Clean Air VI Conference
Workshop on Clean Development Mechanism

"THE CLEAN DEVELOPMENT MECHANISM" A FRAMEWORK FOR CO-OPERATION WITH DEVELOPING COUNTRIES

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OBJECTIVES OF TH PRESENTATION

To show how CDM may:

- ⇨ help Europe to fulfil the Kyoto Targets.
- ⇨ promote European investment opportunities.
- ⇨ enable European industry to disseminate European clean technologies in Developing Countries.
- ⇨ attract the interest of investors, banks, private sectors and donors.
- ⇨ raise public awareness for the successful implementation of the Kyoto requirements.

CONTENTS

- The United Nations Framework Convention on Climate Change and the Kyoto Protocol.
- The current status of the negotiation process.
- The Kyoto Protocol Flexible Mechanisms.
- The Clean Development Mechanism.
- The strategy to implement CDM in Developing Countries:
    - Small Island Developing Country special case: Cape Verde, Islands of Santo Antão and Santiago;
    - Least Developed Country special case: Mozambique, South-Eastern Africa;
    - Developing Country special case: Brazil, South America.
- Conclusions - CDM: where to go from here.

THE CONVENTION FOR CLIMATE CHANGE

- Commitments of the Parties - Developed Countries (Annex I), Countries with Economies in Transition and Developing Countries (non-Annex I) - for stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
- Recognition of the role of the Annex I Parties to stabilise GHG emissions.
- Adoption by Annex I Parties of Policies and Measures for climate change mitigation and commitments to assist non-Annex I Parties to achieve sustainable development - technology transfer, capacity building and financial resources.
- Recognition of the role of research and systematic observation, and education, training and public awareness.

COMMITMENTS OF ALL PARTIES

To reduce the impact of GHG emissions on the global climate, all Parties must:

- ⇨ Adopt national programs for the mitigation of the effects of climate change and develop strategies for adaptation;
- ⇨ Take in consideration climate change issues into relevant social, economic and environment policies;
- ⇨ Co-operate on scientific, technical and educational matters;
- ⇨ Promote public education and information.

committing the Developed Country Parties (Annex I) to:

- ⇨ Take measures to stabilise GHG emissions to the 1990 level by the year of 2000;
- ⇨ Financially and technically support Developing Countries (Non-Annex I Parties).

THE KYOTO PROTOCOL

- International agreement adopted on December 10, 1997, by the Parties participating on the third session of the Conference of the Parties, in Kyoto, Japan.
- The Kyoto Protocol states that all 38 Parties included in Annex B shall, individually or jointly, reduce their aggregate anthropogenic carbon dioxide equivalent emissions of 6 GHG by at least 5% below 1990 levels in the commitment period 2008-2012.
- This Protocol will enter into force when not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55% of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval and accession.

CONTENTS OF THE KYOTO PROTOCOL

- ⇨ Policies and Measures;
- ⇨ Acquisition, monitoring and inventory of data - National Communications;
- ⇨ Compliance;
- ⇨ Relations with Developing Countries (Transfer of Technology);
- ⇨ Flexible Mechanisms - Emissions Trading (Article 17), Joint Implementation (Article 6) and CLEAN DEVELOPMENT MECHANISM (Article 12).

FLEXIBLE MECHANISMS

- JI - for the purpose of meeting its commitments, any Annex I Party may transfer to, or acquire from, other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions of GHG at any economic sector.
- ET - Annex B Parties may participate in emissions trading for the purposes of fulfilling their commitments, being this suplemental to domestic actions for the purpose of meeting quantified quantified emission limitation and reduction.
- CDM - to assist Parties non-Annex I Parties in achieving sustainable development and contributing to the ultimate objective of the Convention, and to assist Annex I Parties in achieve compliance with their quantified emission limitation and reduction commitments.

THE CLEAN DEVELOPMENT MECHANISM (CDM)

- Will allow Annex I countries to invest in emission-saving projects in Developing Countries and gain credit for the savings achieved through the generation of Certified Emission Reductions that they can use to contribute to compliance of their commitments.
- Is designed to minimise significantly the cost of achieving Kyoto objectives.
- Is an effective tool for the promotion of the use of clean technologies by Developing Countries.

THE UNFCCC NEGOTIATION PROCESS

- An agreement was not reached at CoP6, in the Hague (November 2000) on the President of CoP6 (Dutch Minister of Environment, Mr. Pronk) Document.
- Although the difficulties of the negotiations and the outcome from The Hague, the UNFCCC Parties held on continuing regular dialogues for the ratification of the Protocol.
- The President of CoP6 issued a new document (basis for agreement) on April 2001.
- The Parties agreed on meeting in Bonn (July 2001) to discuss the proposals of the document, in what is already known as CoP6-bis.
- Although President Bush latest declaration on the faith if USA Kyoto Protocol commitments, the great majority of the Parties, with EU and its Member States at the front platoon, still hold to ratify Kyoto.

EUROPEAN CLIMATE CHANGE PROGRAMME (ECCP)

- ECCP was established in June 2000 to help identify the most envionmentally and cost effective additional measures enabling the EU to meet its target under the Kyoto Protocol, namely an 8% reduction in GHG from 1990 levels by 2008-2012.
- ECCP has been set as a multi-stakeholder consultative process focussed on energy, transport, industry, research and agriculture and the issue of ET within the EU.
- Seven technical Working Groups were established which work was co-ordinated with other on-going EU activities, such as Joint Expert Groups on Transport and Environment, and on Fiscal Measures, as well as the Sixth Environmental Action Programme and the EU Strategy for Sustainable Development.

EUROPEAN CLIMATE CHANGE PROGRAMME (ECCP)

- ECCP investigated more than 40 measures and could identify cost-effective options totalling 664-765 $MtCO_2eq$.
- ECCP Report was presented on July 2-3, 2001, in Brussels - the Report classifies the measures in 3 different categories, to allow a better indication of the short-term potential of cost-effective measures at the EU level:
  - measures at an advance stage of preparation - 8 measures representing an estimated 240 $MtCO_2eq$ cost-effective emission reduction potential;
  - measures in the pipeline - 11 measures with an estimated cost-effective emission reduction potential of about 140 $MtCO_2eq$;
  - measures needing further work - 22 measures.

CDM - HOW TO GET THERE?

⇨ The Kyoto Protocol says little about how CDM should be designed and implemented- a number of functions will need to be performed:

→ International Functions:

- Certification of CDM eligible project activities;
- Emissions additionality and baseline setting;
- Quantification, certification and pricing of ERUs;
- Assistance for funding for certified projects;
- System to track ERU trades;
- Protecting vulnerable players.

→ National Functions:

- Domestic monitoring and verification of baselines;
- Registration of third-party certification entities
- Certification of projects;
- Setting national or sectoral emissions inventories.

EU CAPACITY BUILDING FOR CDM

- ⇨ Identification and elimination of structural and operational barriers.
- ⇨ Articulation of the public and private sectors.
- ⇨ Introducing CDM perspectives into financing policies for development at bilateral and multilateral levels.
- ⇨ Strengthen R&D Programmes directed to the needs of globalisation and measures to achieve Kyoto Objectives.
- ⇨ Reinforcement of technical, business, marketing, organisational know-how, legislative, regulatory and enforcing skills of both public and private sectors.
- ⇨ Improving SMEs capacities on risk analysis of environment friendly technology projects.

DEVELOPING COUNTRIES CAPACITY BUILDING FOR CDM

- Identification and removal of institutional and other barriers.
- Creation of a framework for CDM implementation.
- Elaboration of a methodology to assess CDM project direct benefits and co-benefits.
- Identification of a methodology for mapping CDM potential.
- Identification of potential CDM projects.
- Elaboration of pre-feasibility studies on potential CDM project impacts.

IST PROJECTS AND PROPOSALS ON CAPACITY BUILDING AND CDM

Implemented projects:

- ⇨ Analysis of the Power Market and the Potential for Market Penetration of EU Innovative Technologies in Cabo Verde Islands - EU Thermie Programme.
- ⇨ Assistance to Energy Policy Implementation in Cabo Verde Islands - EU Synergy Programme.
- ⇨ Assistance to Energy Policy Implementation in Mozambique- EU Synergy Programme.

On-going project:

- ⇨ Facilitating the Kyoto Protocol Objectives by CDM in Small Island Developing States - EU DG Development.

Submitted proposals:

- ⇨ FlexMechs - Integrating Flexible Mechanisms of the Kyoto Protocol into the Member States Energy and Environmental Policies
- ⇨ Enabling Activities for the Implementation of CDM in South American Countries.

IST WORK FOR CDM DESIGN AND IMPLEMENTATION

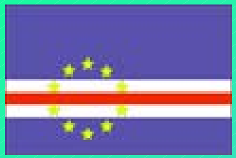
- Showing the potential influence of Kyoto Protocol Financial Mechanisms on Energy Planning and Energy Technology Transfer in Developing Countries.
- Showing potentials of assumed rules of CDM on influencing future CO_2 emissions.
- Illustrating the cases of:
  - Small Island Developing State - CDMSIDS project;
  - Least Developing Country - Synergy Mozambique project;
  - Developing Country: CDM Brazil.

CAPE VERDE MAP

SMALL ISLANDS SPECIAL CASE

- ⇨ High price of small scale fossil fuel technology (diesel).
- ⇨ Possible competitiveness of renewable energy.

⇨ **Cape Verde**



- ⇨ Wind as competitive energy source in electricity production (8% of total).
- ⇨ High dependency on diesel in electricity production.

CASE: SANTO ANTÃO
OBJECTIVES

- showing particular case of a rural small island with low carbon intensity.
- showing the potential of CDM on investing into clean energy technology in Developing Countries.

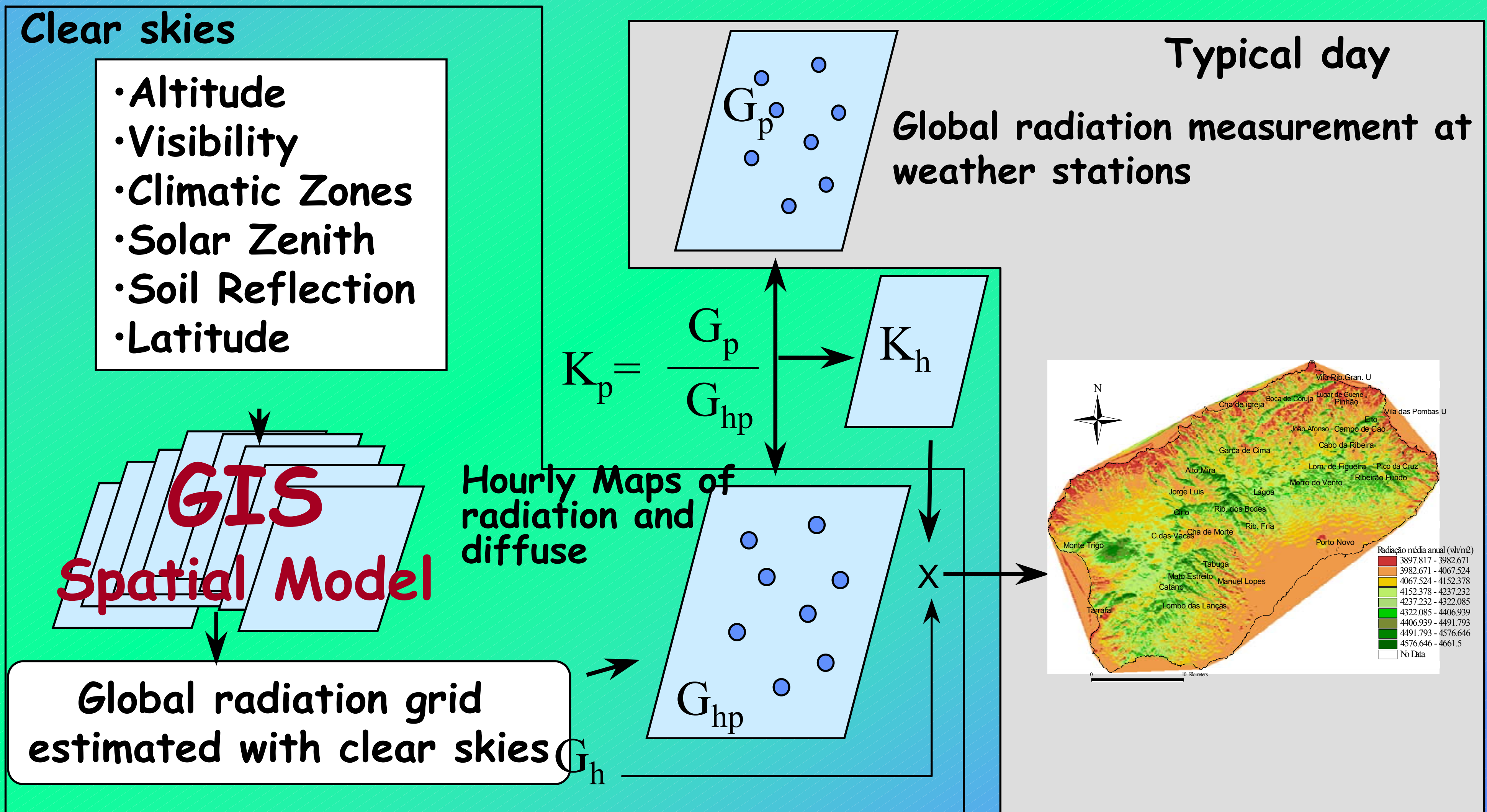
Electricity production - island of Santo Antão
Case for CDM

2000-2030

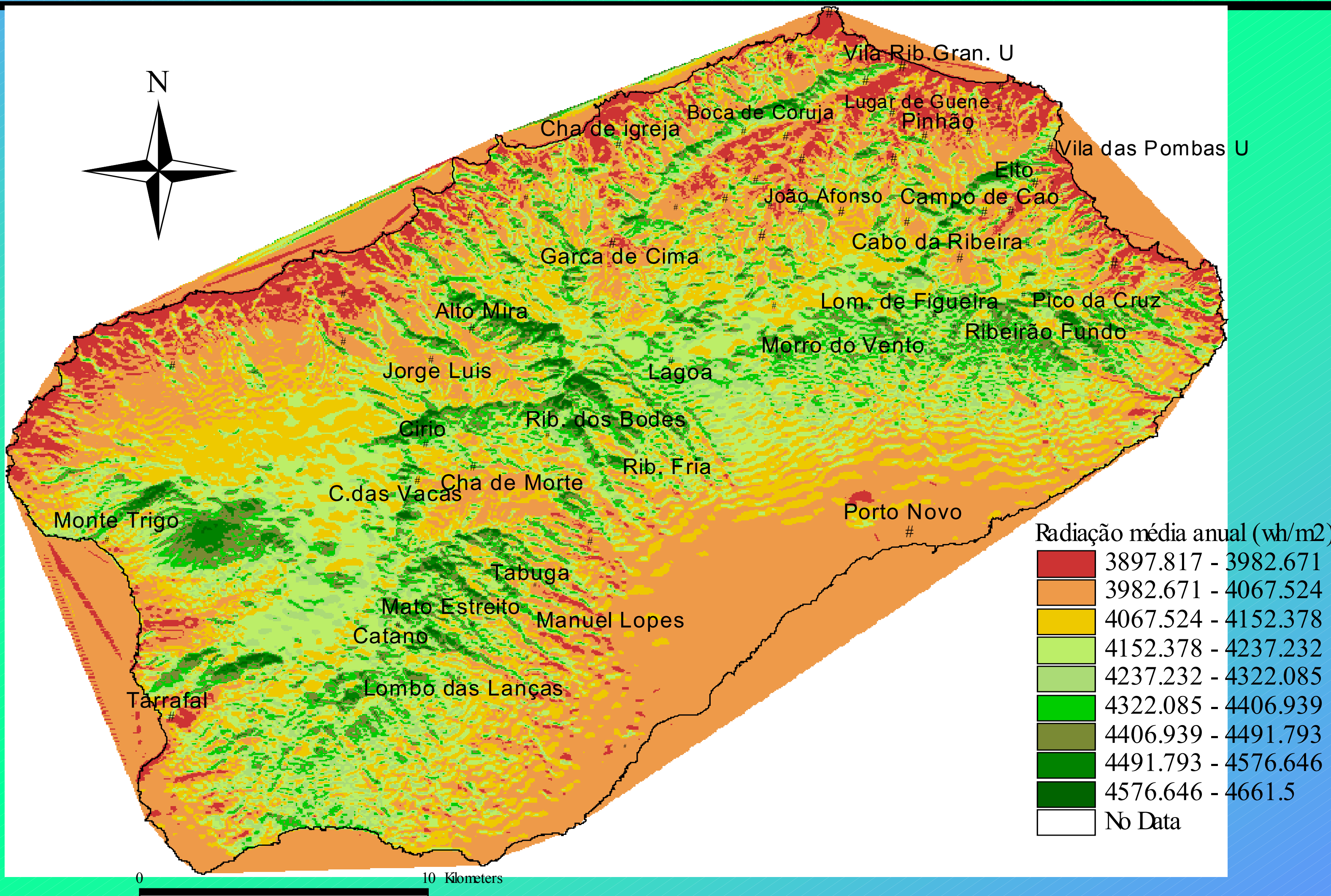
Scenario 1: Business as usual* – Diesel only
Scenario 2: 30% RE - 25% Wind + 5% PV
Scenario 3: 30% Wind energy
Scenario 4: as scenario 2 with declining prices of RET

* based on studies by Jansénio Delgado et al.: Perspectivas de desenvolvimento, Plano director de electricidade de Santo Antão, 1997, Cape Verde, and Diagnóstico de situação local, Plano director de electricidade de Santo Antão, 1997, Cape Verde

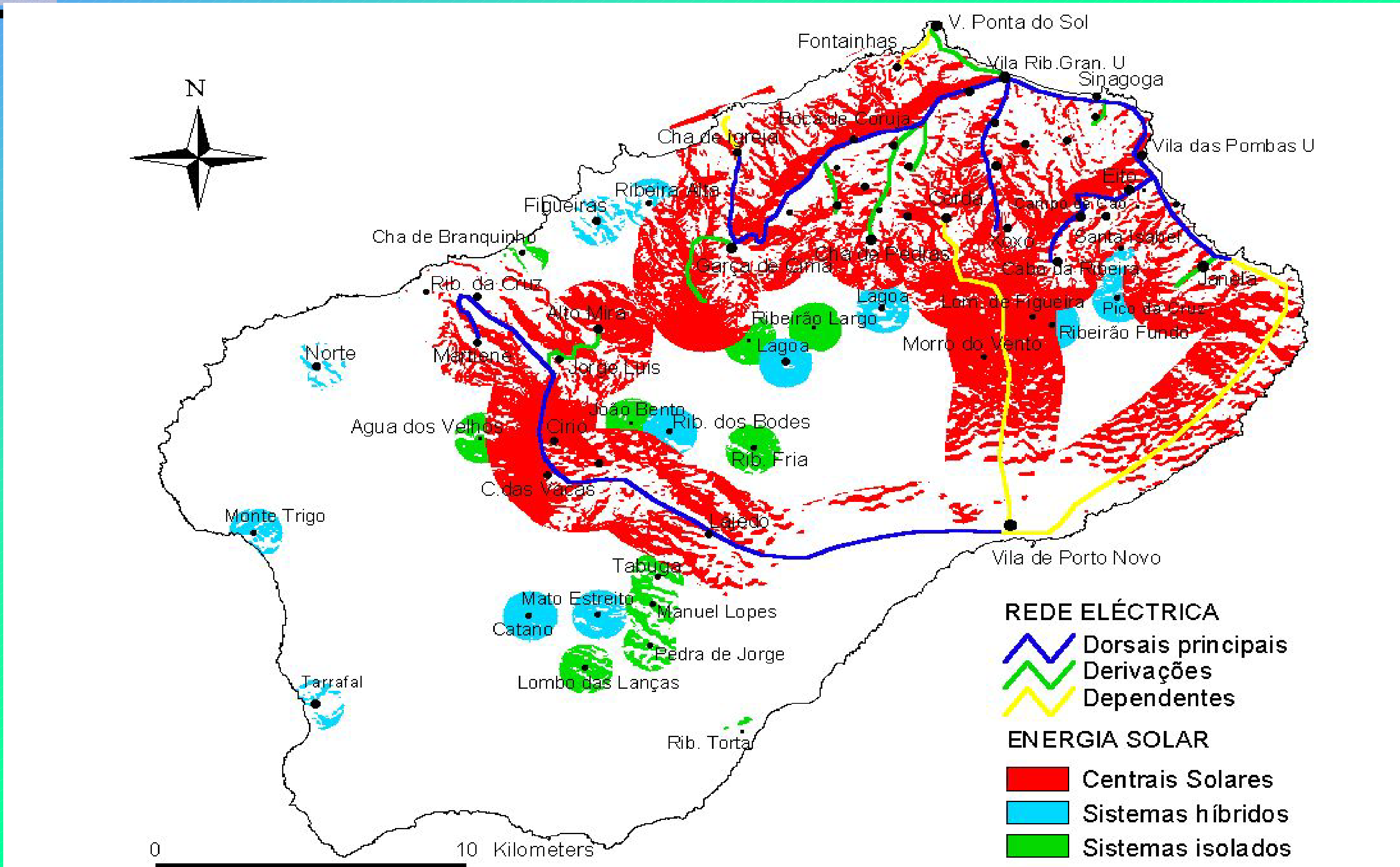
EVALUATION OF SOLAR POTENTIAL



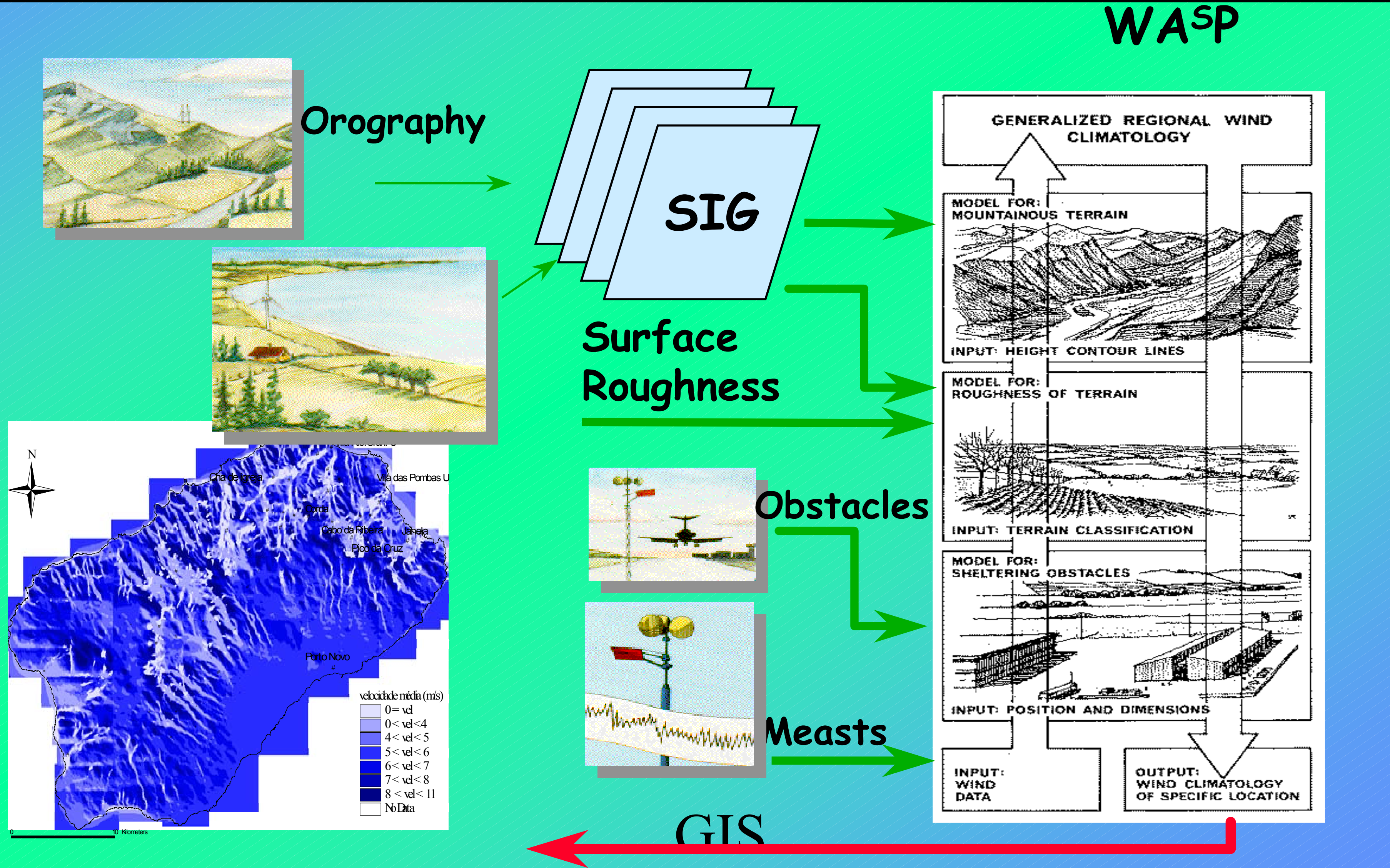
MAP OF SOLAR ENERGY RESOURCES



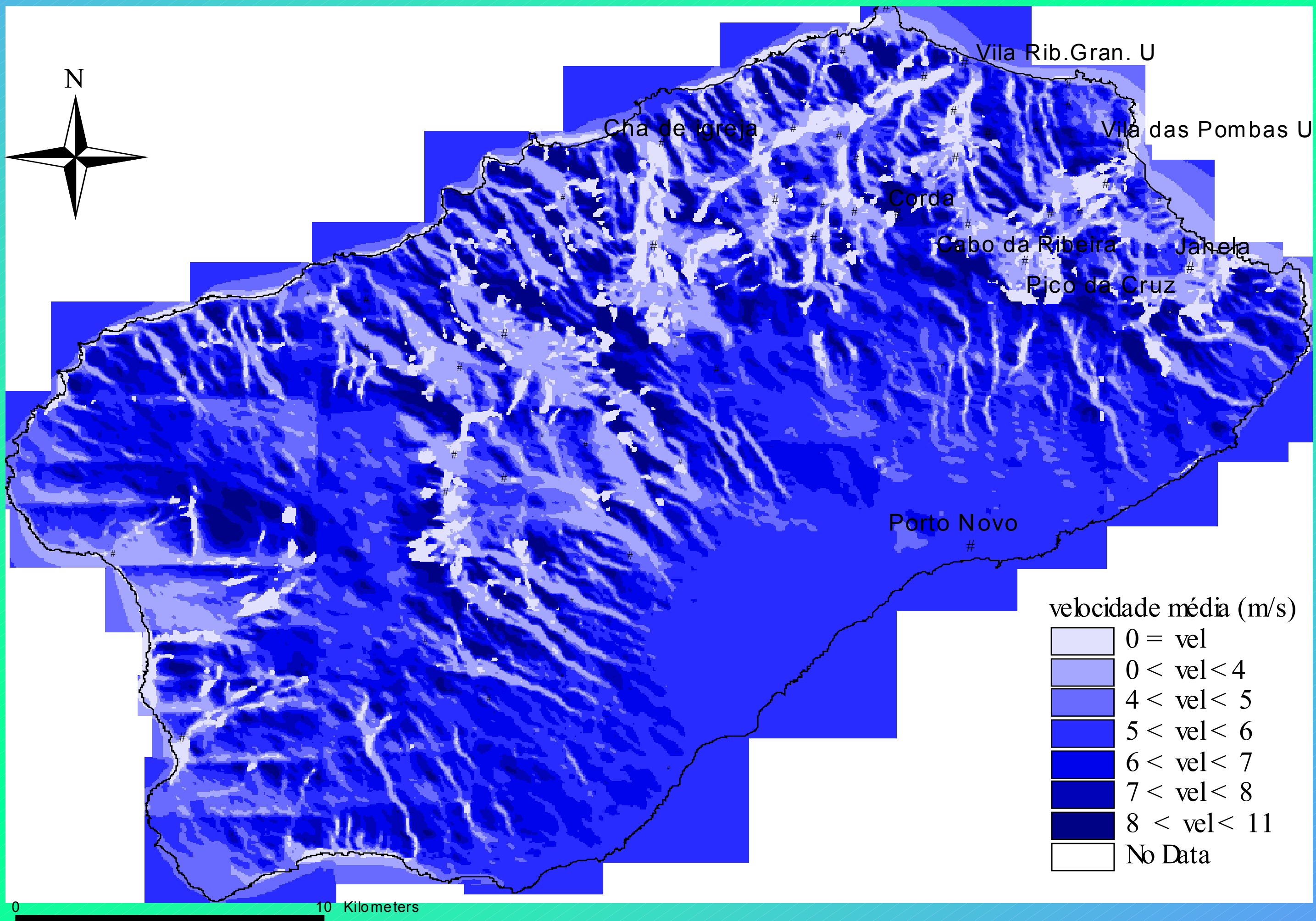
ZONES WITH POTENTIAL FOR EXPLORATION OF SOLAR ENERGY



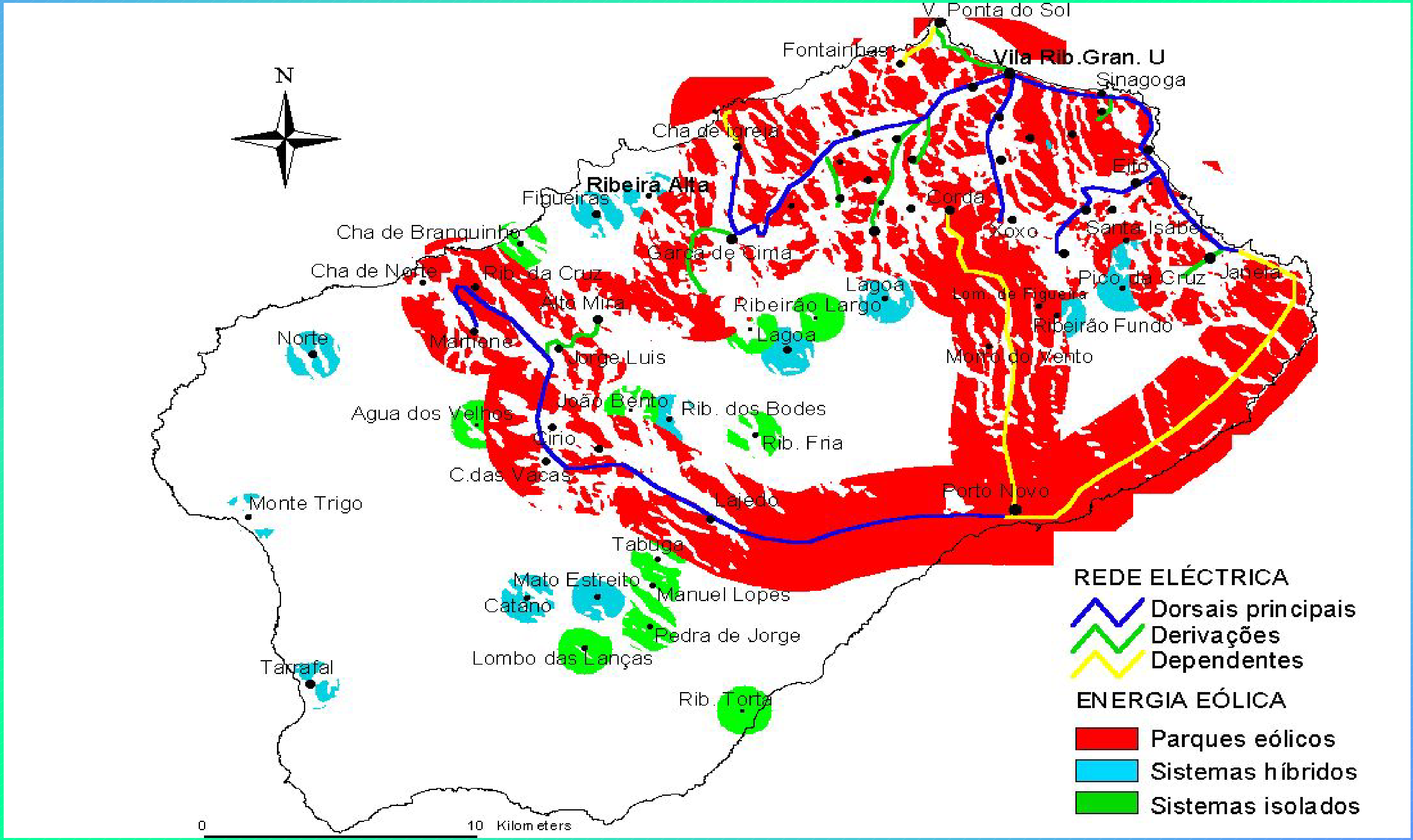
EVALUATION OF WIND ENERGY POTENTIAL COMBINATION OF SIG AND WASp



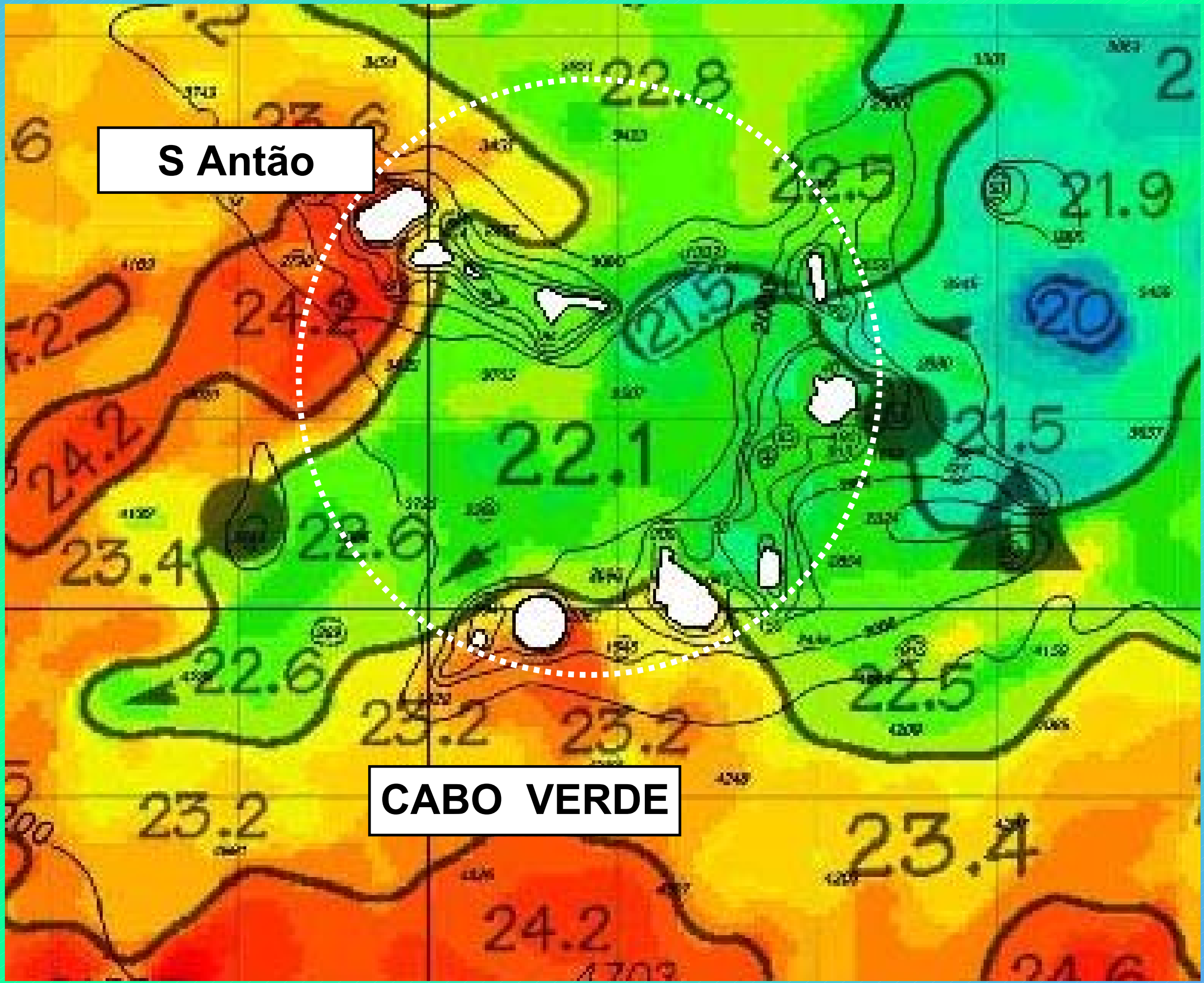
MAP OF WIND ENERGY RESOURCES



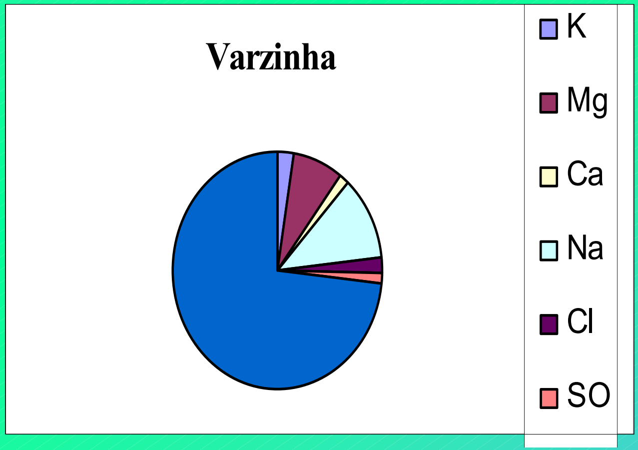
ZONES WITH POTENTIAL FOR EXPLORATION OF WIND ENERGY

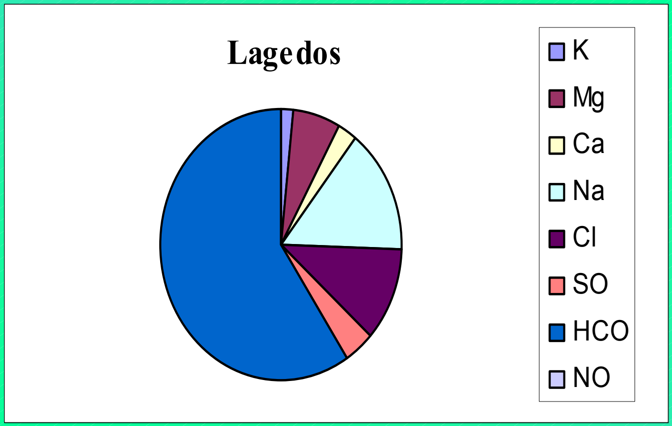


TEMPERATURE OF OCEAN SURFACE



CHEMICAL COMPOSITION OF THERMAL SOURCES

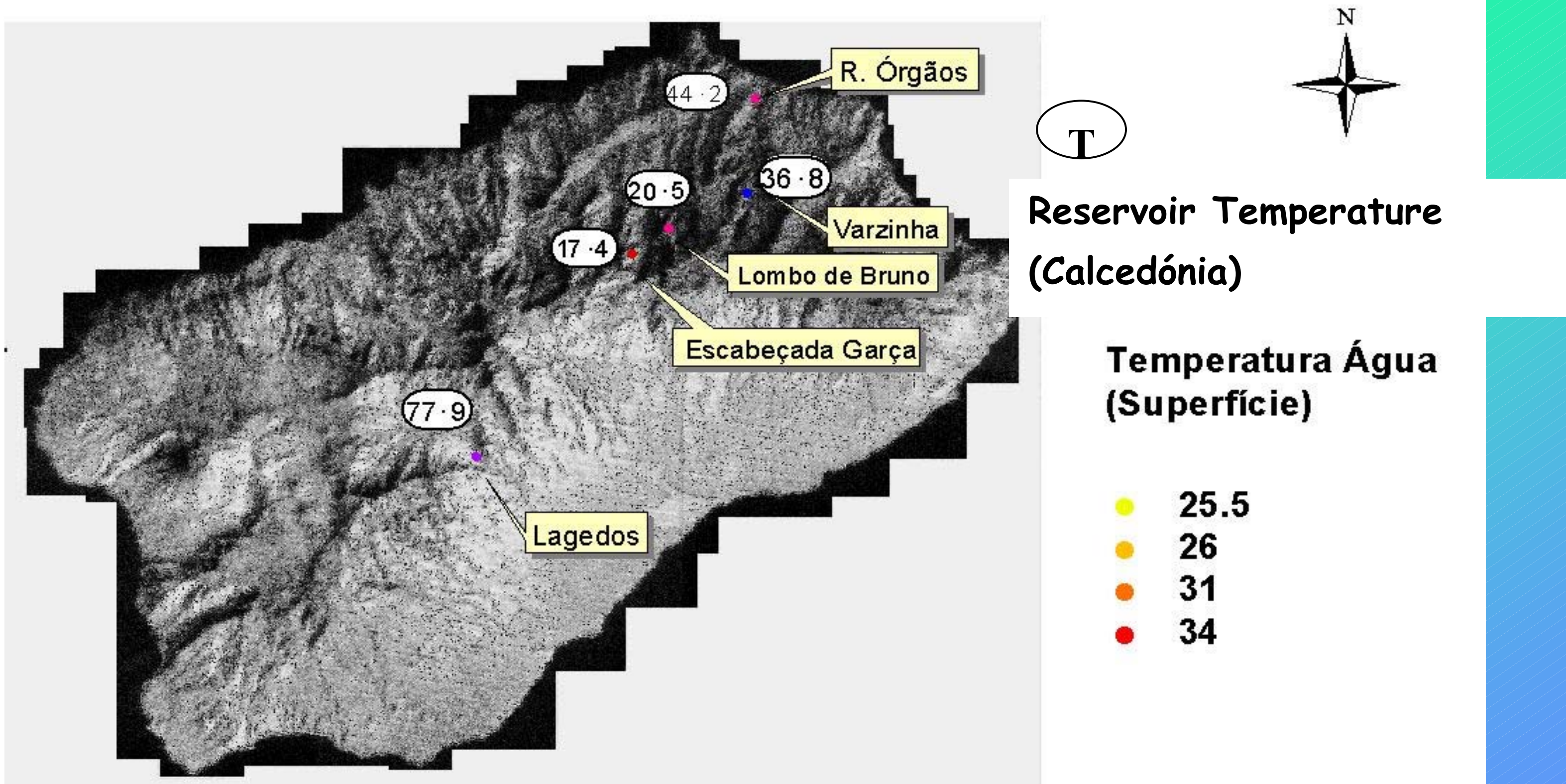




Ribeira dos Órgãos:
prevalence of chloride typical of sea wtaer

Varzinha e Lagedos:
water with high hydrocarbonate and Na^+ ions contents typical of granitic water.

THERMAL SOURCES IN SANTO ANTÃO

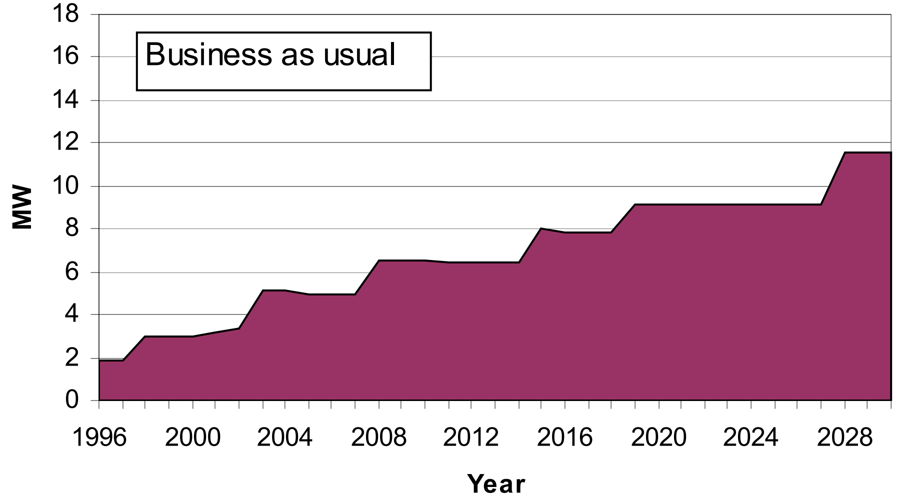


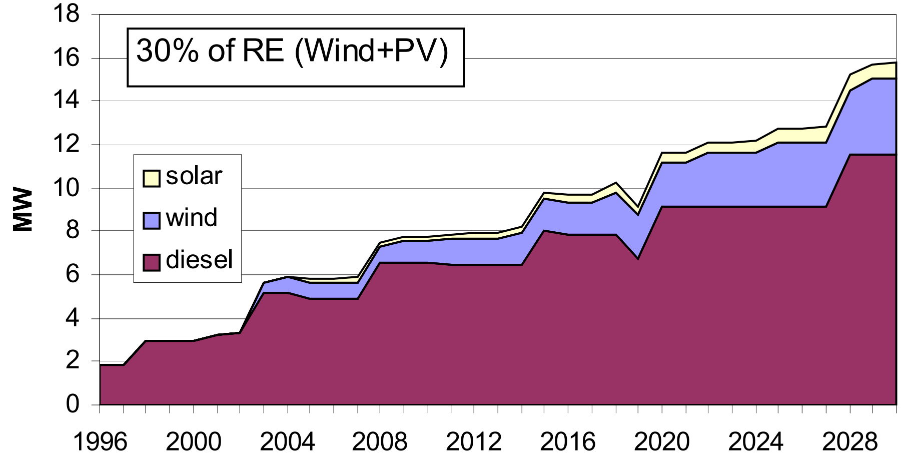
The island of Santo Antão, Cape Verde

Santo Antão	scenario	1996	2010	2030
Electricity penetration		29%	70%	90%
Production [GWh]		2.6	14	50
Load peak [MW]		0.7	2.6	7.5
Installed capacity [MW]	BAU	1.9 D	6.5 D	11.5 D
	25% Wind + 5% PV		6.5 D +1 W +0.2 PV	11.5 D +3.5 W +0.8 PV
	30% Wind		6.5 D +1.3 W	11.5 D +4 W

INSTITUTO SUPERIOR TÉCNICO

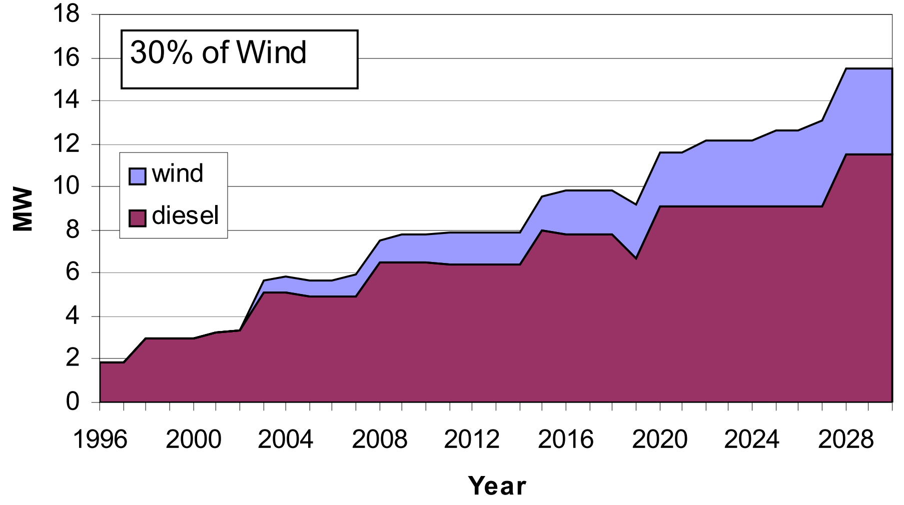
CASE: SANTO ANTÃO



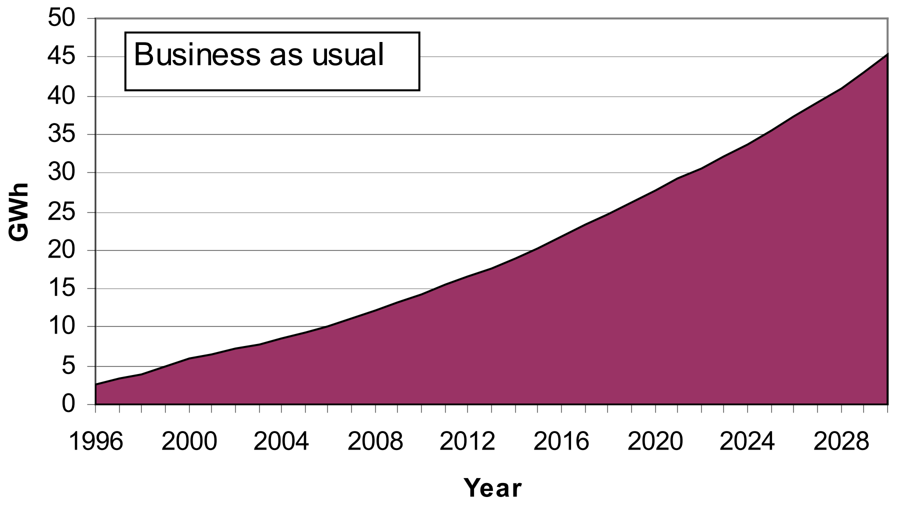


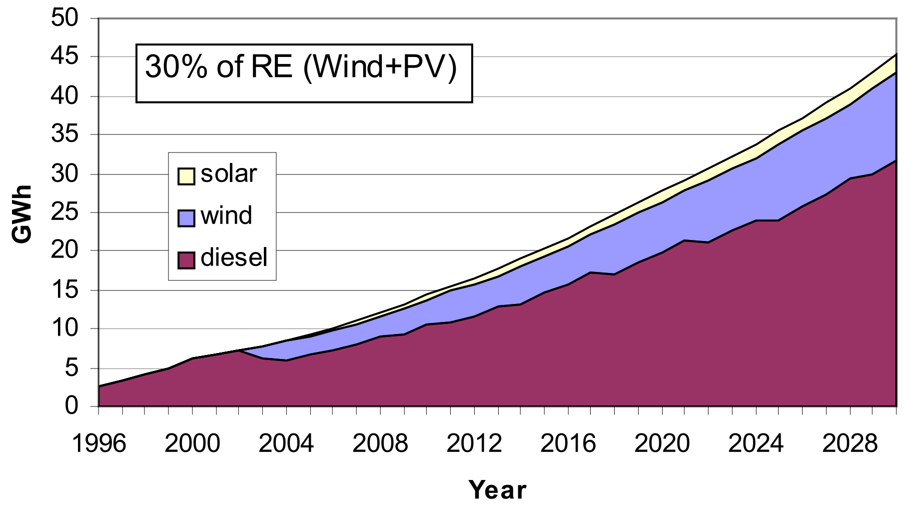
Installed capacities

- Wind does not reduce significantly the installed diesel capacity needed



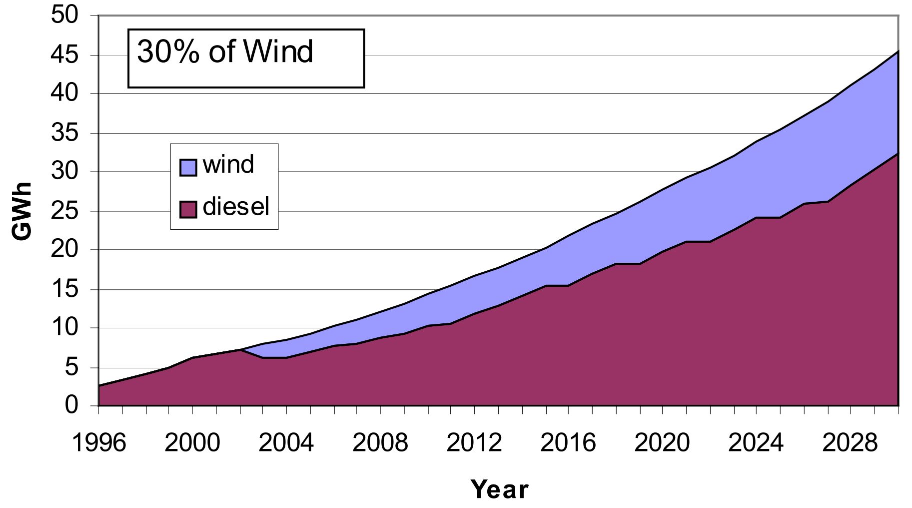
CASE: SANTO ANTÃO



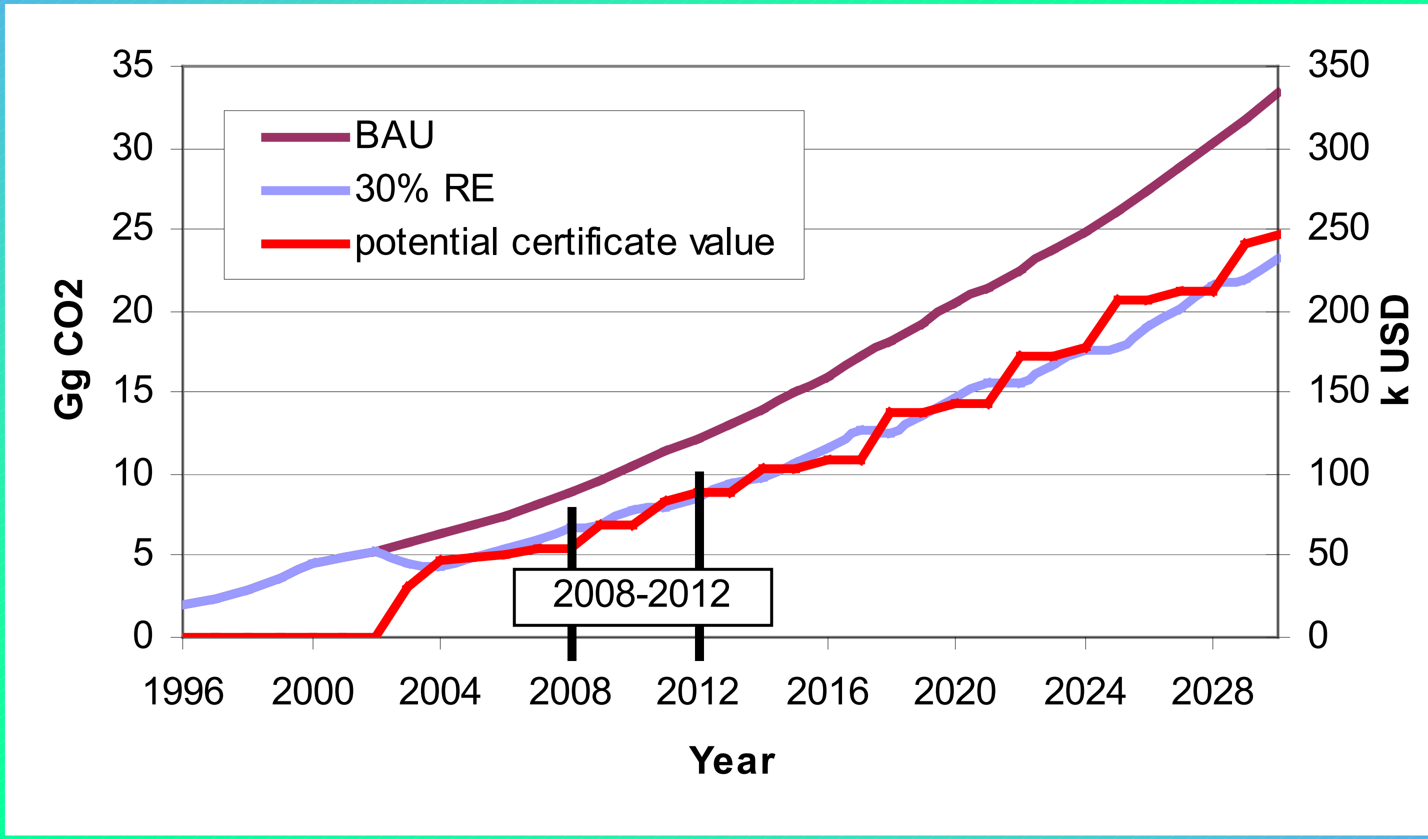


Electricity production

- Wind & PV - intermittent sources
- Diesel - the rest



CASE: SANTO ANTÃO



CO_2 emissions comparison and potential CDM value

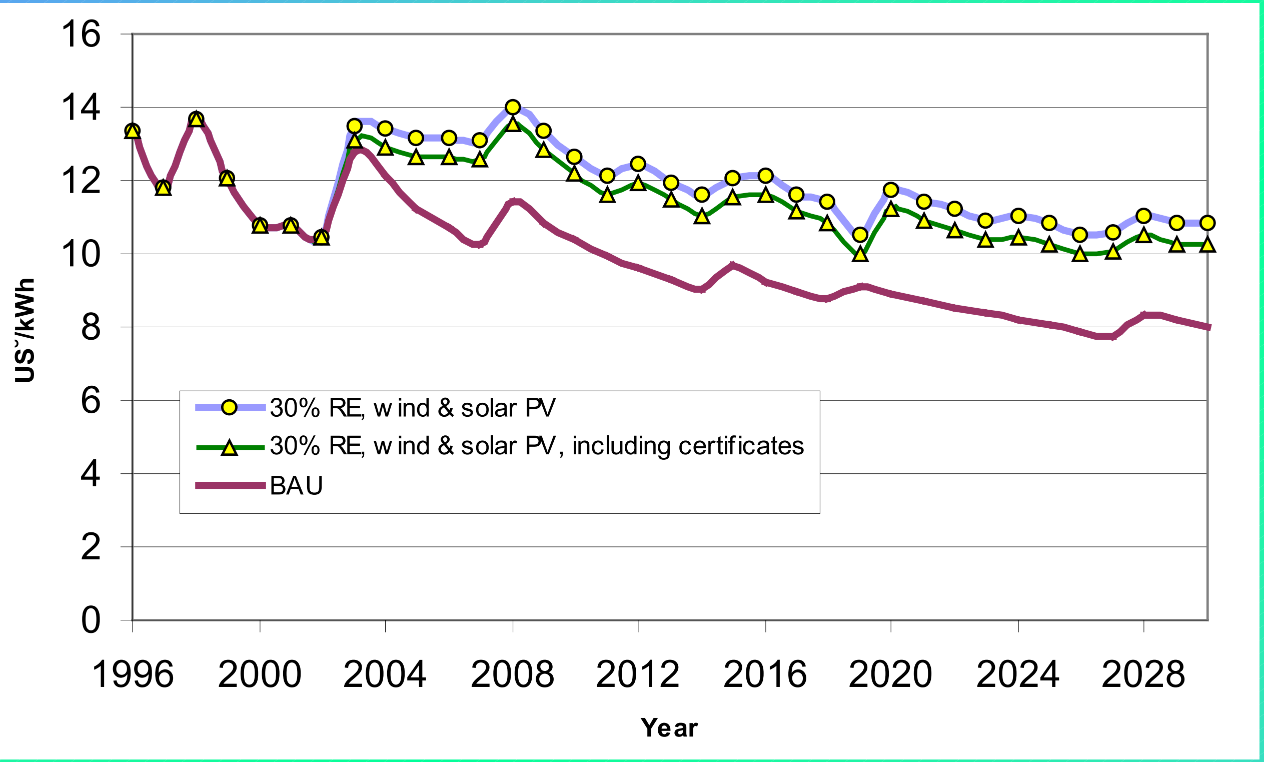
(based on OECD study that concluded that in case of emission trading the price of CO_2 reduction is 25 USD/t CO_2)

CASE: SANTO ANTÃO

Electricity cost:

⇨ Diesel (at 45% load)	8 US¢/kWh
⇨ Wind	7 US¢/kWh
⇨ Solar PV	50 US¢/kWh

CASE: SANTO ANTÃO

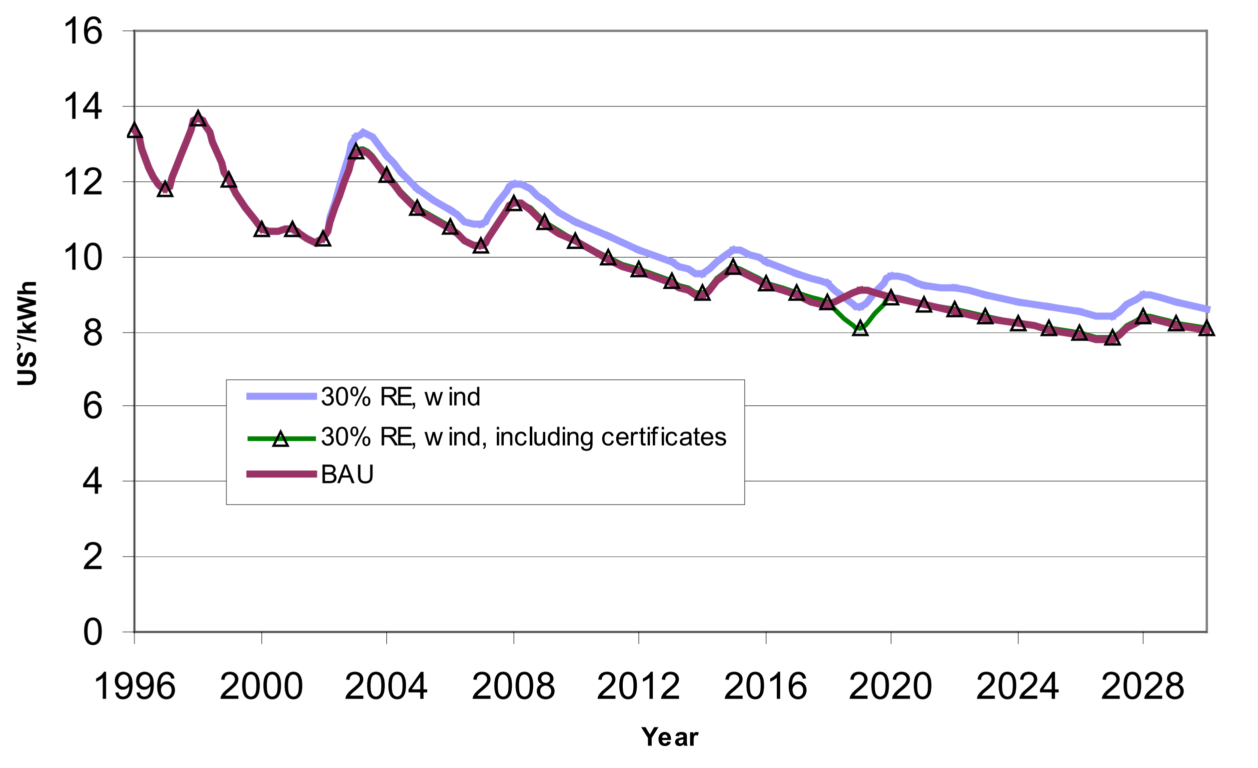


- Santo Antão - wind + PV scenario is not viable with current costs
- CDM does not help much this scenario
- constant prices of RET

Comparison of average electricity production price (1999 USD)

Scenarios 1-2: Business as usual and 30% RE, wind & solar PV

CASE: SANTO ANTÃO

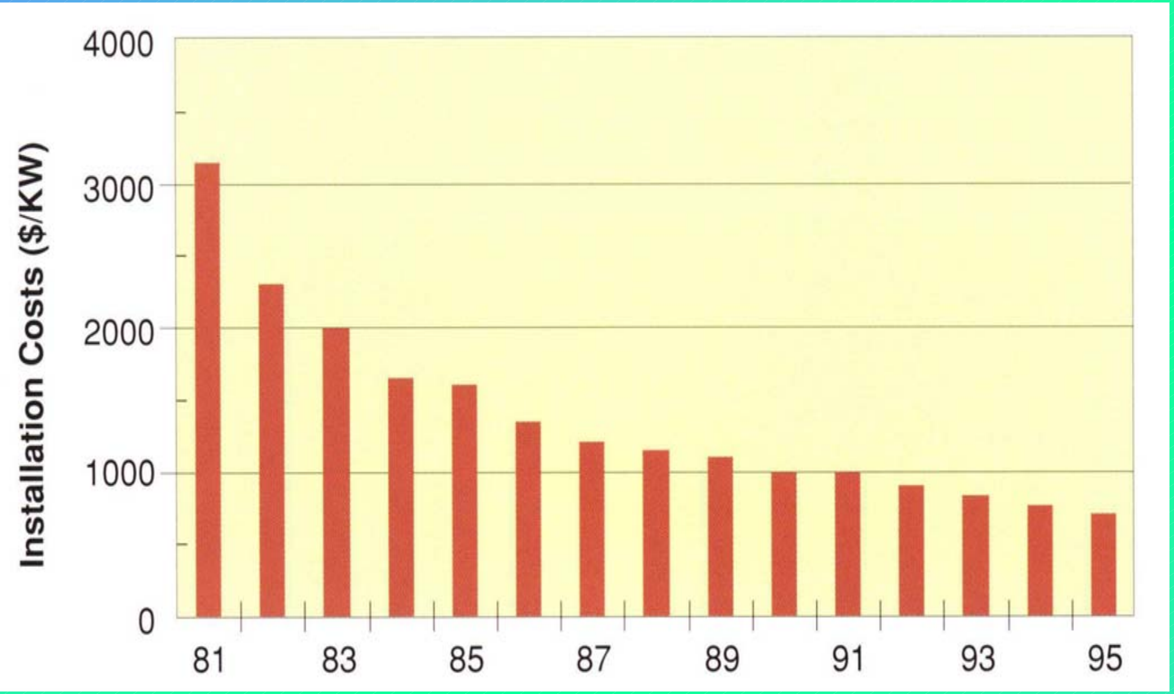


- Santo Antão - wind scenario is not viable with current costs
- CDM could help to make it viable
- constant prices of RET

Comparison of average electricity production price (1999 USD)

Scenarios 1 and 3: Business as usual and 30% wind

CASE: SANTO ANTÃO

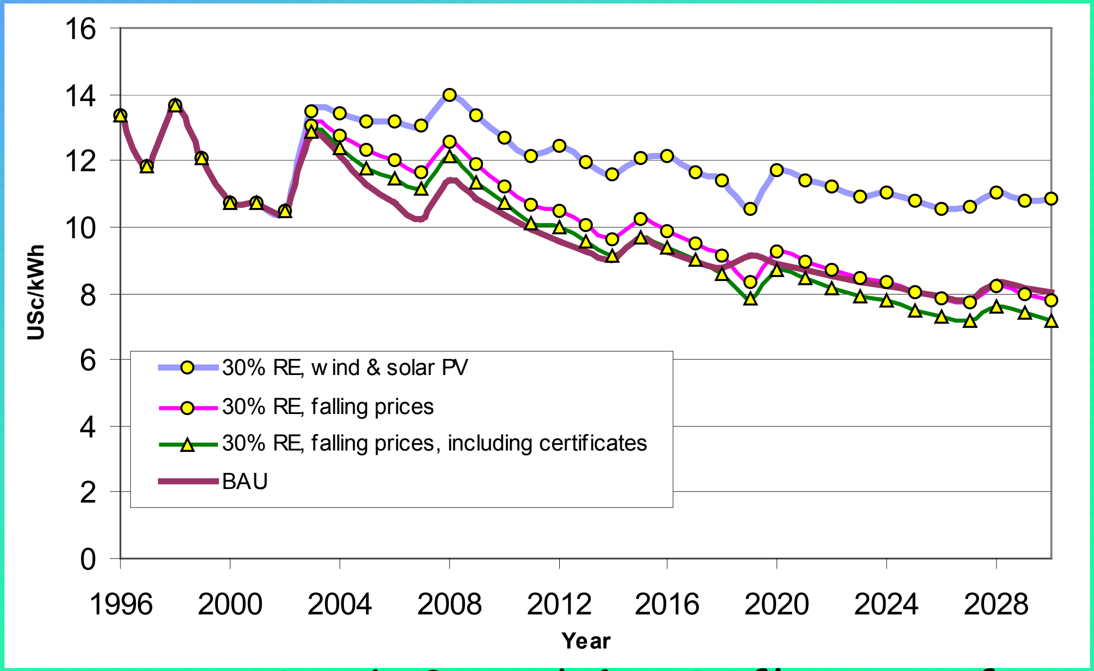


- Most calculations of RET viability assume static relations between different technologies implied costs
- RET are extremely dynamic technologies costwise

Innovation brings fall in cost of RET

ABB: Renewable Energy, Status and Prospects, 1998

CASE: SANTO ANTÃO



- Scenarios 1, 2 and 4 - Influence of **RET innovation**
- Credibility of BAU as CDM baseline depends on declining prices

- Santo Antão - wind & PV scenario gets viable with falling prices
- CDM helps it to become viable sooner
- falling prices of RET - 2% yearly price decline for wind and 5% price decline for PV

CASE: SANTO ANTÃO
CONCLUSIONS

- GHG reduction potential from business as usual scenario baseline.
- CDM could help reduce CO_2 emissions from electricity production by one third from baseline.
- Financial and environmental additionality.
- Contribution to the host country´s sustainable development needs.
- Opportunity for RET vendors and CDM investors.

CASE: SANTIAGO
OBJECTIVES

- ⇨ showing particular case of the most populated island of Cape Verde, the island of Santiago.
- ⇨ showing potentials of assumed rules of CDM on influencing future CO_2 emissions.
- ⇨ showing the potentials for investment into RET and supply side energy efficiency technologies.

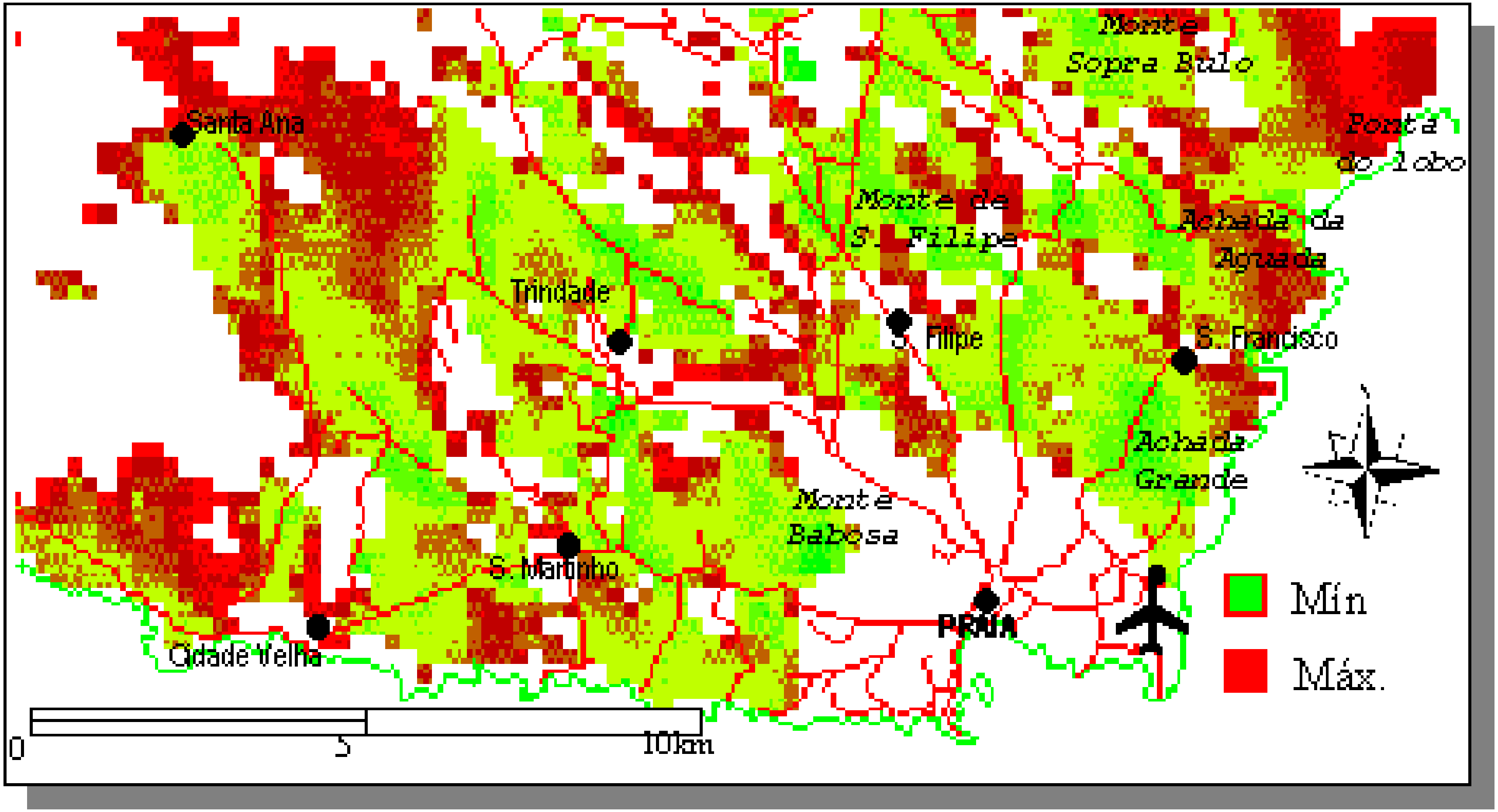
Electricity production - island of Santiago
Case for CDM

2000-2030

Scenario 1: Business as usual* – mainly Diesel
Scenario 2: 30% Wind energy
Scenario 3: Combined cycle + 30% Wind energy
Scenario 4: as scenario 2 with declining prices of RET
Scenario 5: as scenario 3 with declining prices of RET

* based on study by Michel Patou: Programme de développement à moyen terme du sous-secteur de l'électricité géré par l'entreprise publique d'électricité et d'eau ELECTRA, Ministère de la coordination économique, République du Cap Verte, 1997

LEVELIZED ELECTRICITY COSTS IN PRAIA

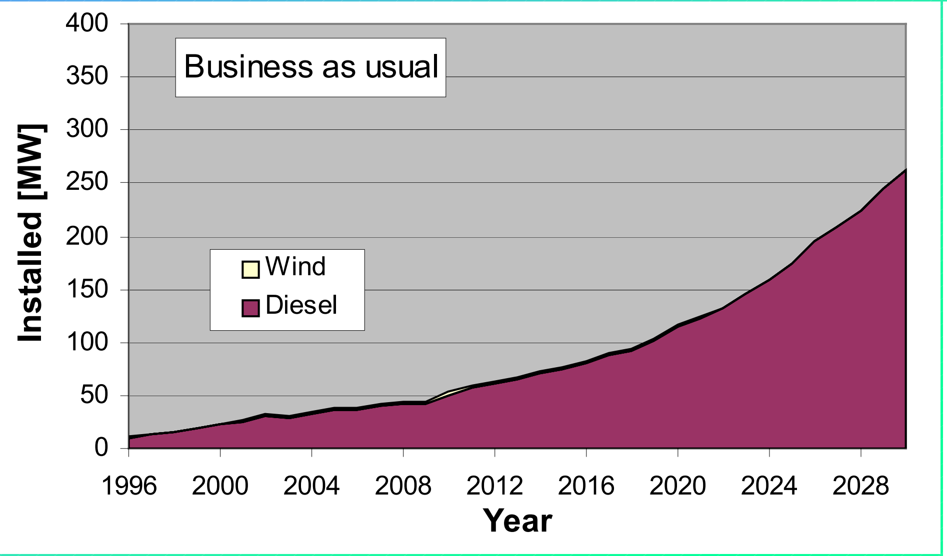


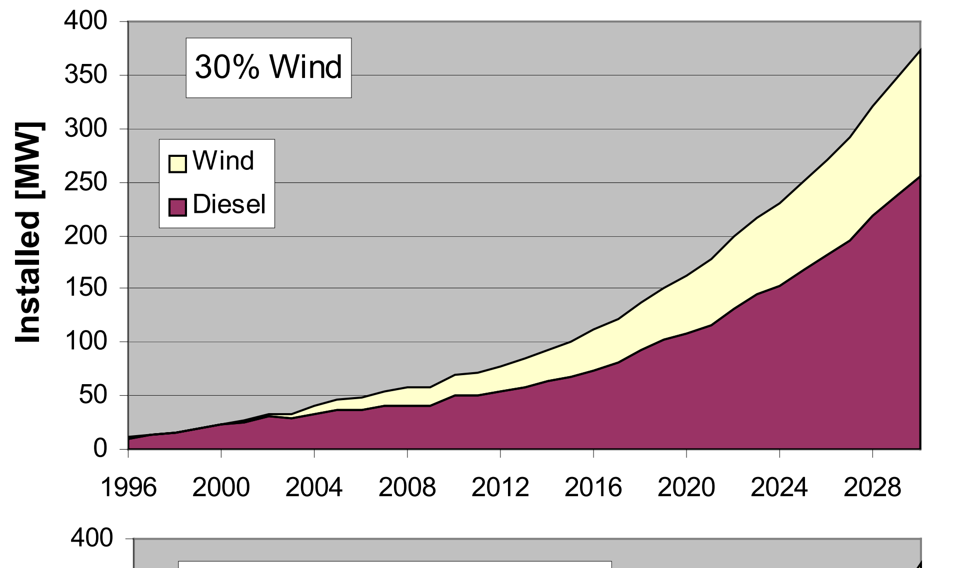
CASE: SANTIAGO

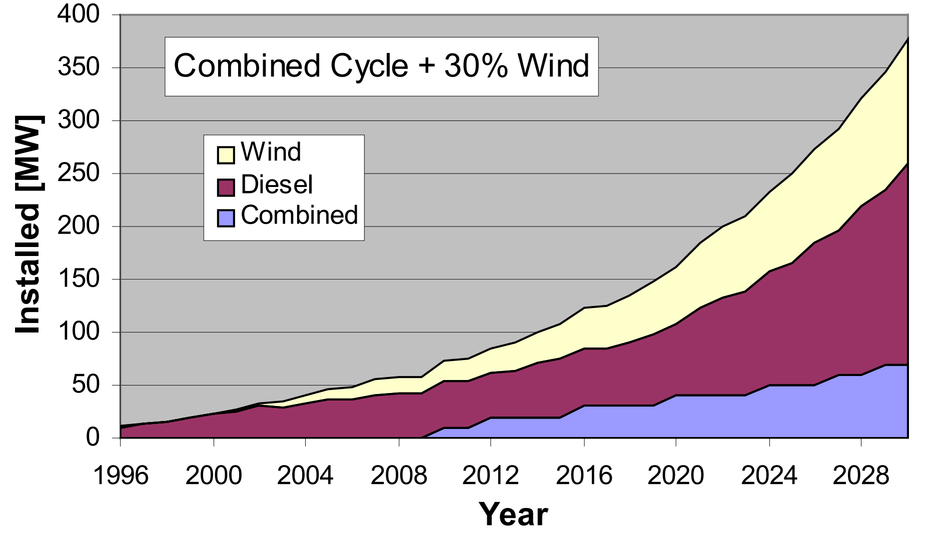
The island of Santiago, Cape Verde

Santiago	scenario	1996	2010	2030
Population		206000	293000	436000
Electricity penetration		31%	64%	91%
Production [GWh]		46	521	1100
Load peak [MW]		6.8	33	204
Installed capacity [MW]	BAU	10 D +0.9 W	50 D +2.7 W	263 D
	30% Wind		50 D +20 W	256 D +118 W
	Combined cycle + 30% Wind		43 D +10 CC +20 W	190 D +70 CC +118 W

CASE: SANTIAGO



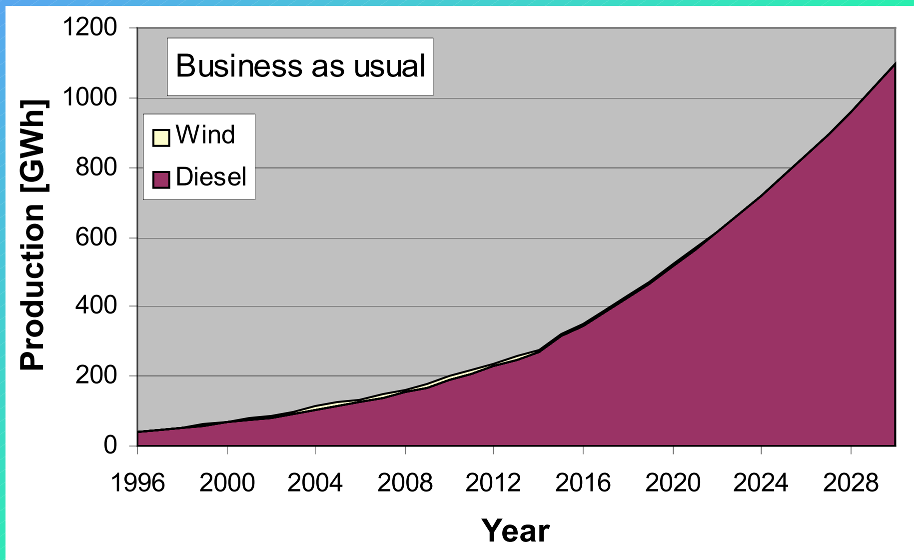


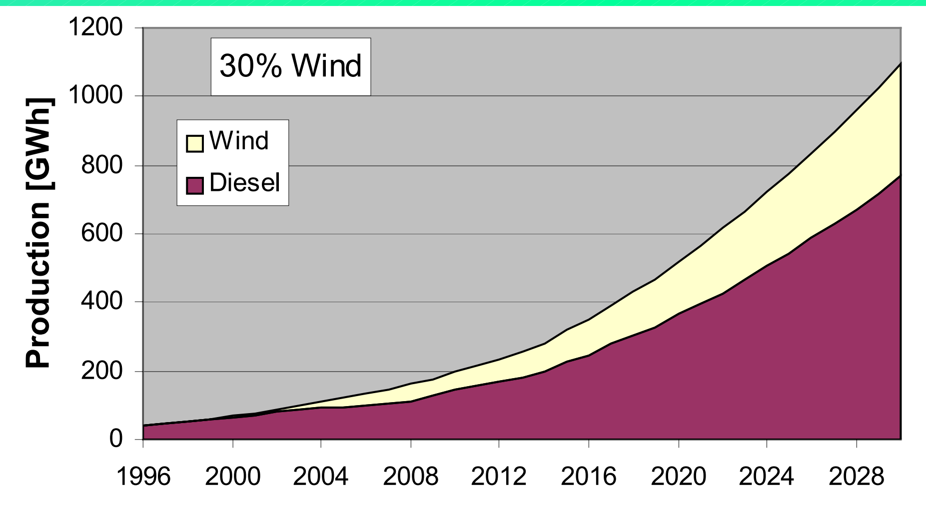


Installed capacities

- Wind does not reduce significantly the installed diesel capacity needed

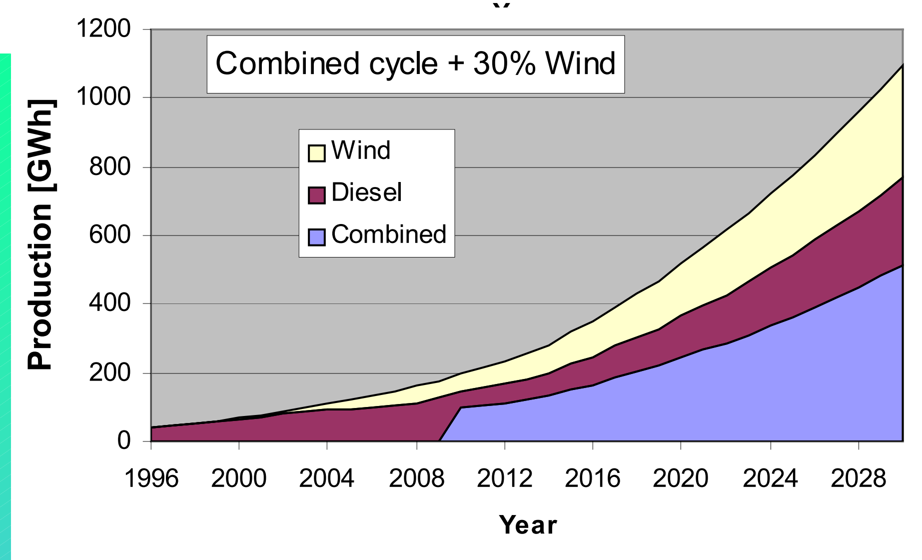
CASE: SANTIAGO



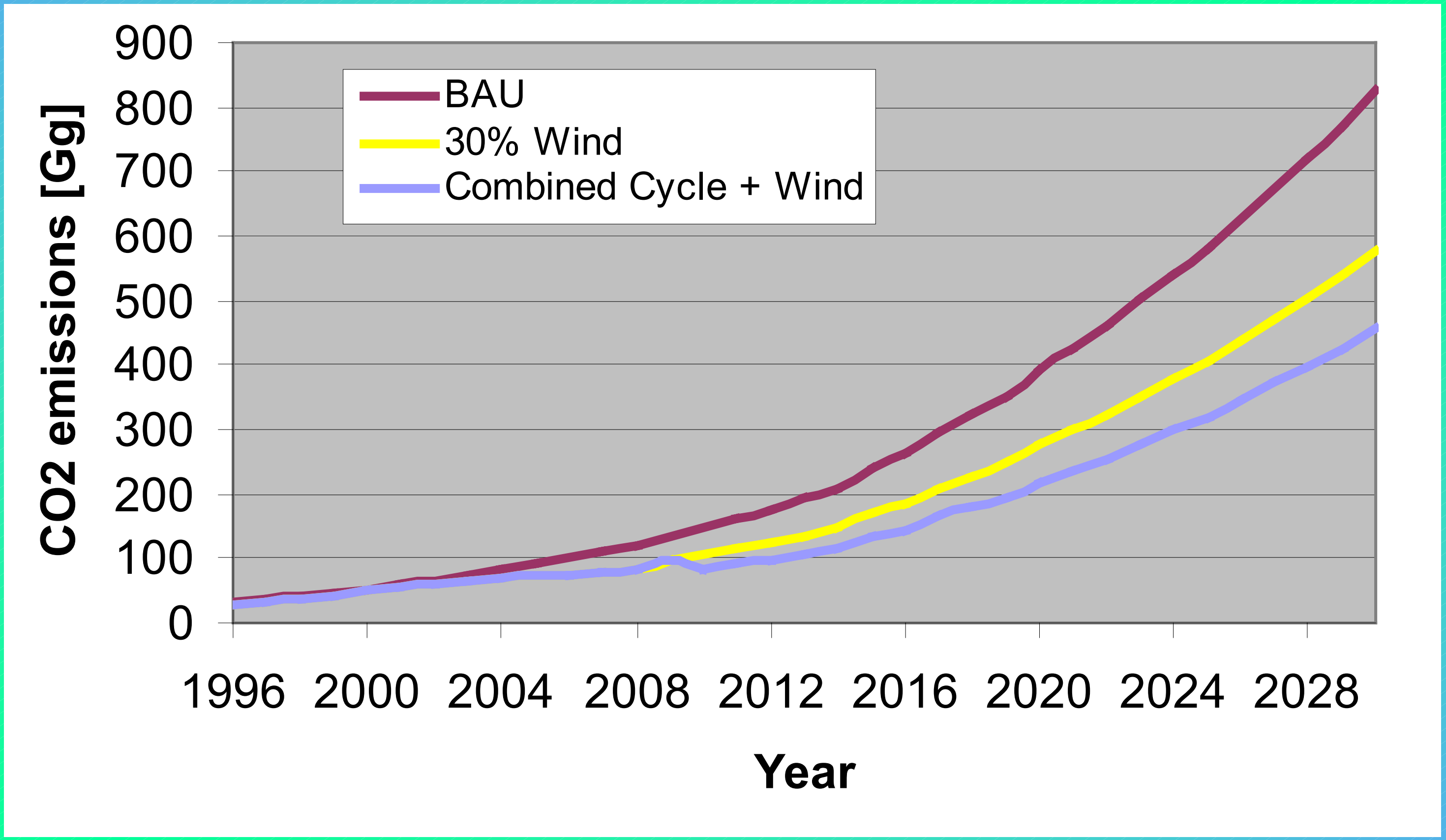


Electricity production

- Combined cycle - base load
- Diesel - peak load + reserve

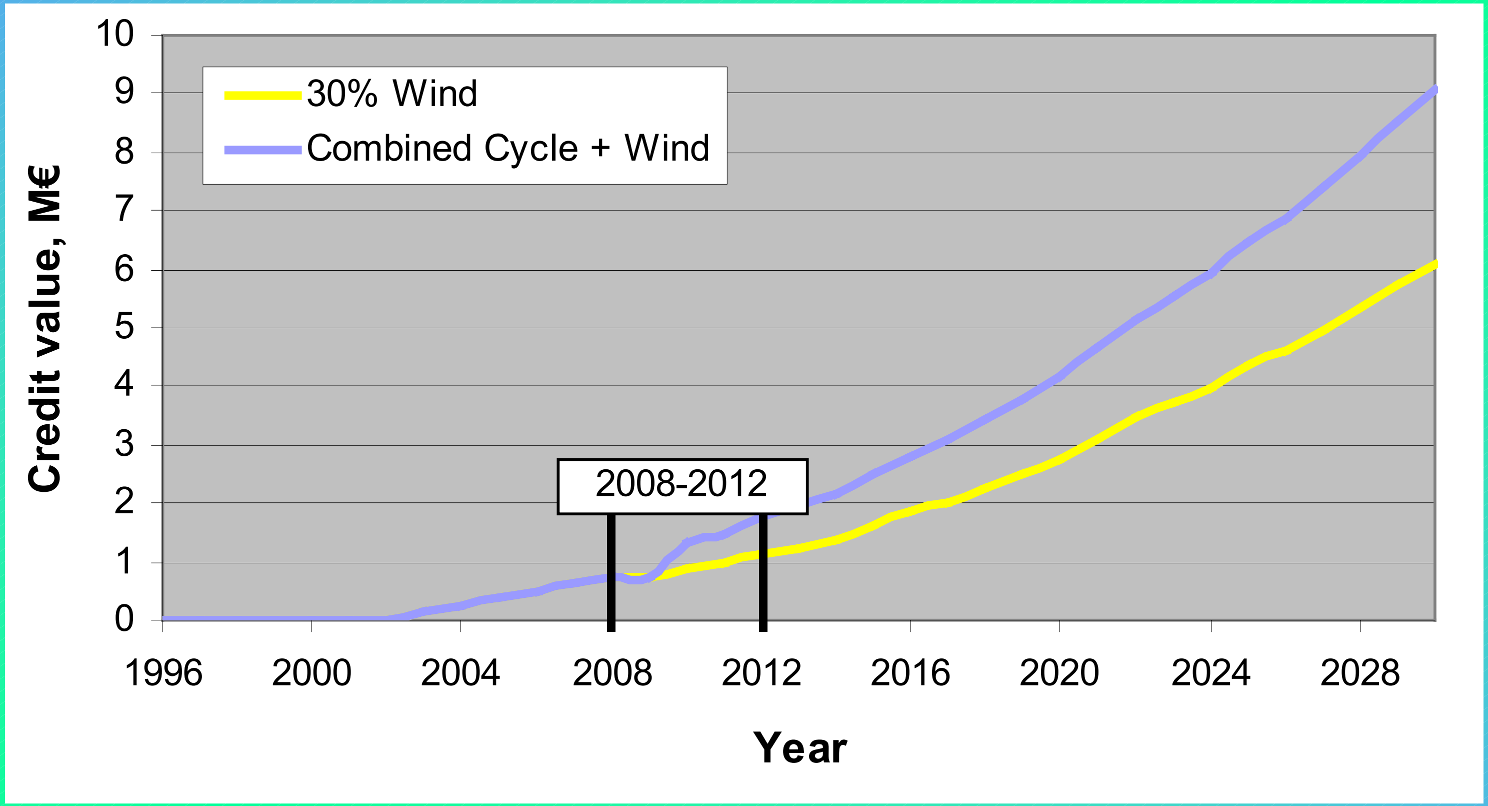


CASE: SANTIAGO



CO_2 **emissions** comparison for various scenarios

CASE: SANTIAGO



Potential CDM value

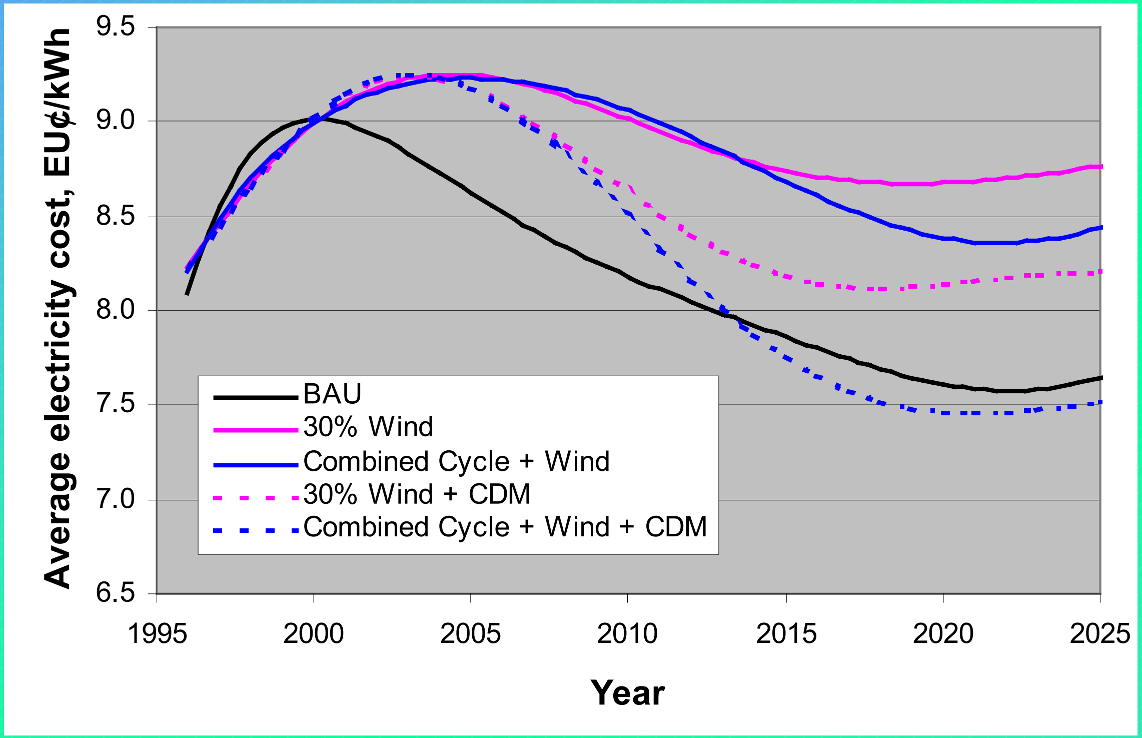
(based on OECD study that concluded that in case of emission trading the price of CO_2 reduction is 25 USD/t CO_2)

CASE: SANTIAGO

Electricity cost:

⇨Diesel	8 EU¢/kWh
⇨Wind	9 EU¢/kWh
⇨Combined cycle	6 EU¢/kWh

CASE: SANTIAGO

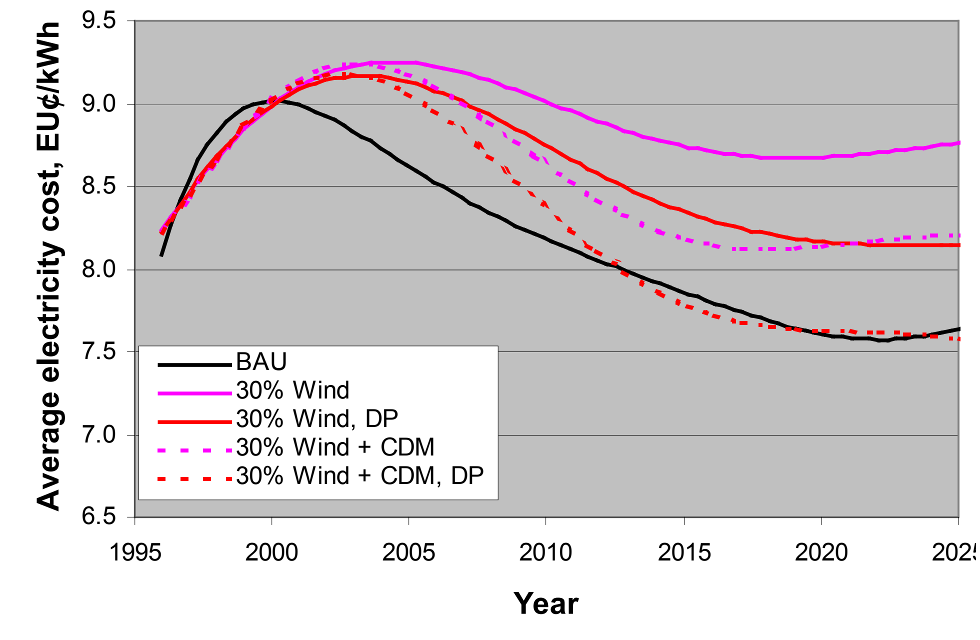


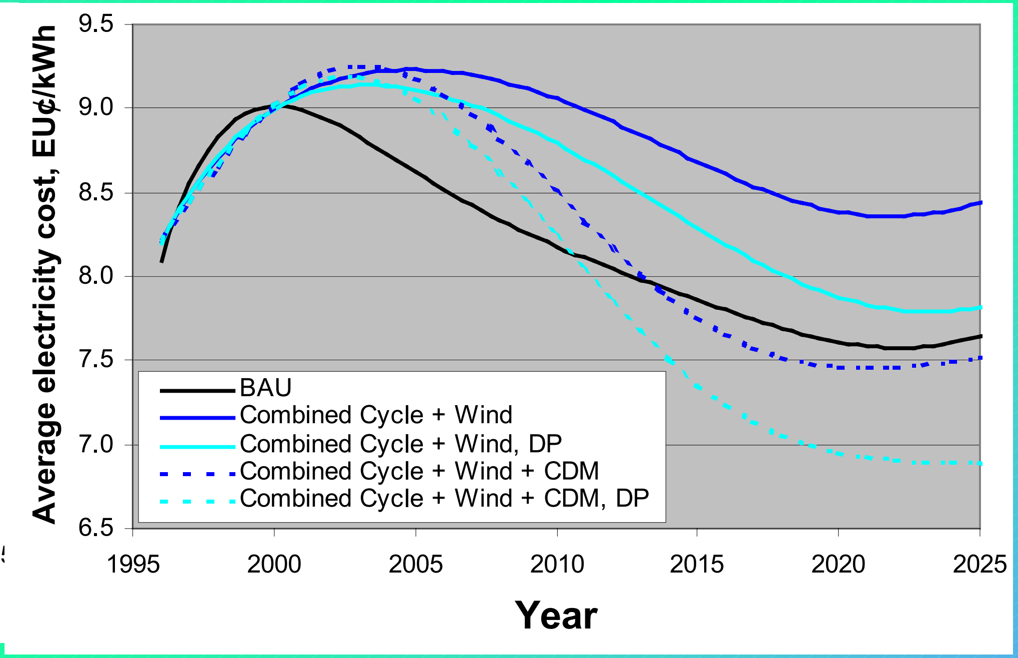
- Santiago - wind is not viable with current costs
- Combined cycle will be viable later
- CDM could help wind to become viable

Comparison of average electricity production price (1999 €)

Scenarios 1-3: Possible influence of CDM

CASE: SANTIAGO





Scenarios 1, 2 and 4

Scenarios 1, 3 and 5

Influence of **RET innovation** - 1% declining prices for wind

Credibility of BAU as CDM baseline depends on declining prices

CASE: SANTIAGO
CONCLUSIONS

- ⇨ CDM could help reduce CO_2 emissions from electricity production to half baseline value.
- ⇨ GHG reduction potential from business as usual scenario baseline.
- ⇨ Financial and environmental additionality.
- ⇨ Contribution to the host country´s sustainable development needs.
- ⇨ Opportunity for RET vendors and CDM investors.

CASE: MOZAMBIQUE OBJECTIVES

- ⇨ showing particular case of the Least Developed Country, sparsely populated, with large distances, low energy consumption but rich in resources.
- ⇨ discussing the assumed rules of CDM.
- ⇨ showing the potentials for investment into RET and supply side energy efficiency technologies.

MOZAMBIQUE SPECIAL CASE

- ⇨ Sparse population, large distances, low energy consumption, rich in resources - decentralised or integrated electricity system.

- ⇨ High price of small scale fossil fuel technology (diesel).

⇨ **Mozambique** 

- ⇨ Competitiveness of large hydro energy.

- ⇨ Large hydro potential installed - 90% for export.

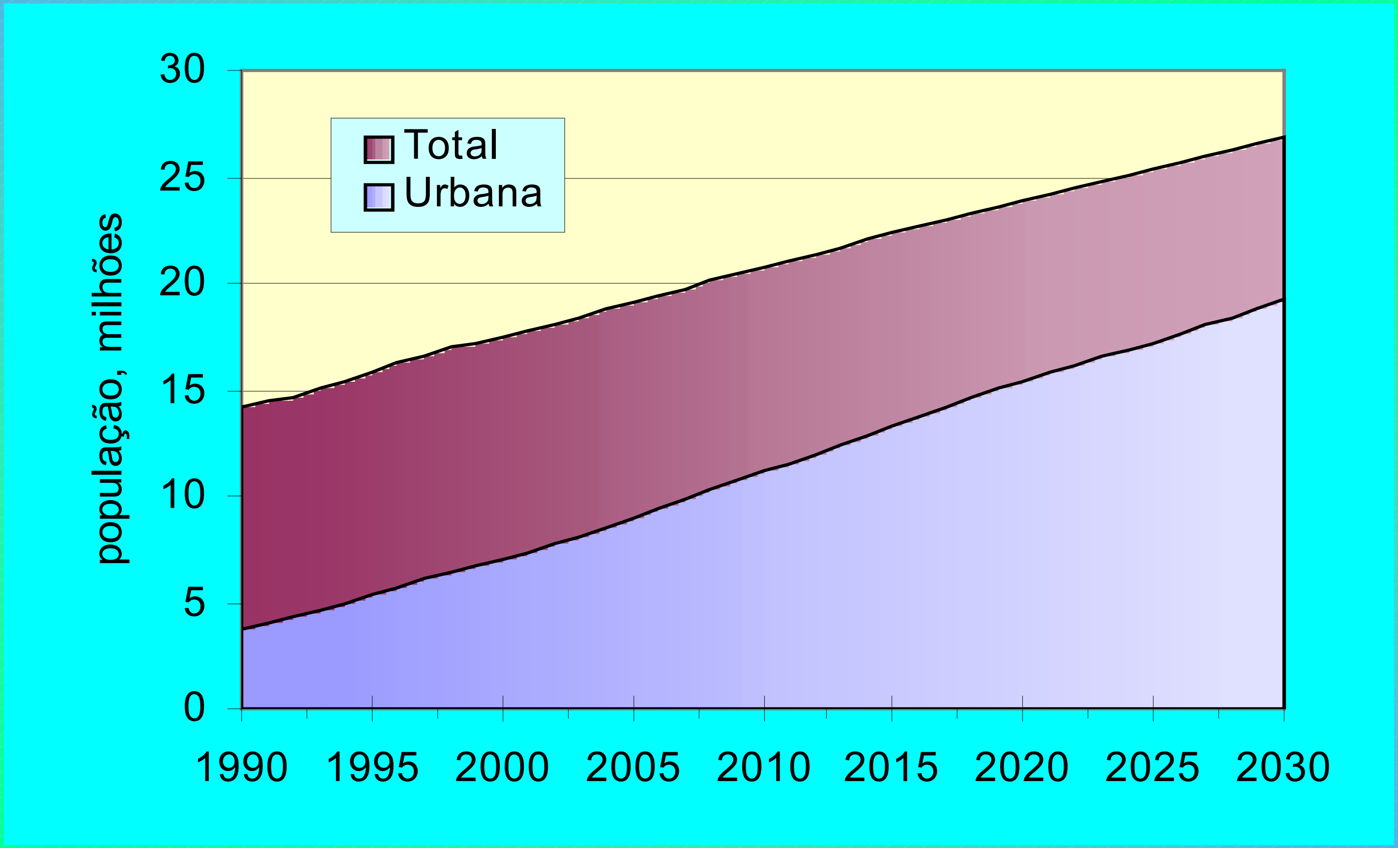
Electricity production - Mozambique

Possible case for CDM

2000-2030

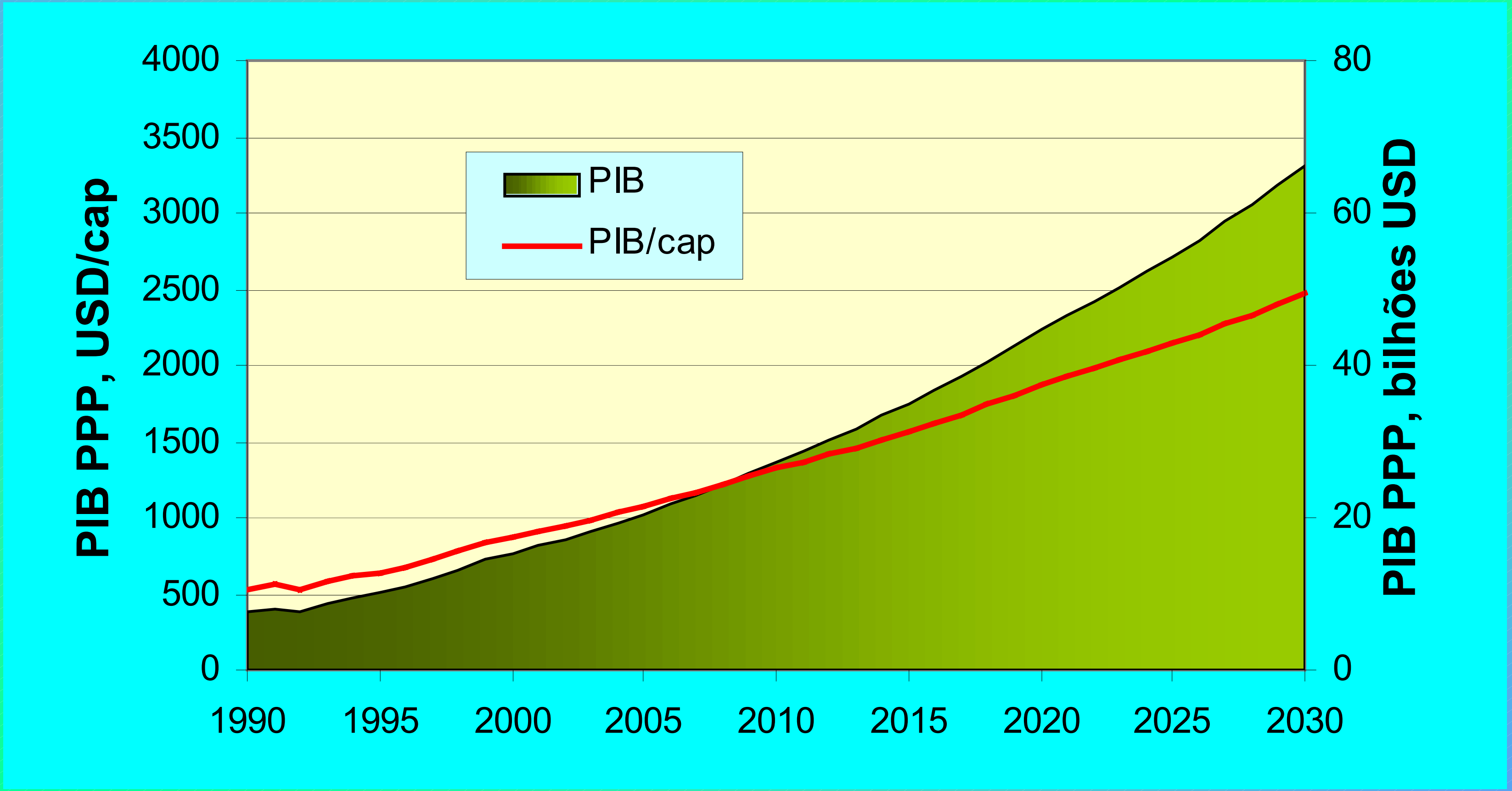
Scenario 1: Baseline – new power mainly Diesel
Scenario 2: Natural gas – new power mainly GT or ST
Scenario 3: Natural gas – new power mainly CC
Scenario 4: Hydro - new power mainly coming from HPP

CASE: MOZAMBIQUE



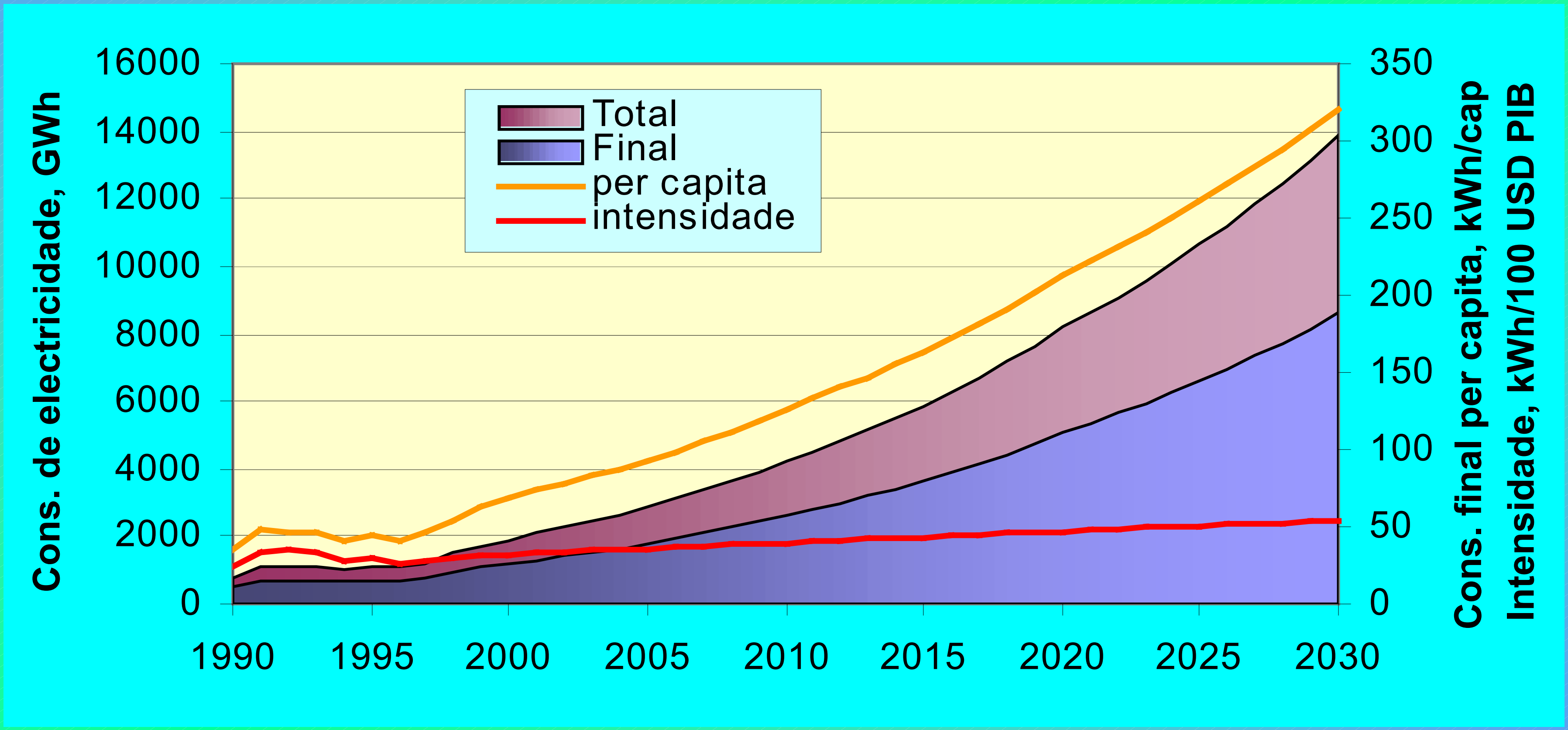
Baseline scenario: **population** growth

CASE: MOZAMBIQUE



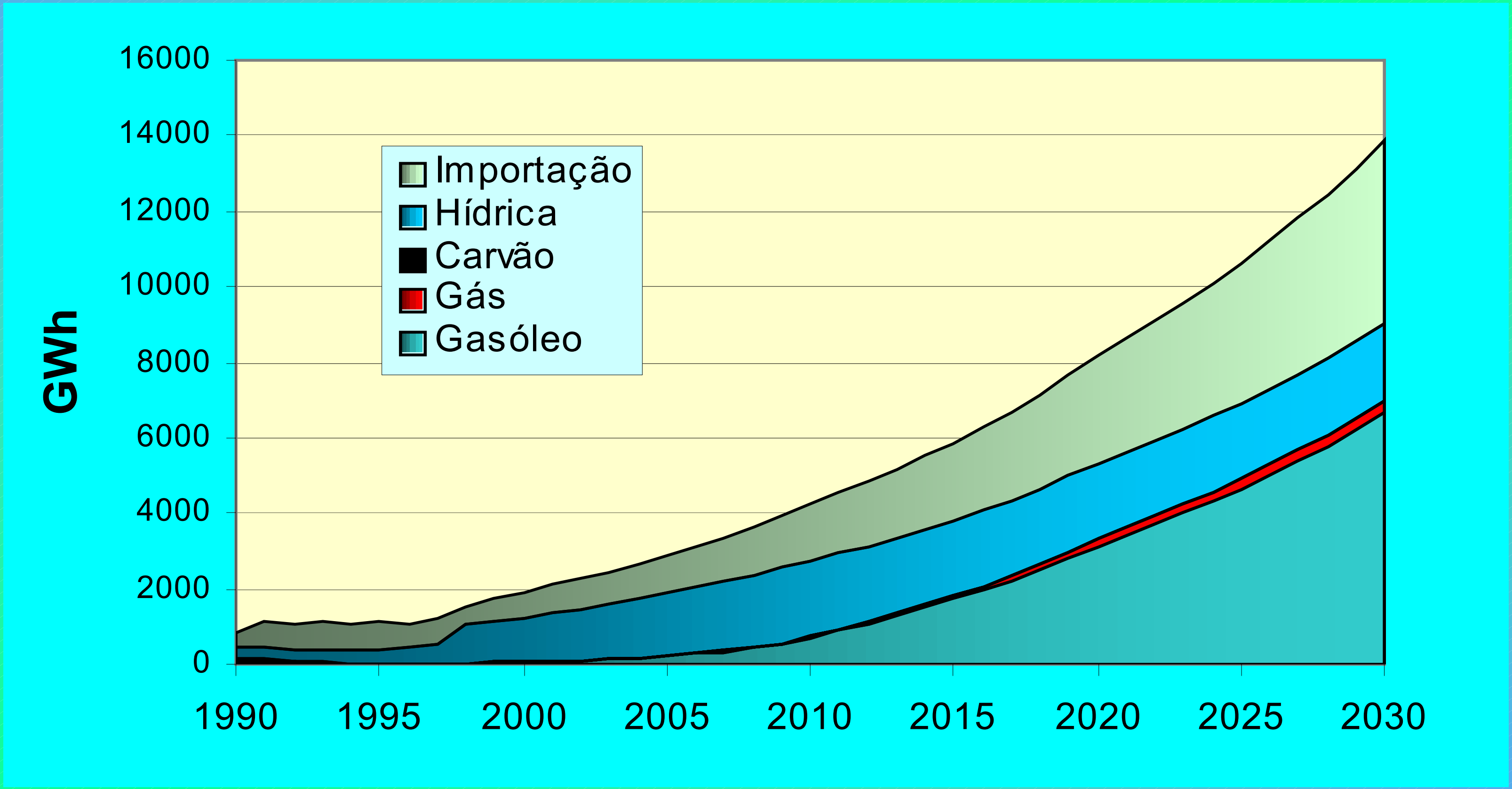
Baseline scenario: **GDP** PPP, and GDP/cap PPP

CASE: MOZAMBIQUE



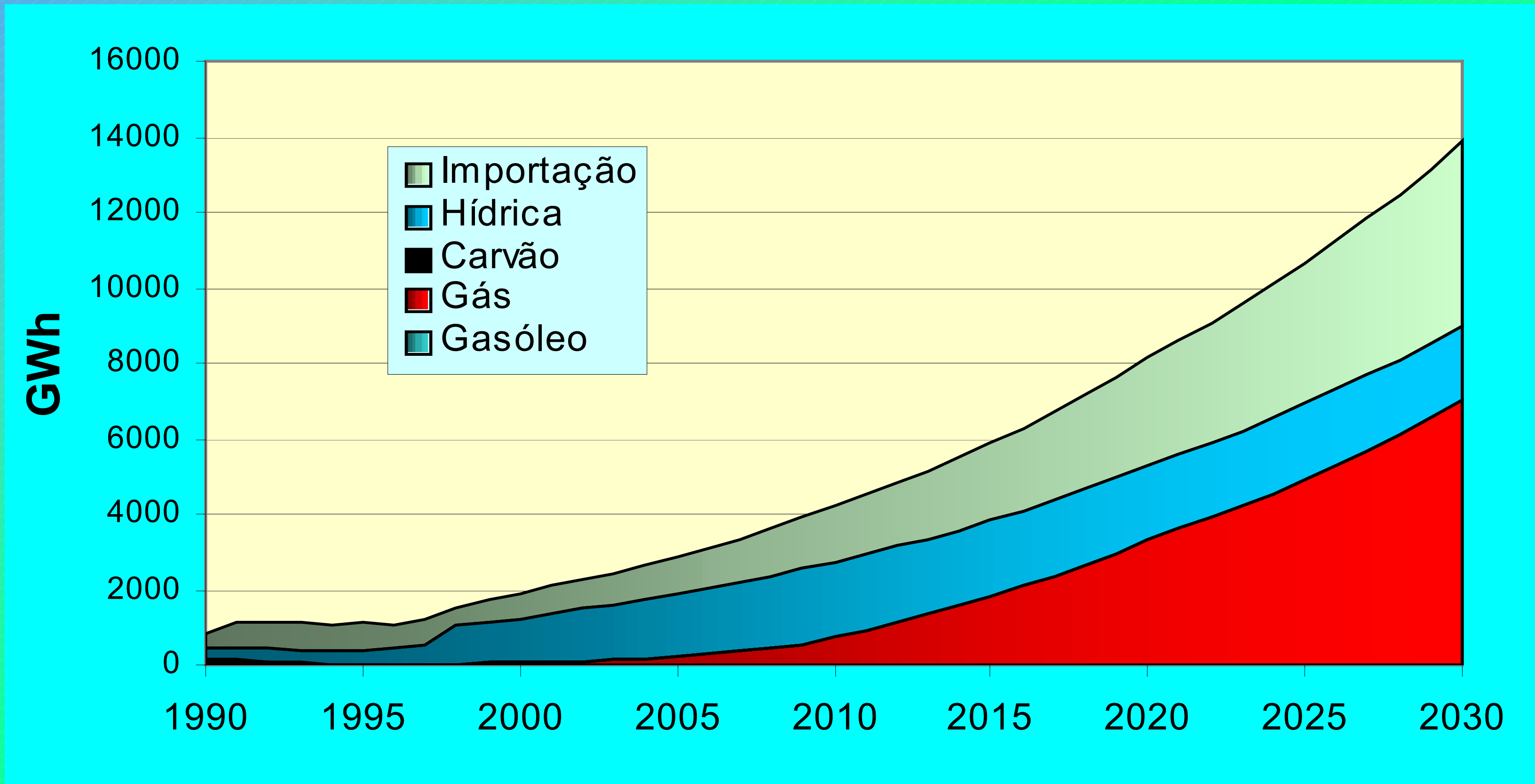
Baseline scenario: Total and final **electricity consumption**, per capita electricity consumption and electricity intensity

CASE: MOZAMBIQUE



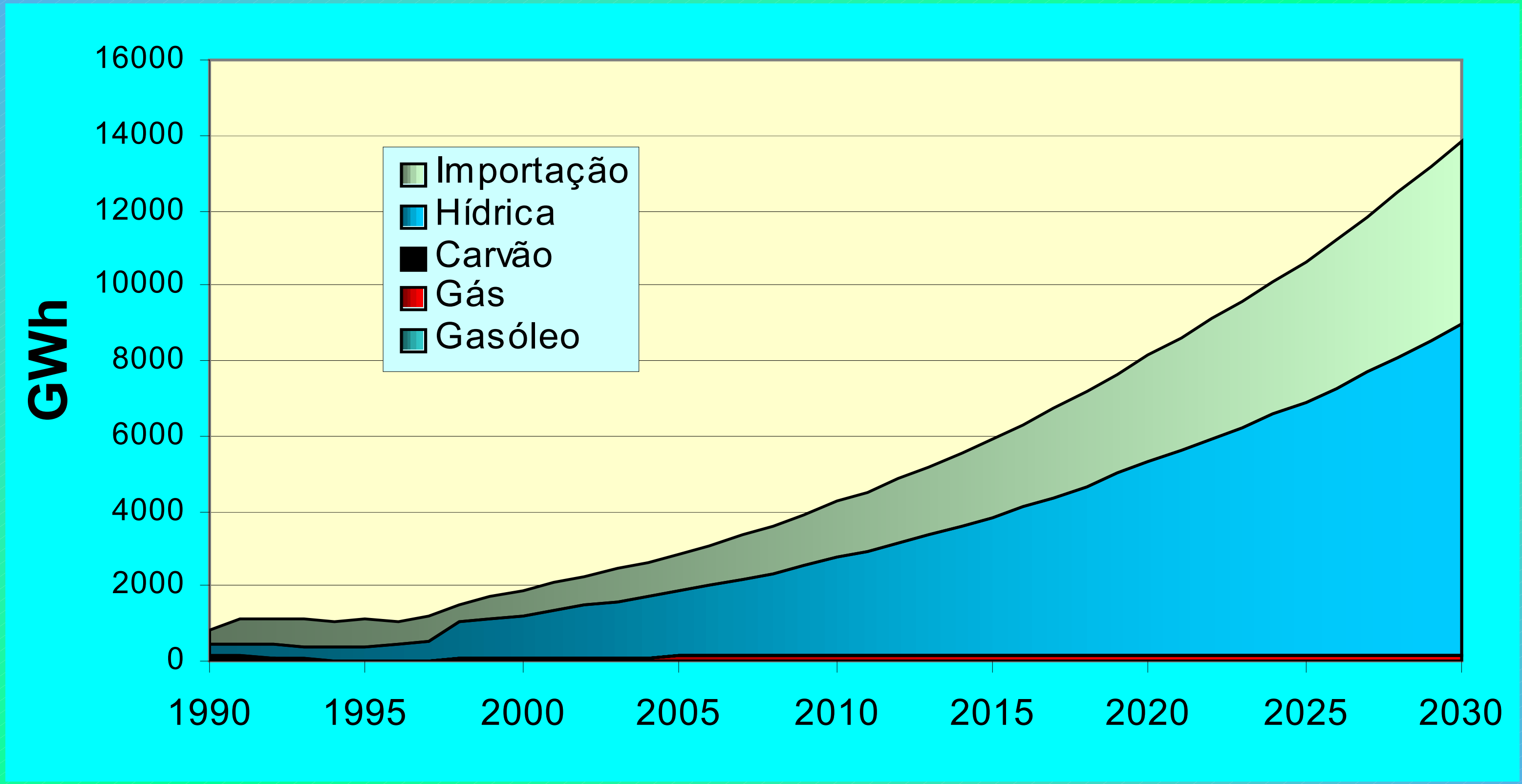
Baseline scenario: electricity production (hydro + coal + natural gas + Diesel) and import

CASE: MOZAMBIQUE



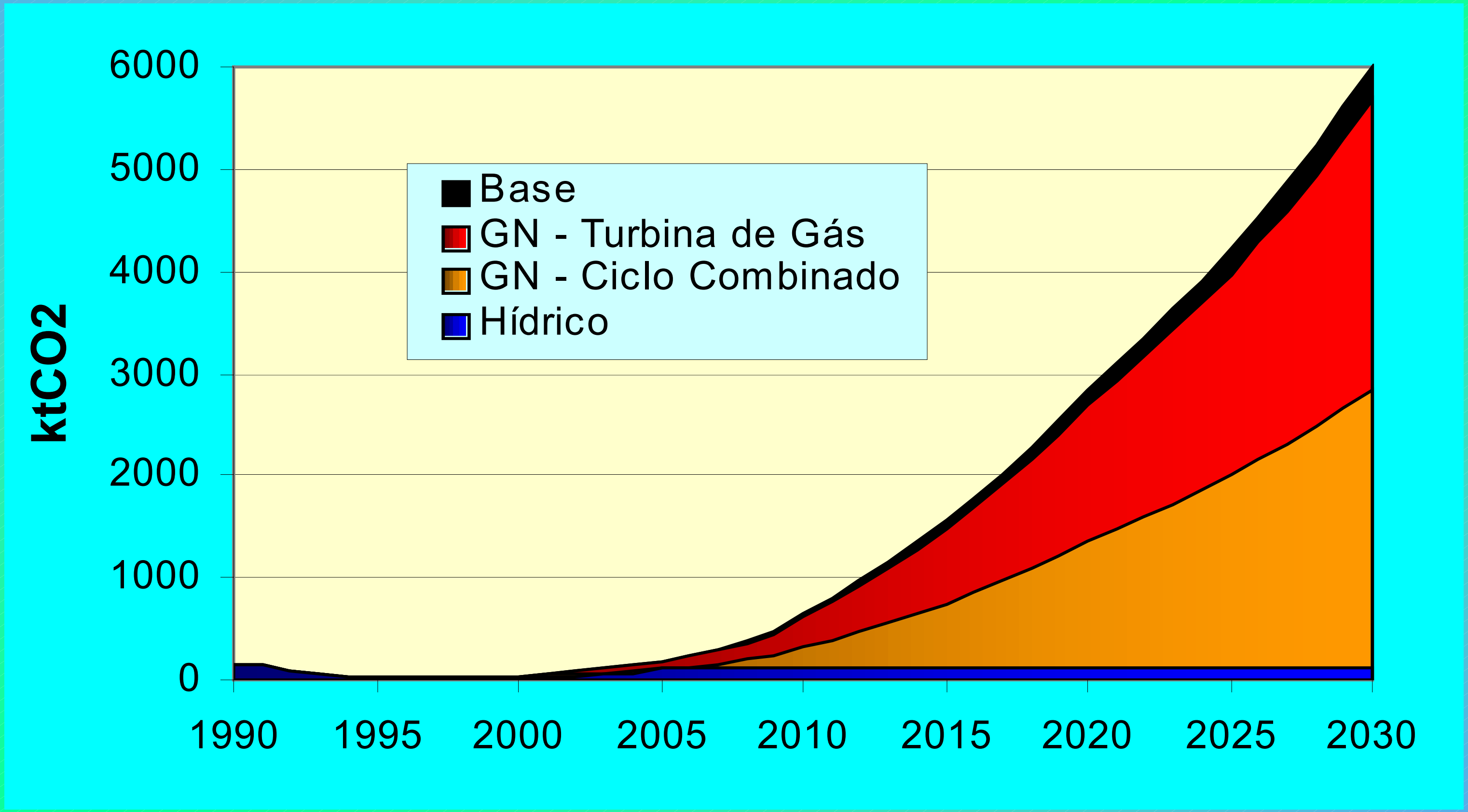
Natural gas scenario: electricity production (hydro + coal + natural gas + Diesel) and import

CASE: MOZAMBIQUE



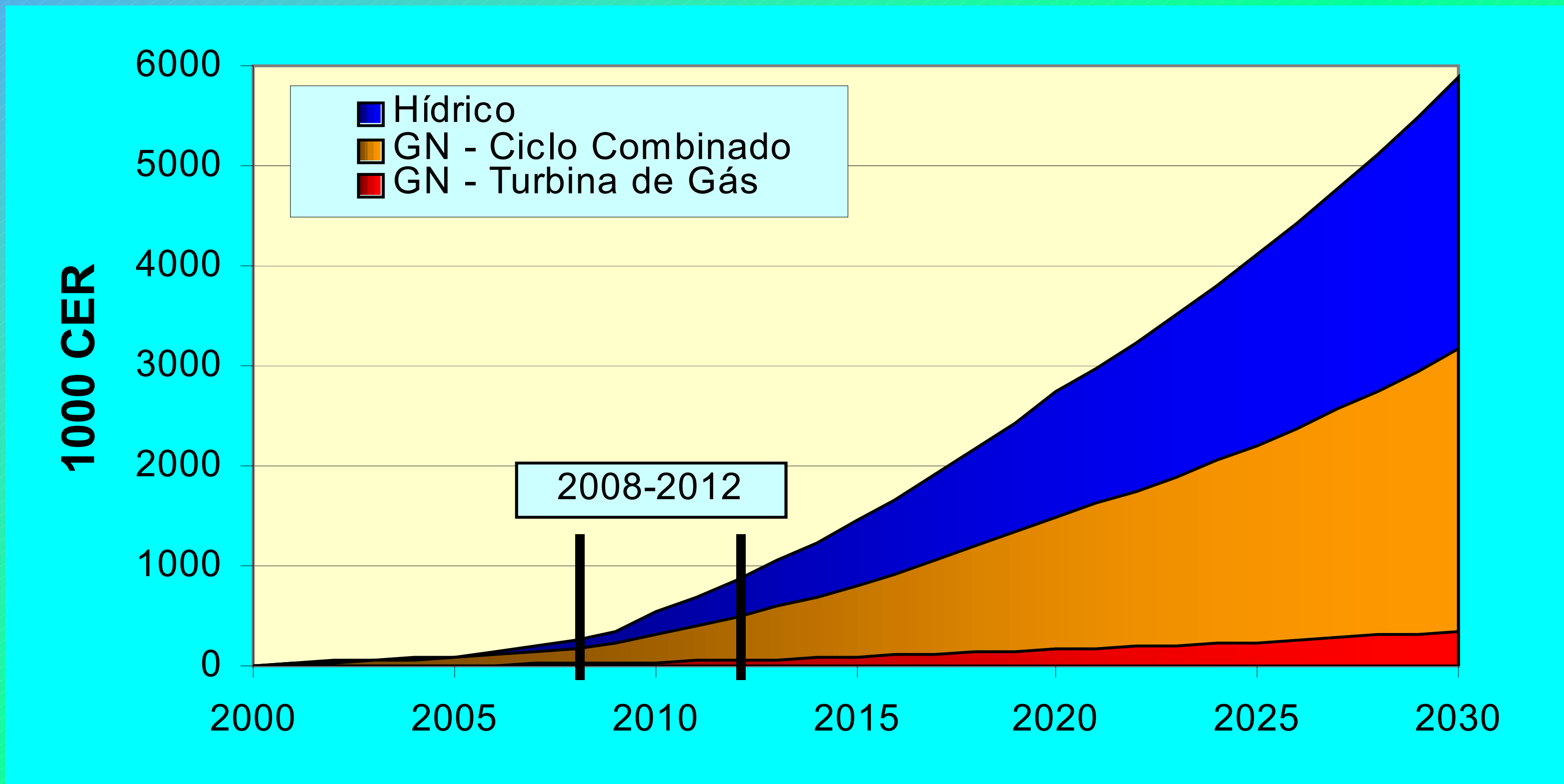
Hydro scenario: electricity production (hydro + coal + natural gas + Diesel) and import

CASE: MOZAMBIQUE



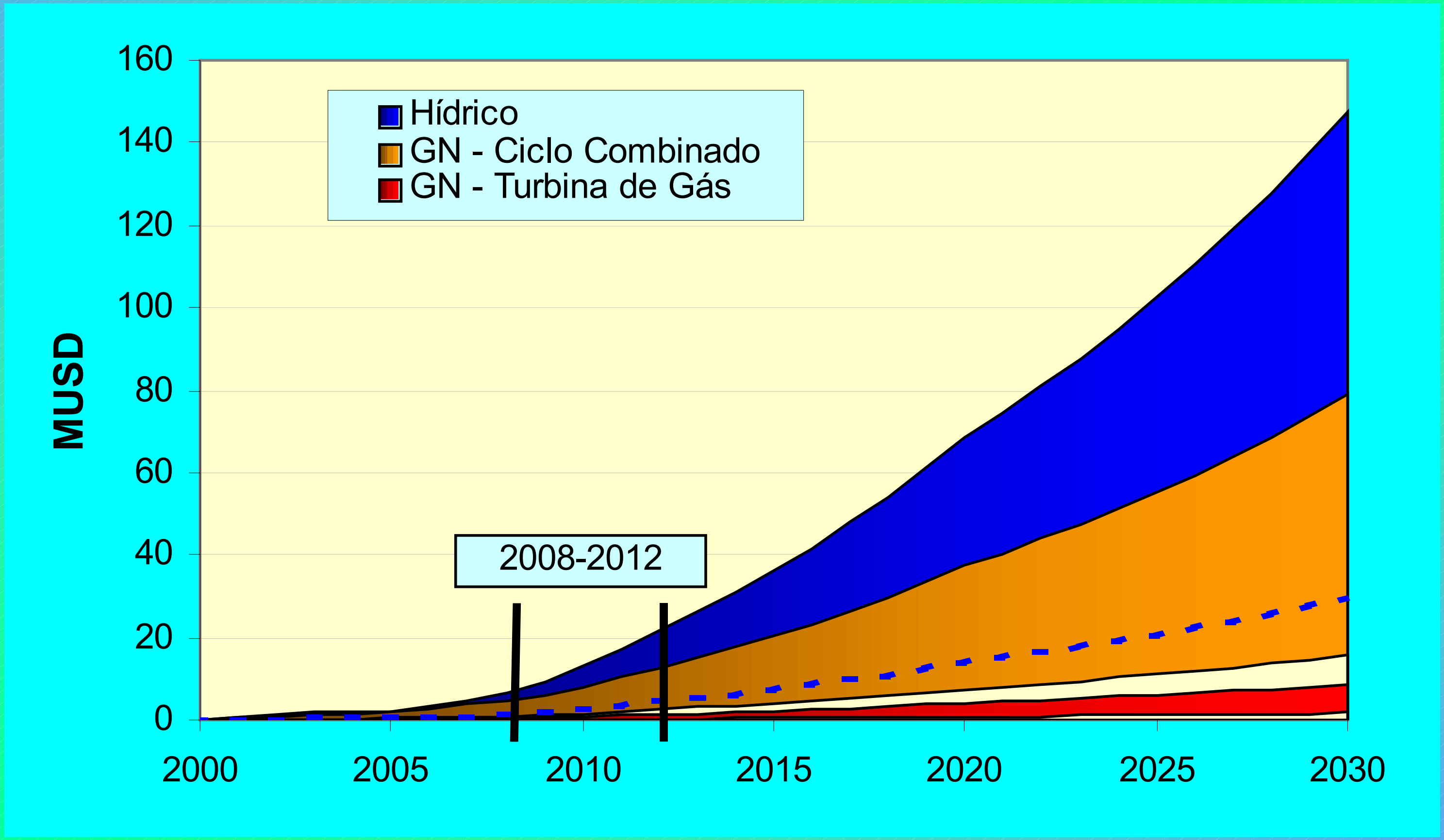
CO2 emissions: comparison of scenarios, baseline, gas turbine natural gas, combined cycle natural gas, hydro

CASE: MOZAMBIQUE



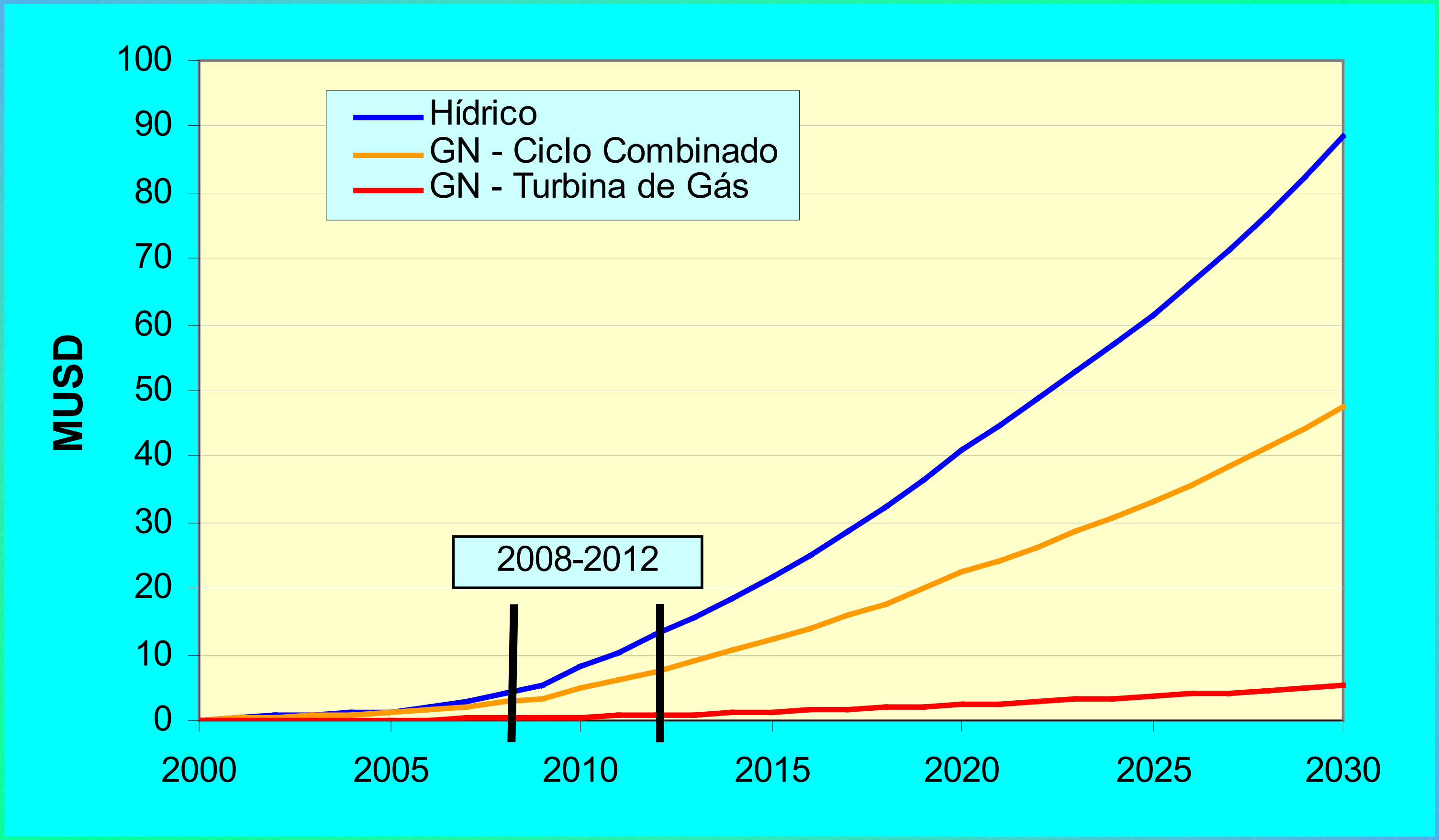
CDM potential: comparison of scenarios to the baseline - gas turbine natural gas, combined cycle natural gas, hydro

CASE: MOZAMBIQUE



Potential CDM value: comparison of scenarios to the baseline - gas turbine natural gas, combined cycle natural gas, hydro

CASE: MOZAMBIQUE



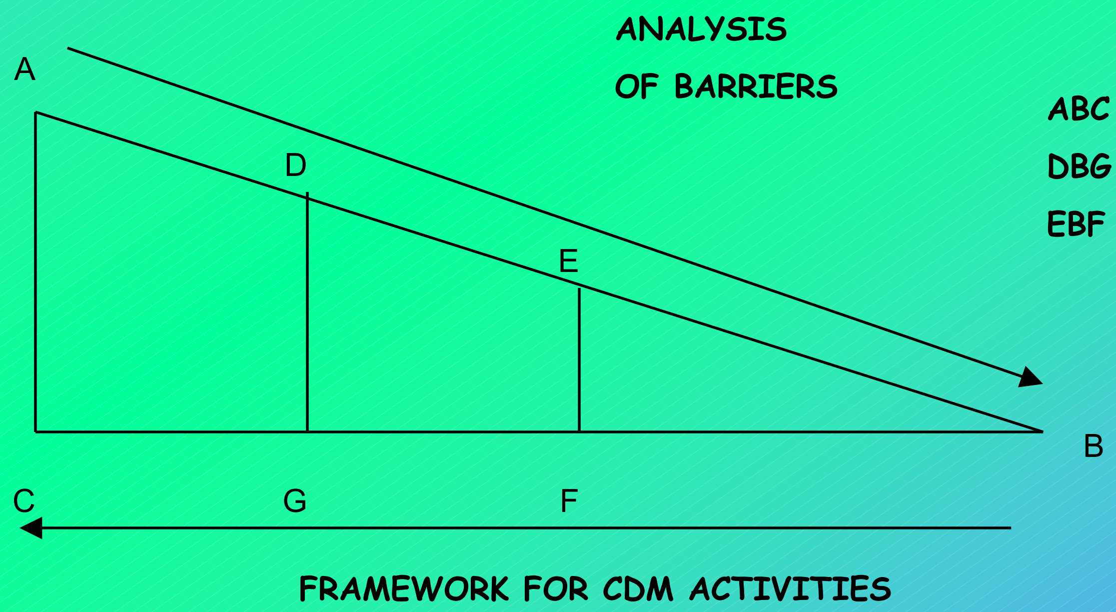
Potential CDM value (15 USD/tCO2): comparison of scenarios to the baseline - GT, CC, hydro

CASE: MOZAMBIQUE
CONCLUSIONS

- Energy Planning methodology combined with consequences of the Kyoto Protocol were presented on the example of Mozambique.
- Additional advantage of integrated electricity system is higher share of cleaner energy technologies (CC + hydro) and the CDM potential.
- It is important for Mozambique that large Hydro be included in CDM.
- It is important for Mozambique that CDM does not include financial additionality condition.
- In case of using Natural Gas from the CDM point of view advantage is on Combined Cycle technology.
- Financial potential in CDM for energy projects.

CDM - BRAZIL

To carry out preparatory activities for the implementation of CDM in South American with Brazil as a case-study offering a rich diversity of representative possibilities in the South American region.



ABC = SOUTH AMERICA

DBG = BRAZIL

EBF = MATO GROSSO

CDM - BRAZIL

Table 2-6

Qualitative Indicators of Secondary Benefits for Energy Options

Secondary benefits	Ethanol (with bagasse cogeneration)	Cogeneration from refineries	Biomass thermoelectricity (gasification of wood)	Wind energy
Environmental impacts				
Effects on water resources availability	–	Neutral	–	Neutral
Effects on water resources quality	–	Neutral	–	Neutral
Effects on urban air pollution	+	++	–	+++
Effects on soil erosion	–	Neutral	–	Neutral
Effects on biodiversity protection	Uncertain	Neutral	+	Neutral
Development impacts				
Effects on aggregate demand	+++	+	++	+
Effects on trade balance	+++	+++	+++	+
Effects on regional economy	++++	+	+++	++
Opportunity cost of the output forgone	+	Neutral	+	Neutral
Equity Impacts				
Effects on income distribution based on the project's unskilled labor participation	+++	Neutral	+	Neutral
Effects on the consumption of the project's output by income class	–	Neutral	+	Neutral
Effects on the distribution of environmental benefits by income classes	+++	++	++	++

Negative impact: – Low

Positive impact: + Low ++ Medium +++ High ++++ Very High

Font: Brazil: CDM opportunities and benefits – WRI, March 2000

CDM - BRAZIL

Table 2-5

Qualitative Indicators of Secondary Benefits for Forestry Options

Secondary benefits	Pulp plantation in degraded area	Charcoal plantation in degraded area	Sawlog plantation in degraded area	Private sustainable native forest management for sawlog	Public concession forests for sawlog
Environmental impacts					
Effects on water resources availability	--	--	--	++	+++
Effects on water resources quality	--	--	--	Neutral	Neutral
Effects on urban air pollution	--	+	Neutral	Neutral	Neutral
Effects on soil erosion	--	--	—	+++	++++
Effects on biodiversity protection	+	+	+	+++	++++
Development impacts					
Effects on aggregate demand	++++	++++	++++	+++	+++
Effects on trade balance	--	Neutral	—	++	++
Effects on regional economy	+	+	++	++++	+++
Opportunity cost of output forgone	--	+	--	--	--
Equity impacts					
Effects on income distribution based on the project's unskilled labor participation	+	+	+	+++	++
Effects on the consumption of the project's output by income class	Neutral	Neutral	Neutral	+	++
Effects on the distribution of environmental benefits by income classes	Neutral	+	Neutral	++	+++

Negative impact
– Low

Positive impact
+ Low ++ Medium +++ High ++++ Very High

Font: Brazil: CDM opportunities and benefits – WRI, March 2000

CONCLUSIONS

⇒ Energy Planning should be done taking into account CDM.

⇒ Large GHG reduction potential in Developing Countries.

⇒ Opportunity for RET vendors and CDM investors.

⇒ Contribution to the host country´s sustainable development needs.

CDM - WHERE TO GO FROM HERE

CDM is about:

- ENVIRONMENT, because it allows non-Annex I Parties to contribute to Kyoto objectives and assist Annex I Parties in meeting their emission limitation commitments;
- DEVELOPMENT, because it assist non-Annex I Parties in achieving sustainable development and in contributing to the ultimate objective of the UNFCCC;
- ECONOMY, because CDM projects create emission reduction units (ERUs) which can be purchased by Annex I Parties to contribute to their compliance with their emissions limitation obligations under the Protocol - CDM lowers compliance costs.