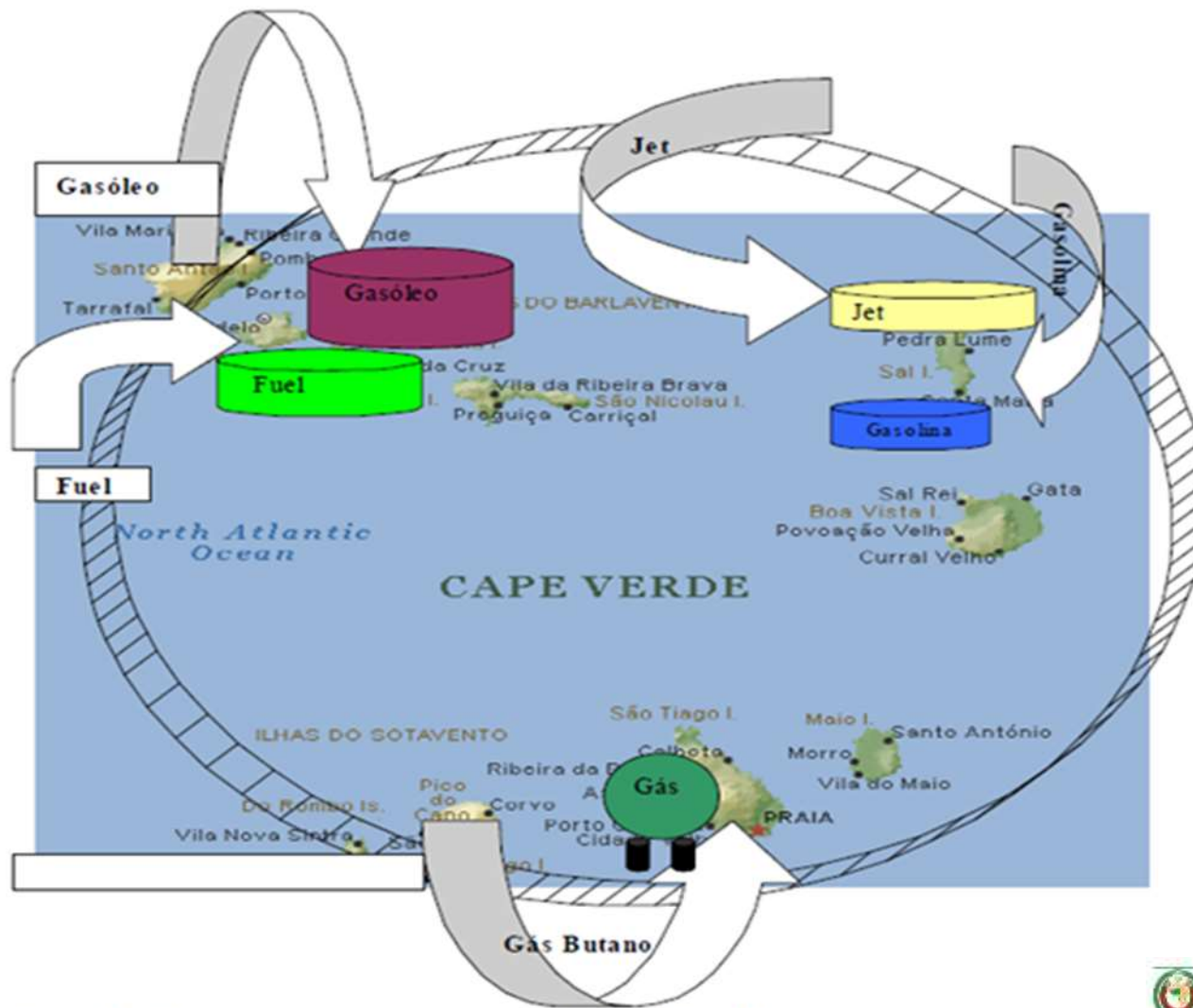
| Indicators | 2016 |
|--|-------|
| Total Primary Energy Supply (Ktep) | 214,5 |
| Energy Intensity (tep/ milhões Euros) | 162,4 |
| Net Production (GWh) | 443 |
| Installed Capacity (MW) | 176 |
| Electricity access (%) | 93 |
| Renewable energy penetration rate (%) | 19% |
| Installed Capacity renewable energy (MW) | 32 |

Current Situation Energy Statistics

- National Directorate of Energy, Industry and Commerce (DNEIC) is responsible for the collection, processing, validation and dissemination of energy information;
- DNEIC do not have a systematic energy information management systems implemented in the country;
- DNEIC collect data directly from regulated entities in the energy sector (electricity and fossil fuels);
- DNEIC collect data from other institutions such as: the National Institute of Statistics ; the Service Directorate of Forestry within the Ministry of Environment; and other state institutions;

Energy Systems : Refined Fuel

Complex System of Fuel Import and Distribution

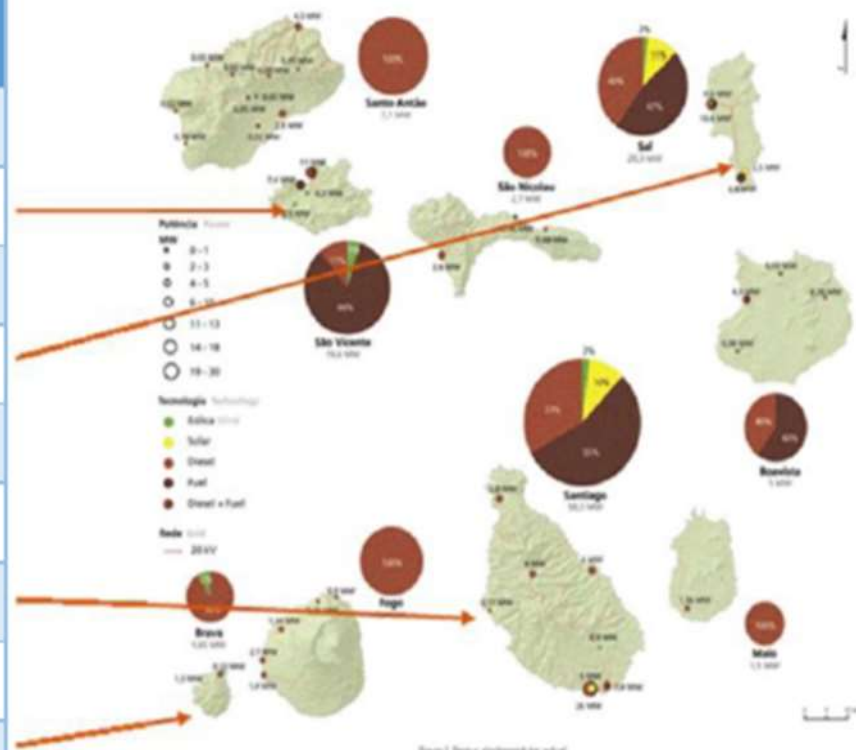


Energy Systems : Power Sector

Population and Electricity Supply in the Nine CV Islands

| Installed Capacity (MW) | Population | 2010 | 2016 |
|-------------------------|------------|------|------|
| Santo Antão | 43915 | 6 | 8,4 |
| São Vicente | 76107 | 19,4 | 32,8 |
| São Nicolau | 12817 | 2,2 | 4,1 |
| Sal | 25765 | 16,9 | 25,3 |
| Boavista | 9162 | 4,5 | 16,4 |
| Maio | 6952 | 1,4 | 1,6 |
| Santiago | 273919 | 46,9 | 80,5 |
| Fogo | 37051 | 3,8 | 5,1 |
| Brava | 5995 | 1,1 | 1,1 |

Generation installed capacity in 2011 (in: Cabo Verde Action Plan 2010-2020)



NOT SUSTAINABLE

**MAINLY FROM DIESEL
(GHG)**

**AFFORDABILITY
(30 Cents €/kWh include Taxes)**

Energy Systems : Data Collected

Energy Statistics

Sectors



Refined fuel products



Electricity

Example of types Data collected

- Import of Refined fuel products;
- International Marine Bunkers
- International Aviation Bunkers
- Fuel consumption by sector;
- Stock change and storage capacity;
- Internal consumption;
- Etc;
- Energy production;
- Consumption by sector;
- Energy losses;
- Internal consumption;
- Installed capacities;
- Technical specification of assets;
- Etc

Energy Systems : Data Collected

Energy Statistics

Renewable Energy



Example of types Data collected

- Energy production;
- Capacities;
- Technical data;
- Load Curves;

- Firewood production;
- coal production;

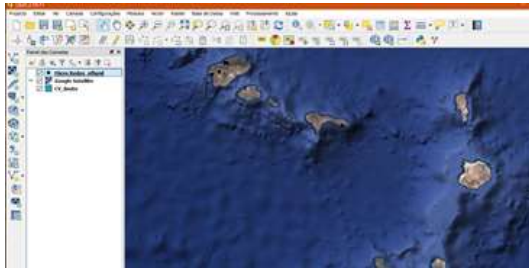
Energy Systems : Data Collected

Energy Statistics

Sectors



Energy Efficiency



Geo-referencing Systems
Open Source QSIG

Example of types Data collected

data are not collected

Future: Project PEEE (2017-2019)

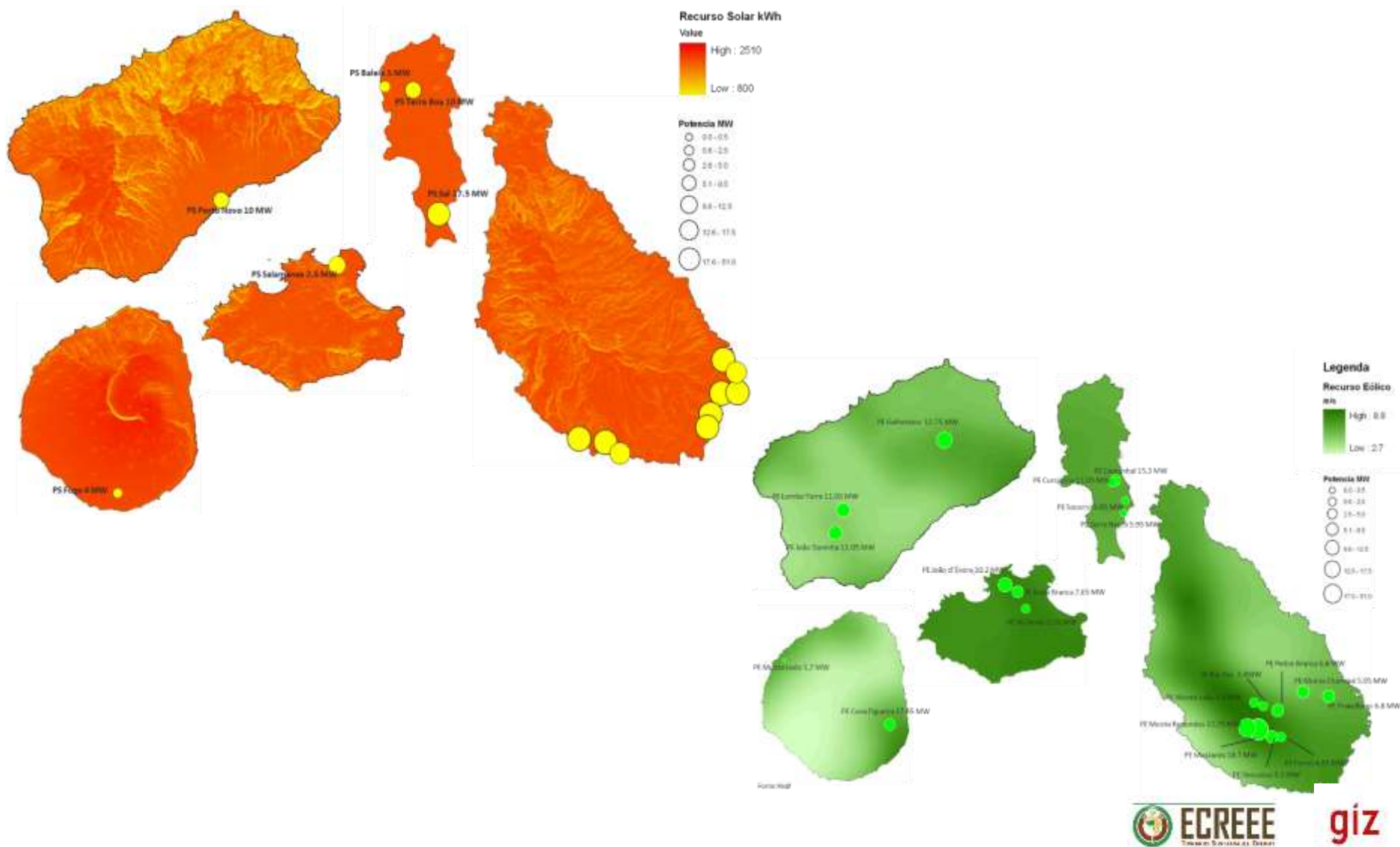
- Improving the legislative framework
- Creating Energy Etiquette and Labeling
- Replication and dissemination of best practices and lessons learned

Coordinates of Energy infrastructures:

- Power plants;
- Fuel stations;
- Micro grid
- Etc

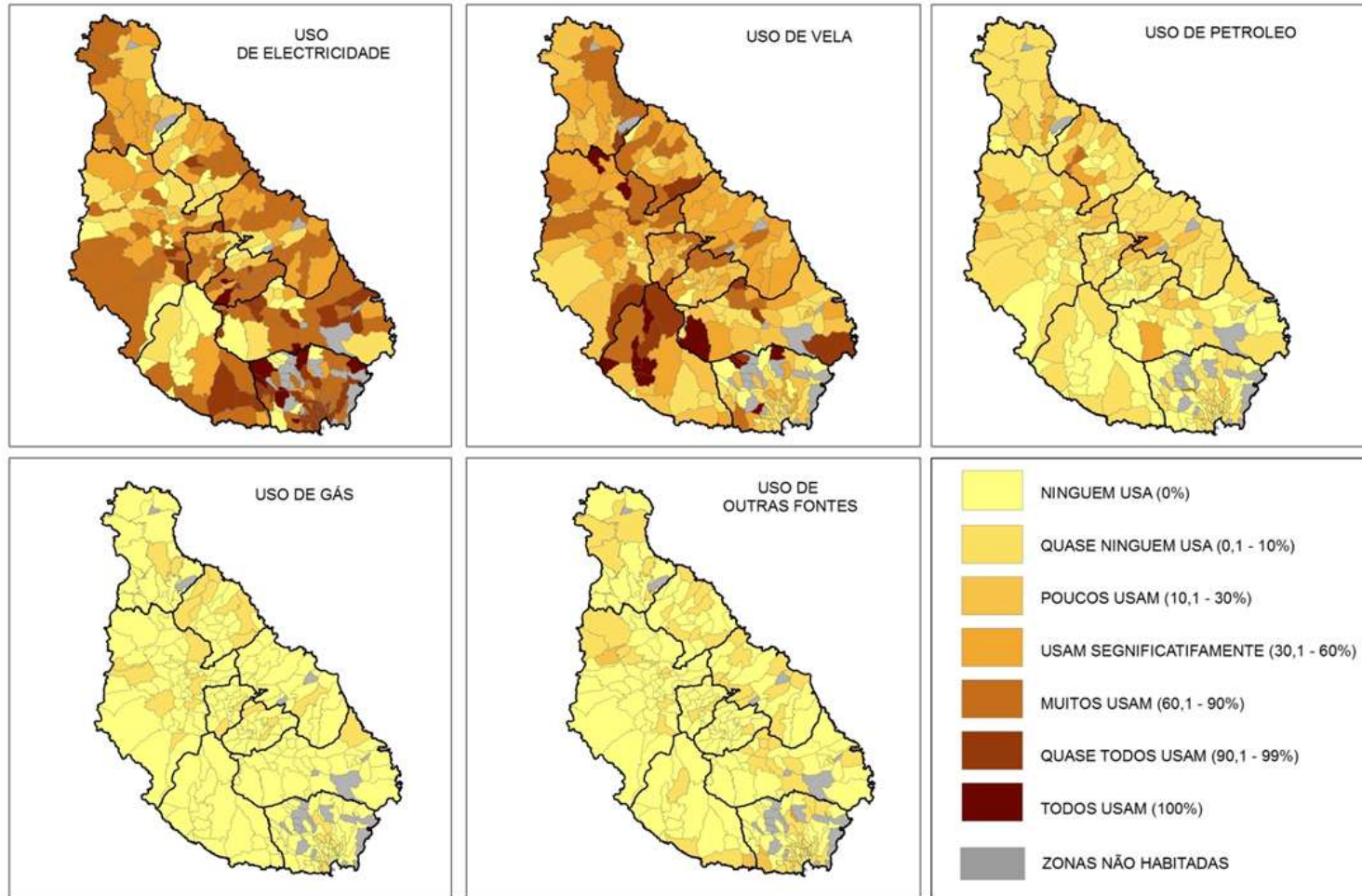
Energy Systems : Available Data

Geographical Information System: Renewable Resources



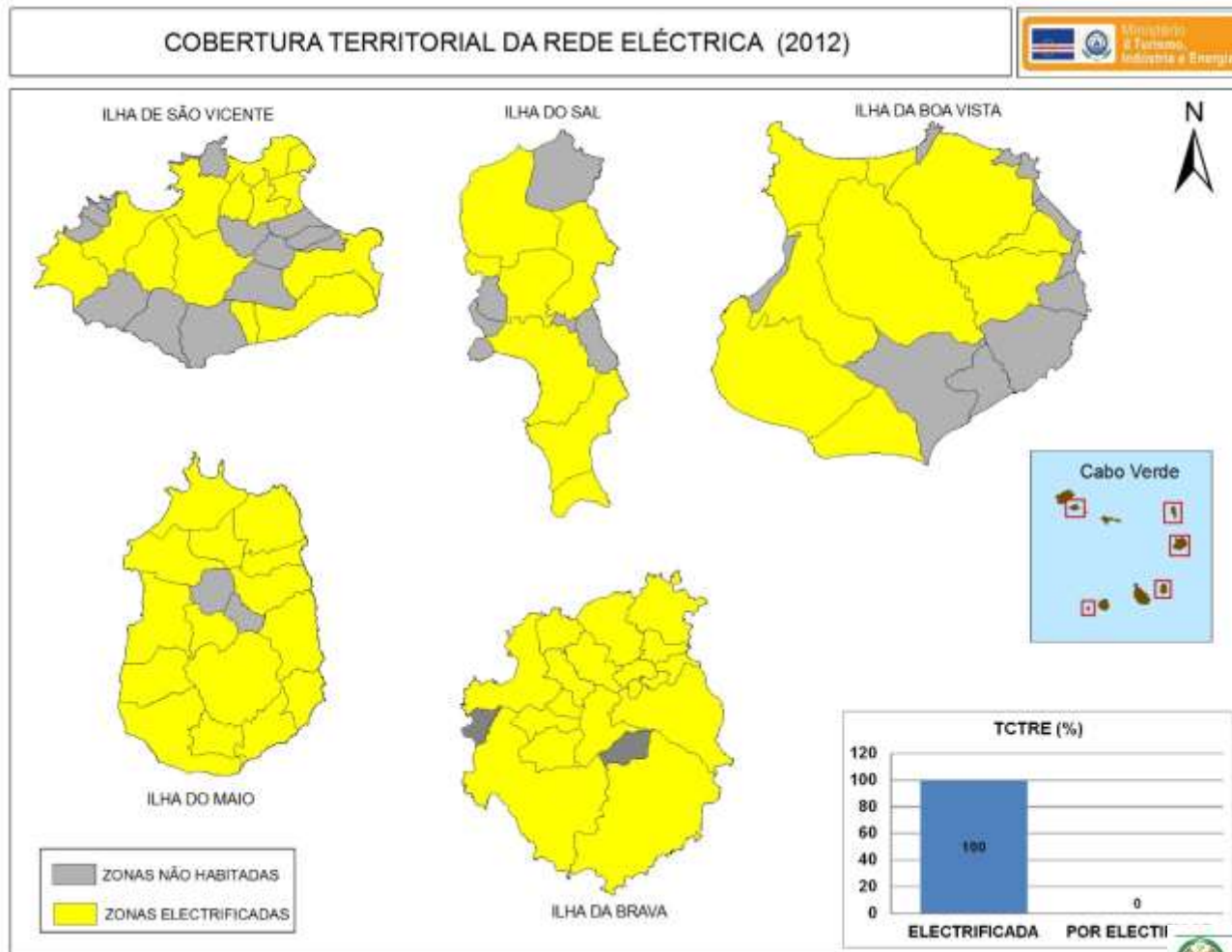
Energy Systems : Available Data

Geographical Information System: Spatial Distribution of Energy Use



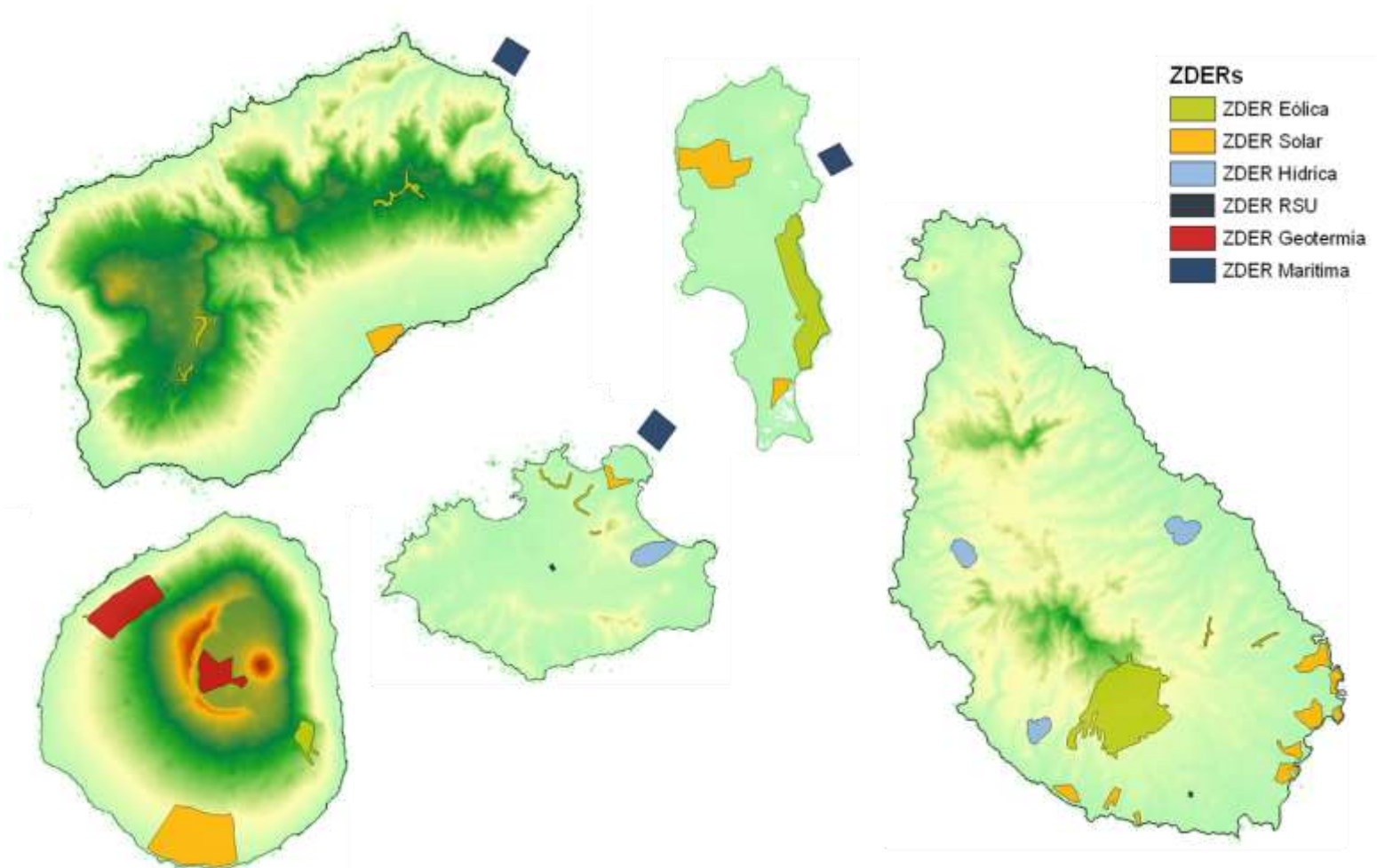
Energy Systems : Available Data

Geographical Information System: Spatial Distribution of Electrification



Energy Systems : Available Data

Geographical Information System: Zones for Renewable Implementation



Fonte: Gesto Energia

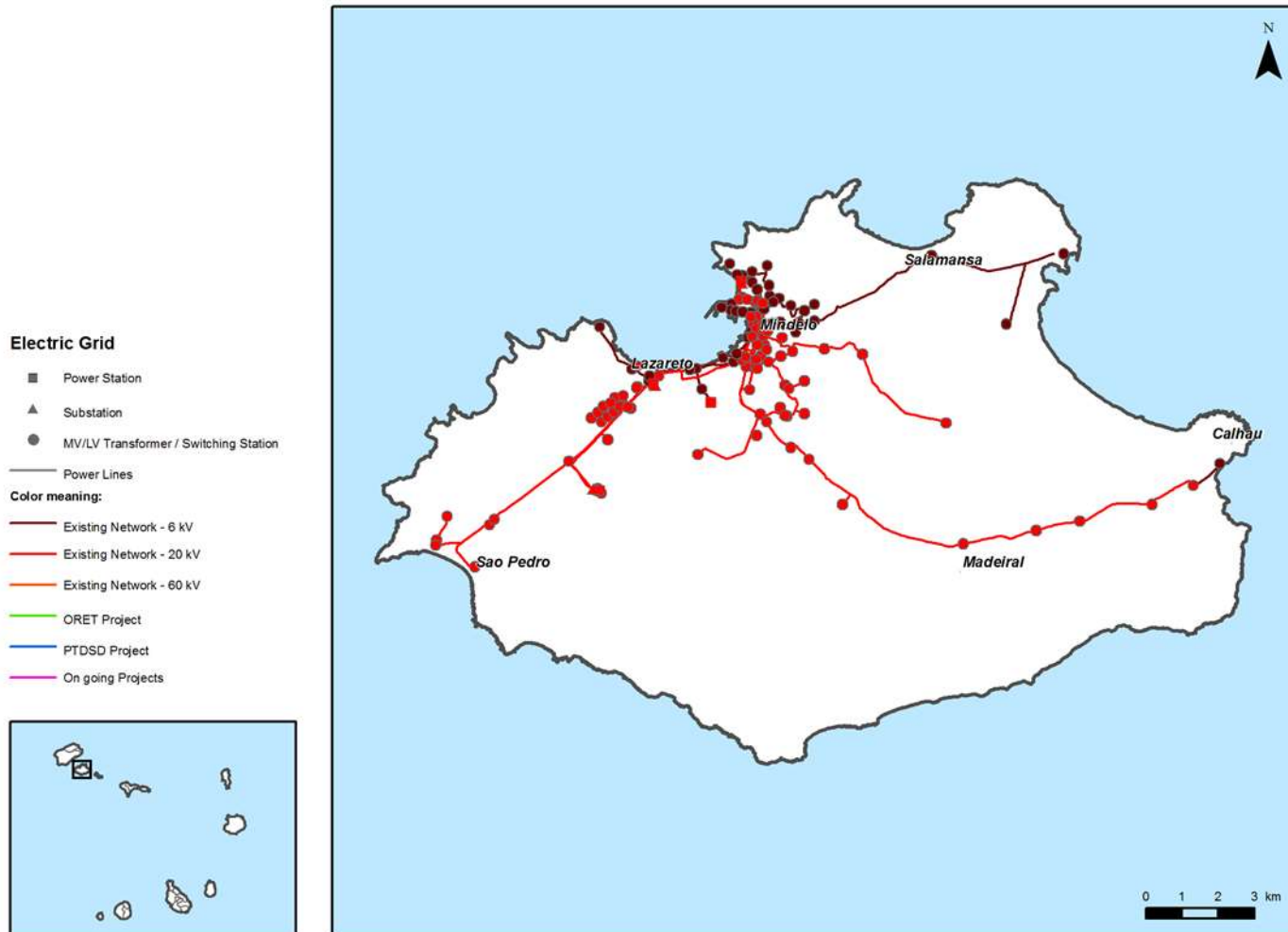
Energy Systems : Available Data

Geographical Information System: Small RE Systems



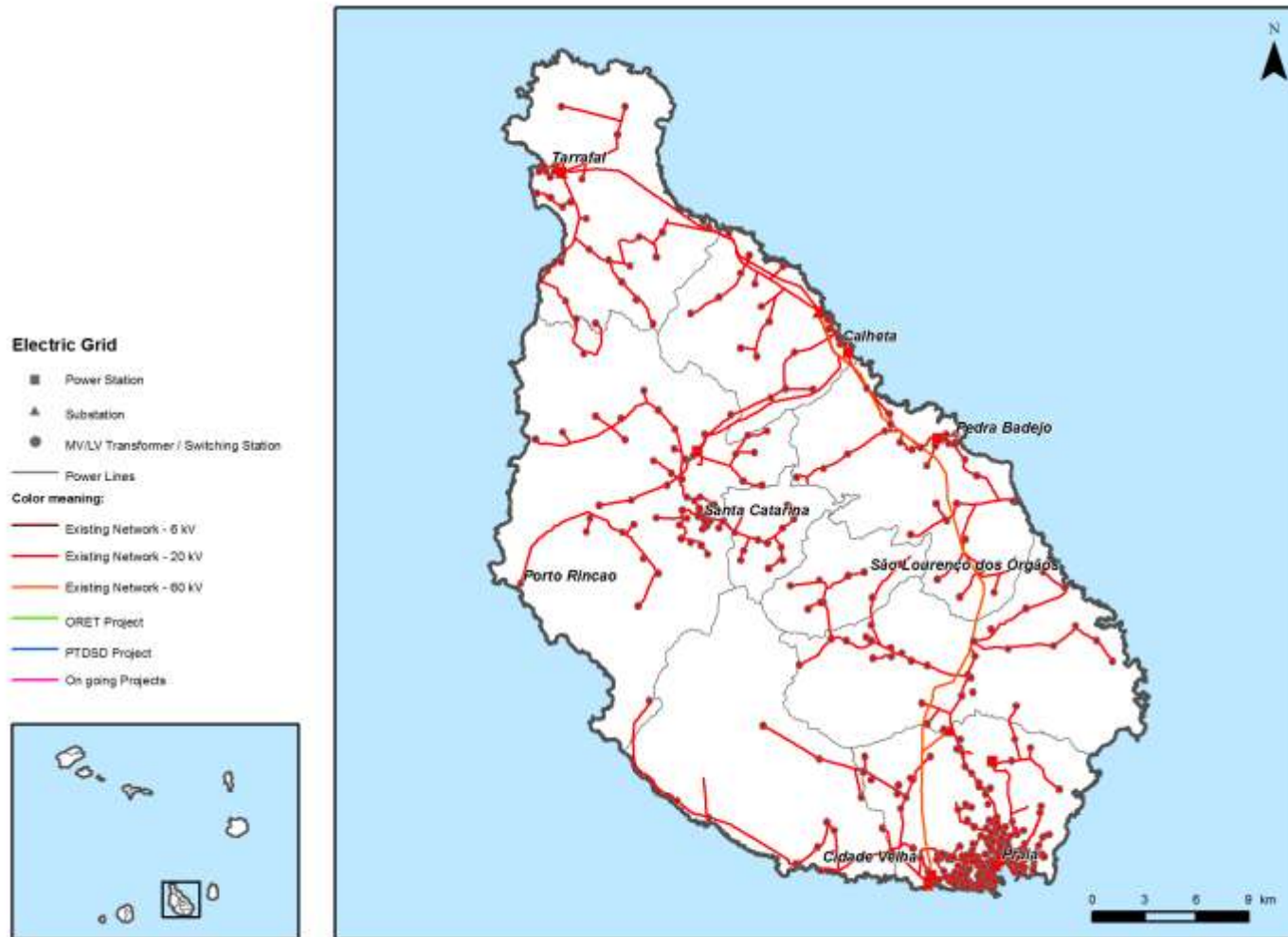
Energy Systems : Available Data

Geographical Information System: Power Grid Infrastructure – São Vicente



Energy Systems : Available Data

Geographical Information System: Power Grid Infrastructure - Santiago



Energy Statistics Purpose: Energy Balance

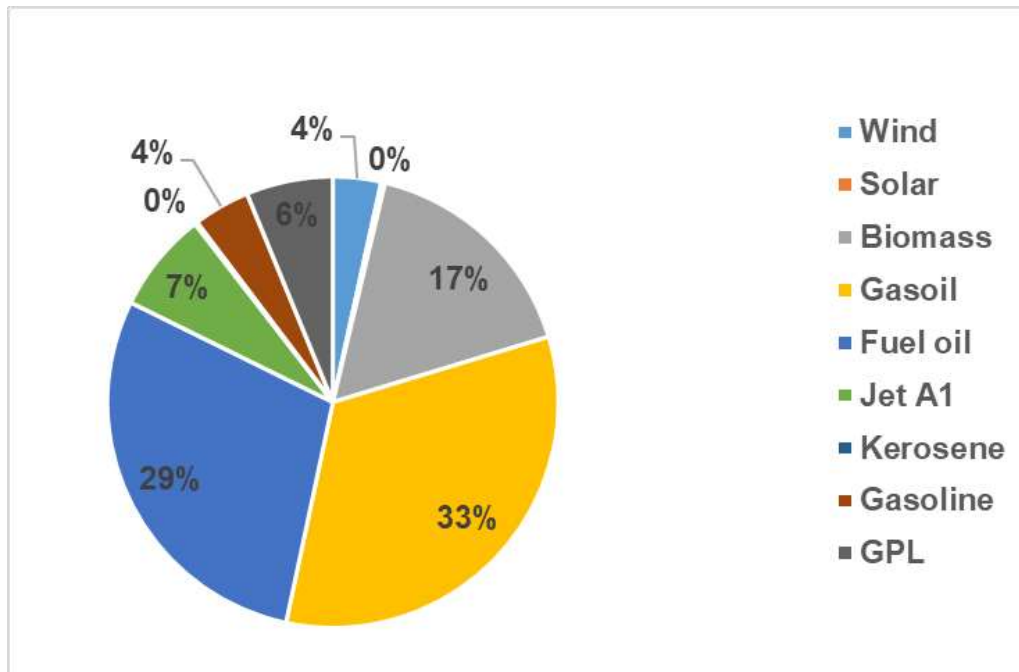
Energetic balance

| Balanço Energético Cabo verde 2015 (Tep) | Eólica | Solar | Lenha | Gasóleo | Fuel Oléo | Jet A1 | Petróleo | Gasolina | Butano | Electricidade | Carvão | Total |
|--|--------|-------|--------|---------|-----------|--------|----------|----------|--------|---------------|--------|---------|
| Produção | 6 779 | 538 | 32 605 | | | | | | | | | 39 921 |
| Importação | | | | 107 146 | 108 218 | 71 016 | 374 | 7 998 | 12 222 | | | 306 974 |
| Variação Stock | | | | | | | | | | | | 0 |
| Marinha Internacional | | | | 42 254 | 51 335 | | | | | | | 93 589 |
| Aviação Internacional | | | | | | 56 804 | | | | | | 56 804 |
| Oferta Interna bruta | 6 779 | 538 | 32 605 | 64 892 | 56 883 | 14 211 | 374 | 7 998 | 12 222 | 0 | 0 | 196 502 |
| Transformação - Térmica | | | | -11 589 | -54 039 | | | | | 28 854 | | -36 774 |
| Transformação - Eólica + solar | -6 779 | -538 | | | | | | | | 7 316 | | 0 |
| Transformação - Carvoarias | | | -642 | | | | | | | | 642 | 0 |
| Uso interno | | | | | | | | | | -1 645 | | -1 645 |
| Perdas | | | | | | | | | | -8 342 | -182 | -8 524 |
| Total de transformação | -6 779 | -538 | -642 | -11 589 | -54 039 | 0 | 0 | 0 | 0 | 26 183 | 460 | -46 943 |
| Consumo final | 0 | 0 | 31 963 | 53 303 | 2 844 | 14 211 | 374 | 7 998 | 12 222 | 26 183 | 460 | 149 559 |
| Transporte | | | | 40 414 | 0 | 14 211 | 0 | 7 998 | | | | 62 623 |
| Terrestre | | | | 36 029 | | | | 7 998 | | | | 44 027 |
| Aéreo | | | | | | 14 211 | | | | | | 14 211 |
| Marítimo | | | | 4 384 | | | | | | | | 4 384 |
| Dessalinização | | | | | | | | | | 2 288 | | 2 288 |
| Indústria | | | | 10 994 | 2 844 | | | | | 2 156 | | 15 994 |
| Residencial | | | 31 963 | | | | 374 | | 8 381 | 12 936 | | 53 654 |
| Comércio, Serviços e Adm. Pública | | | | 1 896 | | | | | 3 841 | 6 468 | 460 | 12 666 |

Energy Statistics Purpose: Energy Balance

Total Primary Energy Supply 2015 (tep)

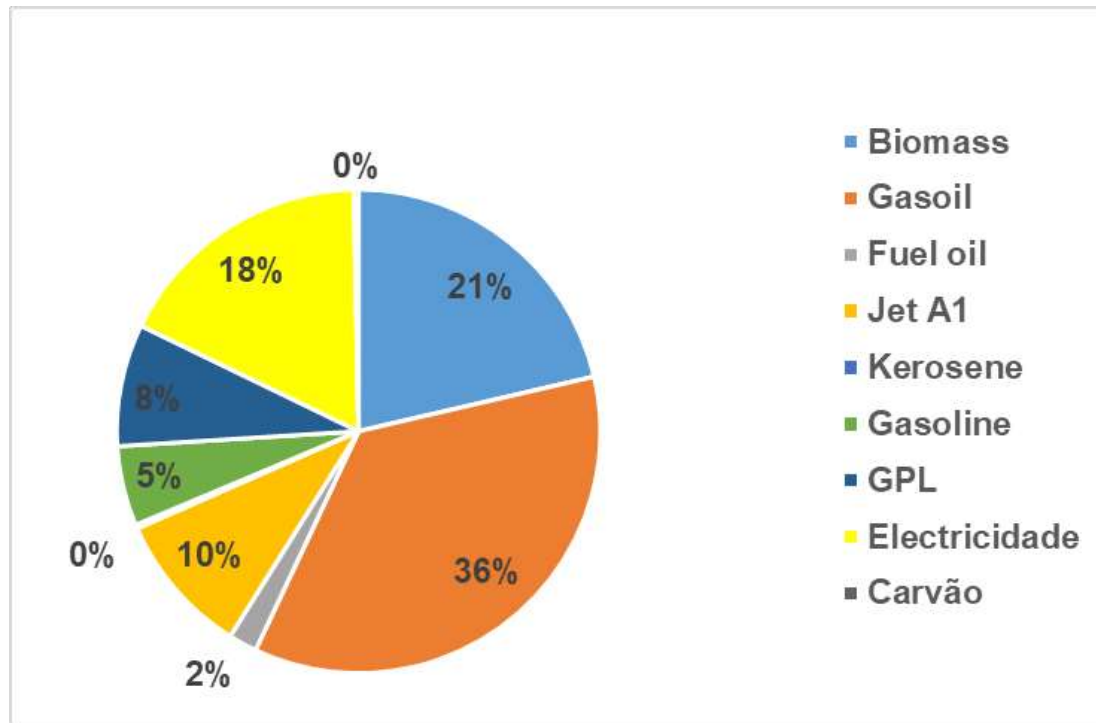
| Wind | Solar | Biomass | Gasoil | Fuel oil | Jet A1 | Kerosene | Gasoline | GPL | Total |
|-------|-------|---------|--------|----------|--------|----------|----------|--------|---------|
| 6 779 | 538 | 32 605 | 64 892 | 56 883 | 14 211 | 374 | 7 998 | 12 222 | 196 502 |



Energy Statistics Purpose: Energy Balance

Final Consumption 2015 (tep)

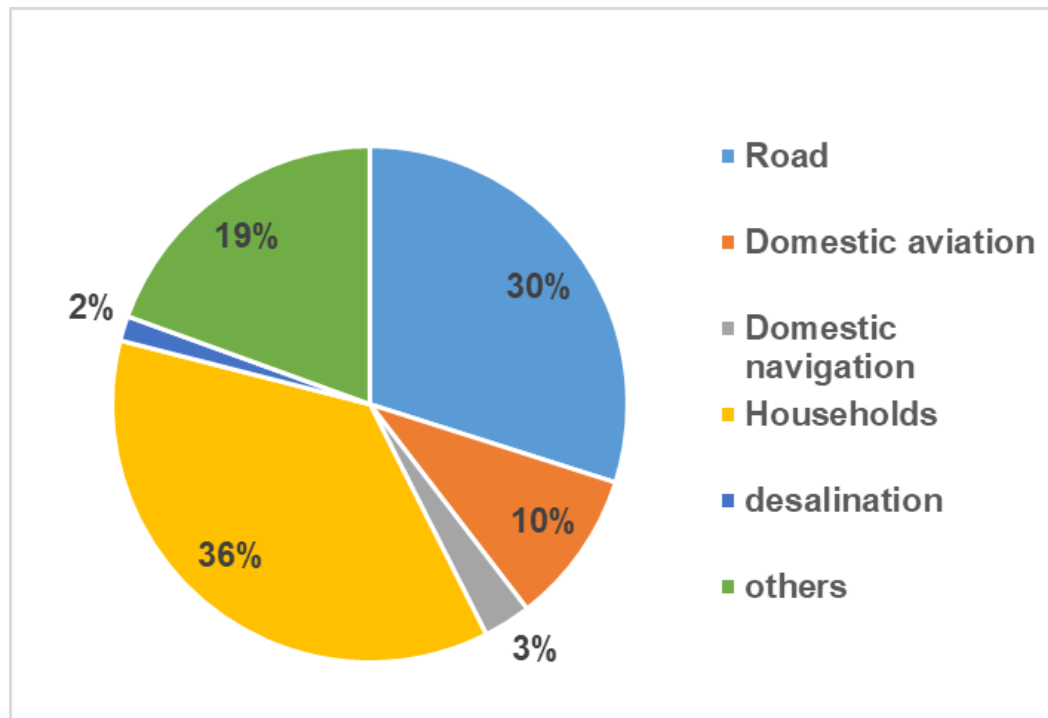
| Biomass | Gasoil | Fuel oil | Jet A1 | Kerosene | Gasoline | GPL | Electricidade | Carvão | Total |
|---------|--------|----------|--------|----------|----------|--------|---------------|--------|---------|
| 31 963 | 53 303 | 2 844 | 14 211 | 374 | 7 998 | 12 222 | 26 183 | 460 | 122 916 |



Energy Statistics Purpose: Energy Balance

Final Consumption by sectors 2015 (tep)

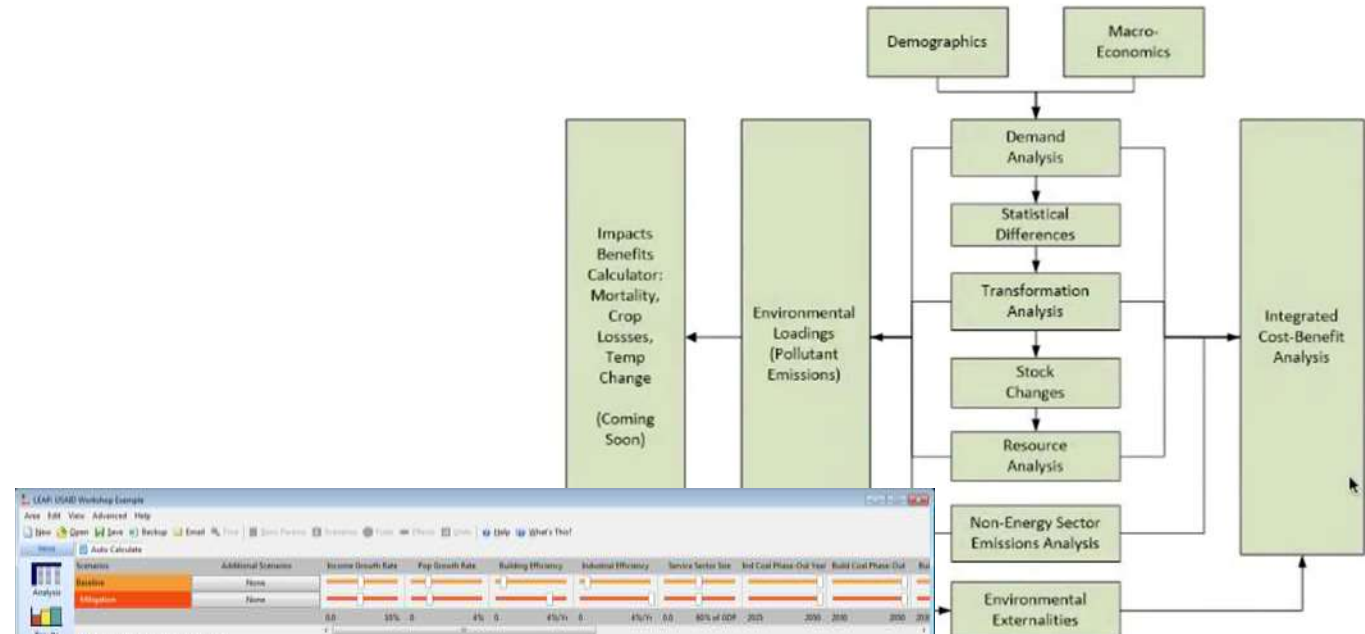
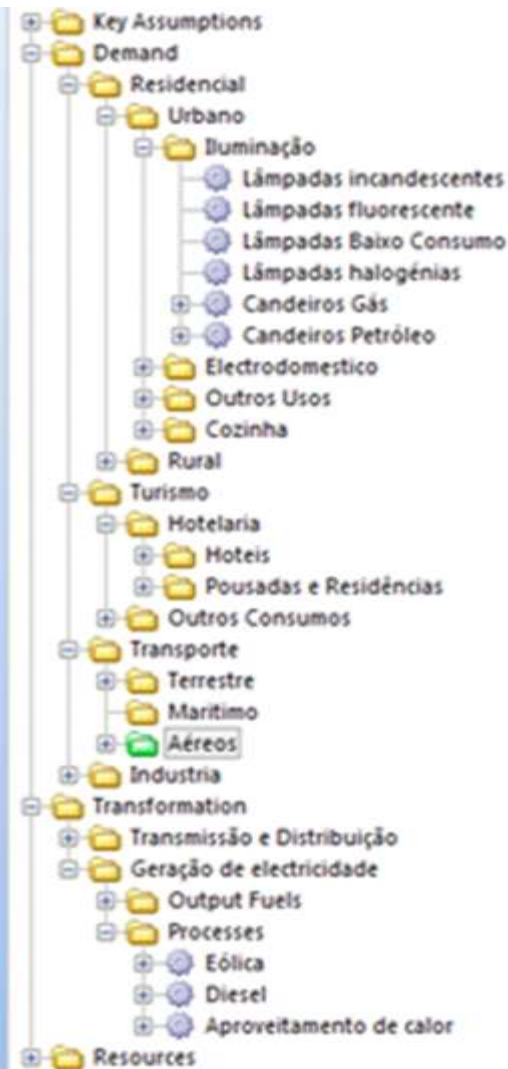
| Road | Domestic aviation | Domestic navigation | Households | desalination | others | Total |
|--------|-------------------|---------------------|------------|--------------|--------|---------|
| 44 027 | 14 211 | 4 384 | 53 654 | 2 288 | 28 659 | 147 224 |



Energy Statistics Purpose: Energy Planning

Prepare to Use LEAP Software for Energy Planning

LEAP Structure



Energy Statistics Purpose: CO2 Emissions

Estimation of Greenhouse Gas Emissions in Energy - Using the IPCC Inventory

Software and the 2006 Guidelines

IPCC Inventory Software - Marizia - [Worksheets]

Application Database Inventory Year Worksheets Reports Tools Export/Import Administrate Window Help

2006 IPCC Categories

- 1 - Energy
 - 1.A - Fuel Combustion Activities
 - 1.A.1 - Energy Industries
 - 1.A.1.a - Main Activity Electricity and Heat Production
 - 1.A.1.a.i - Electricity Generation**
 - 1.A.1.a.ii - Combined Heat and Power Generation
 - 1.A.1.a.iii - Heat Plants
 - 1.A.1.b - Petroleum Refining
 - 1.A.1.c - Manufacture of Solid Fuels and Other Energy Industries
 - 1.A.1.c.i - Manufacture of Solid Fuels
 - 1.A.1.c.ii - Other Energy Industries
 - 1.A.2 - Manufacturing Industries and Construction
 - 1.A.2.a - Iron and Steel
 - 1.A.2.b - Non-Ferrous Metals
 - 1.A.2.c - Chemicals
 - 1.A.2.d - Pulp, Paper and Print
 - 1.A.2.e - Food Processing, Beverages and Tobacco
 - 1.A.2.f - Non-Metallic Minerals
 - 1.A.2.g - Transport Equipment
 - 1.A.2.h - Machinery
 - 1.A.2.i - Mining (excluding fuels) and Quarrying
 - 1.A.2.j - Wood and wood products
 - 1.A.2.k - Construction
 - 1.A.2.l - Textile and Leather
 - 1.A.2.m - Non-specified Industry
 - 1.A.3 - Transport
 - 1.A.3.a - Civil Aviation
 - 1.A.3.a.i - International Aviation (International)
 - 1.A.3.a.ii - Domestic Aviation
 - 1.A.3.b - Road Transportation
 - 1.A.3.b.i - Cars

Fuel Combustion Activities

Worksheet: Energy
 Sector: Fuel Combustion Activities
 Category: 1.A.1.a.i - Electricity Generation
 Sheet: CO2, CH4 and N2O from fuel combustion by source categories - Tier 1

Data

Fuel Type: (All fuels) Conversion Factor Type: NCV

| Fuel | Energy Consumption | | | CO2 | | CH4 | | N2O | | |
|--------------|--|---|-------------------------------------|---|-------------------------------------|---|---|---|---|----------------|
| | A Consumption (Mass, Volume or Energy Unit) | B Conversion Factor (TJ/Unit) (NCV) | C Consumption (TJ) (C=A*B) | D CO2 Emission Factor (kg CO2/TJ) | Z Amount Captured (Gg CO2) | F CH4 Emission Factor (kg CH4/TJ) | G CH4 Emission (Gg CH4) G=C*F/10 ⁶ | H N2O Emission Factor (kg N2O/TJ) | I N2O Emission (Gg N2O) I=C*H/10 ⁶ | |
| Gas/Diese... | 18,91636 | Gg | 41,4 | 783,1... | 74100 | 58... | 3 | 0,0... | 0,6 | 0,0... |
| Residual... | 52,09156 | Gg | 39,8 | 2073... | 77400 | 160... | 3 | 0,0... | 0,6 | 0,0... |
| * | | Gg | | | | | | | | |
| Total | | | | 2856,3 | | 218,499 | | 0,00857 | | 0,00171 |

Time Series data entry... Delete selected

2006 IPCC Guidelines

Worksheet remarks

1.A.1.a.i - Time Series

Emissions (Gg CO2 Equivalents)

Current Situation Energy Statistics

Challenges

- Poor data collection;
- Lack of appropriate framework;
- Poor institutional capacity;
- Unavailable data;
- Little iteration between the different institutions;
- Little legislation on energy statistics

Development of an Energy Information Management System

Energy Information Management System (EIMS)

Energy statistics is a powerful tool to monitor changes in energy production and use; inform debates; and provide a wider understanding of energy sector, and as a result, it can reveal system weaknesses, the need for interventions and opportunities or improvements/investments.

On this basis, the DNEIC of Cabo Verde with the support of the Renewable Energy Sector Support Program **financed by the Luxembourg Development Cooperation** has commissioned a consultancy service to support the design, development, and implementation of a comprehensive Energy Information Management System.

Energy Information Management System (EIMS)

Objective of the EIMS:

Provide data, to support evidence base policies and decisions to transition to a secure, efficient and sustainable energy sector, reducing the country's dependence on imported refined fossil fuels while ensuring universal access and energy security.

EIMS will also intended to improve DNEIC's organizational capabilities, productivity, responsiveness, efficiency and communication with other stakeholders in the energy sector as a whole.

EIMS: 1st study

Q1+Q2
2018

Stages

Diagnostic

- Existing information systems;
- Data flow in the energy sector;
 - interrelated sectors;
- Characterization the current situation,

Energy Information Management Strategic Plan

- Establish a common vision
- Prioritize strategic objectives and actions
- Identify Stakeholders and responsibilities
- Define monitoring and Evaluation Principles

Conceptual Design, Information Architecture

Defines the scope of system

Preparation of the Supporting Documents

- ToR for the implementation of the EIMS;
- Necessary Legal and Documents;
- Monitoring and Evaluation Plan

Development of a Roadmap for the Implementation of the EIMS

- Defines targets and expected results;
- Identification of all documentation needs and responsibility;
- Technical support needs;

EIMS: Implementation starting

Inicio Q3
2018

This first study will **inform** the next phase of the process which is to actually commission a service to build the system.

This work will continue into 2019.

Obrigada!

Merci pour votre attention.

Thank you for your attention

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