Public Awareness and Early Energy Education in Service of Decreased Energy Budget and Climate Change Mitigation

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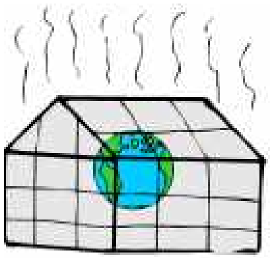
Macedonian Center for Energy Efficiency – MACEF

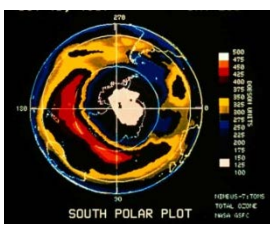
Skopje, 21 March 2009

Why Public Awareness?

- Most common way of communicating new life style
- Energy efficiency V.S. energy saving
- Various types of approach for a specified target group
- Long term dedications and campaigns
- Inventive ways to justify and stimulate changes
- Cheap marketing for relevant players

Environmental Issues











- Global Warming
- Fossil Fuel Depletion
- Ozone Depletion
- Transport Congestion
- Air Pollution
- Waste Generation
- Water Extraction
- Acid Rain
- Water Pollution
- Mineral Extraction

Macedonia in focus

- Lack of organized campaigns
- Political interests at public tenders, not the expert opinion and recommendations
- All is left to the big energy companies, interest for bills collection
- One record of thermal solar purchase subsidy measure – Government
- Activities of the NGO's and intr. support
- The update of the National Energy Efficiency Strategy and the accompanying National Energy Efficiency Action Plan to suggest public education approaches

MACEF activity

- Best practices from the EU countries
- Publications on Energy Efficiency in municipalities, brochures on energy saving tips, coloring books and etc.
- Continuous work with the local self-government – seminars and training
- Energy Week organization since 2004
- Monthly newsletter, the 73rd issue on the way
- Building relationships with the media
- Education and information dissemination thru the media, 2 media features in a week on regular basis

Why Early Energy Education

- The role of the society
- Role of the teachers
- Quality education to meet the needs of a contemporary kid
- In need of focused and expert educational program
- Invest in our future
- The process needs to start at early age when the habits are being made
- Many best practices around the world

Macedonia in Focus

- Lack of additional education on energy and EE in the official education programs
- All is left to the teachers will and interests
- Absence of energy games and kits for schools
- Project based activities – Higher educational institutions and NGO's
- Lack of funds for isolated country cases – need of regional approach
- USAID Primary Education Project Activities

MACEF Activities

- Pilot Kindergarten Project – “Turn it on, turn it off,
  2007
- EVN
  Elec
- Deve
  scho
- Dire
  Sect
- Man

Turn it on, turn if off!

I Level Goals

- Types of energy
- Intelligent use
- Ways to save
- Safe handl ices
- Capacity B

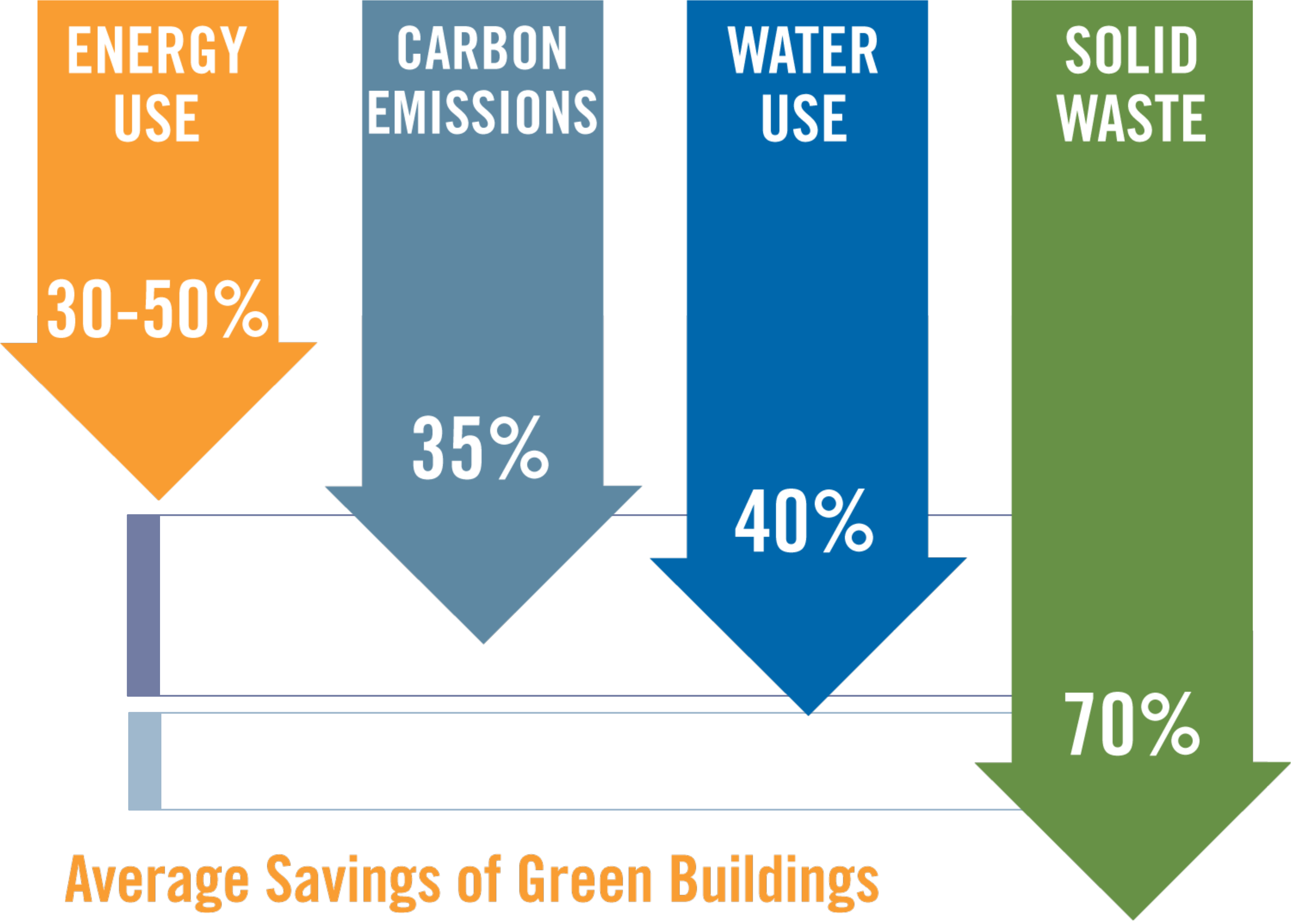
II Level Goa

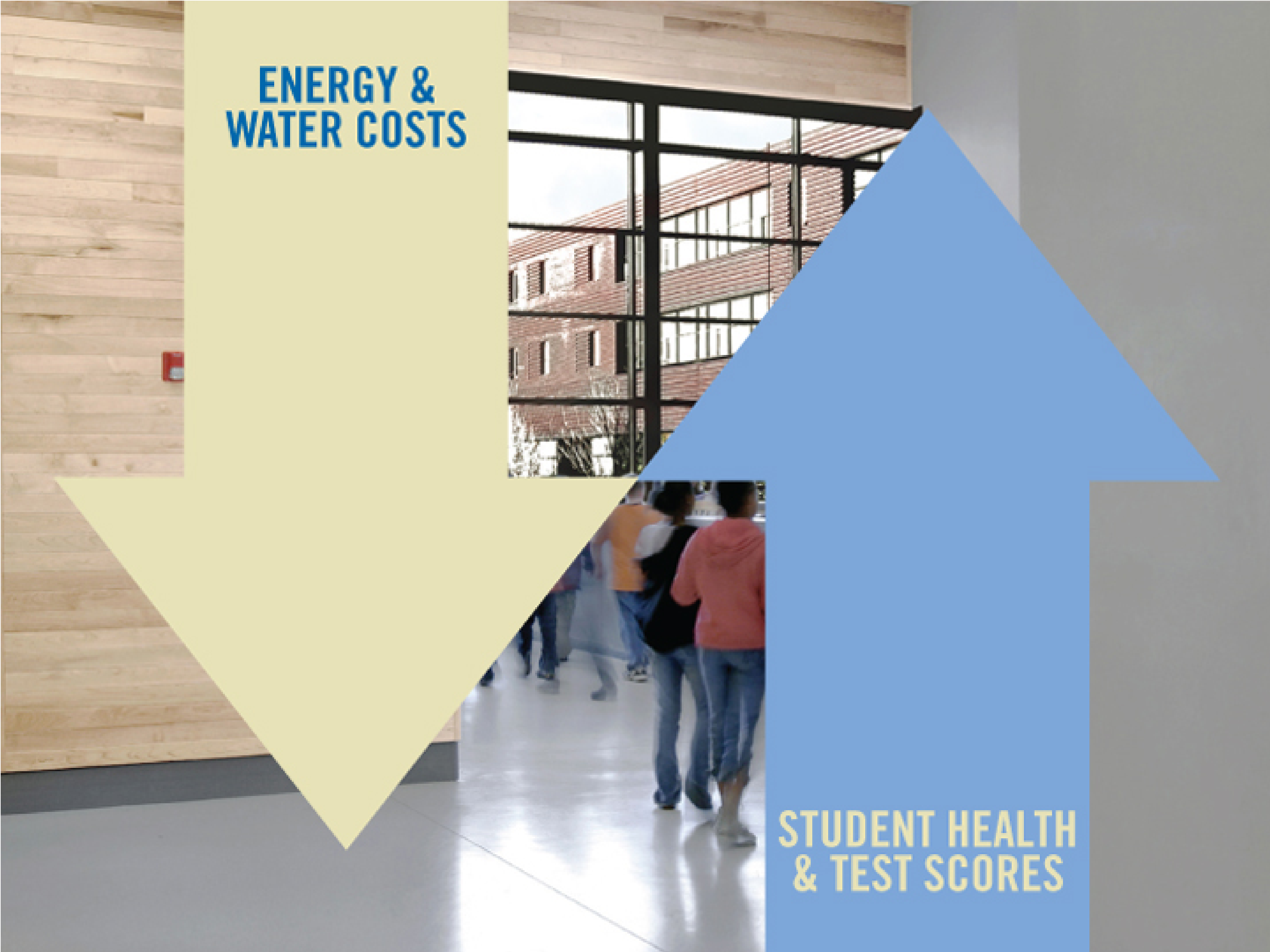
- Perfect way surrounding

III Level Go

- Kindergart taff – Energy Eff


STOP


ENERGY USE
30-50%
CARBON EMISSIONS
35%
WATER USE
40%
SOLID WASTE
70%
Average Savings of Green Buildings


ENERGY &
WATER COSTS
STUDENT HEALTH
& TEST SCORES

CASE STUDY

30 Schools Studied

33.4%

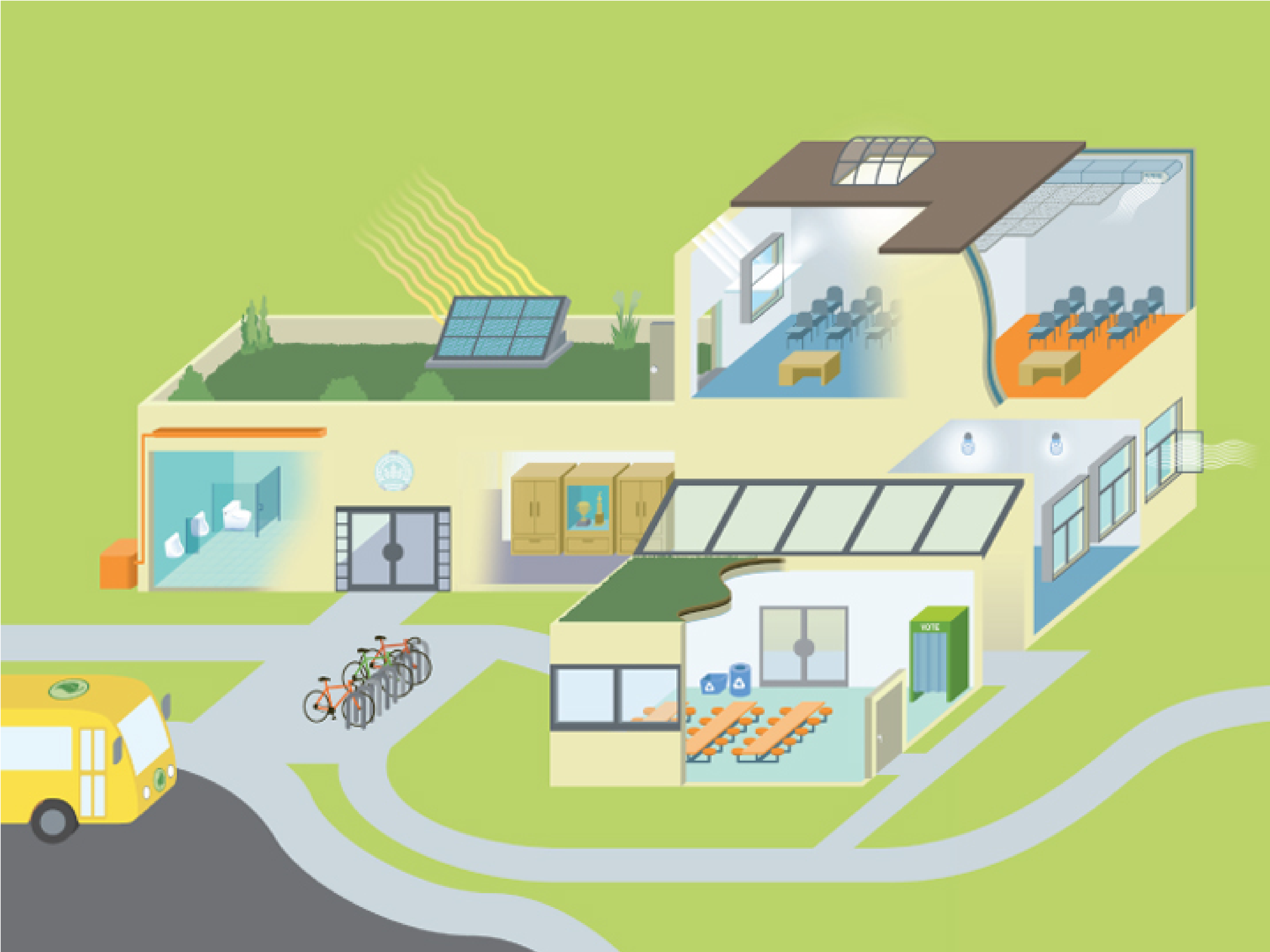
Average direct energy savings

50%

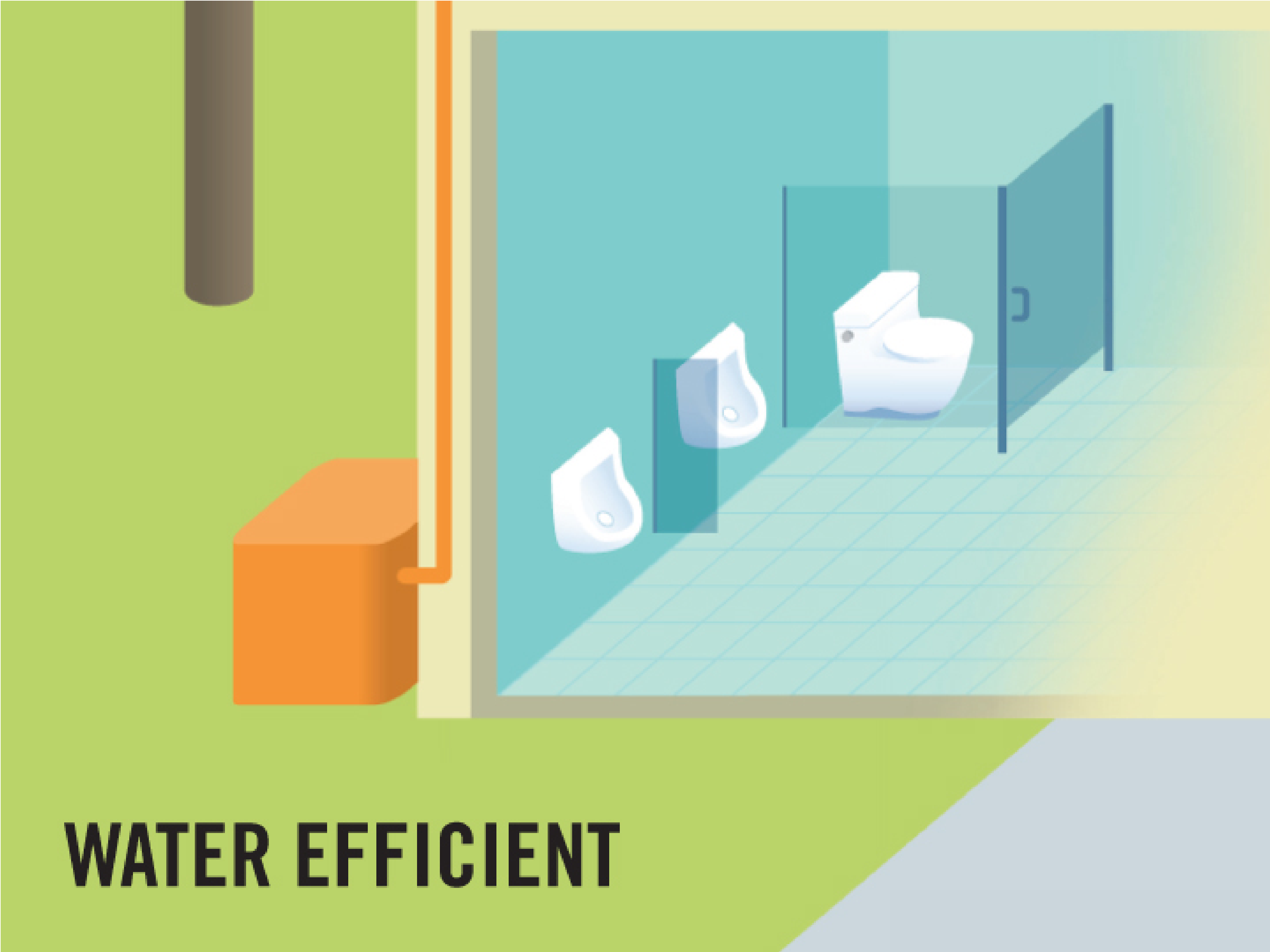
Average indirect energy savings

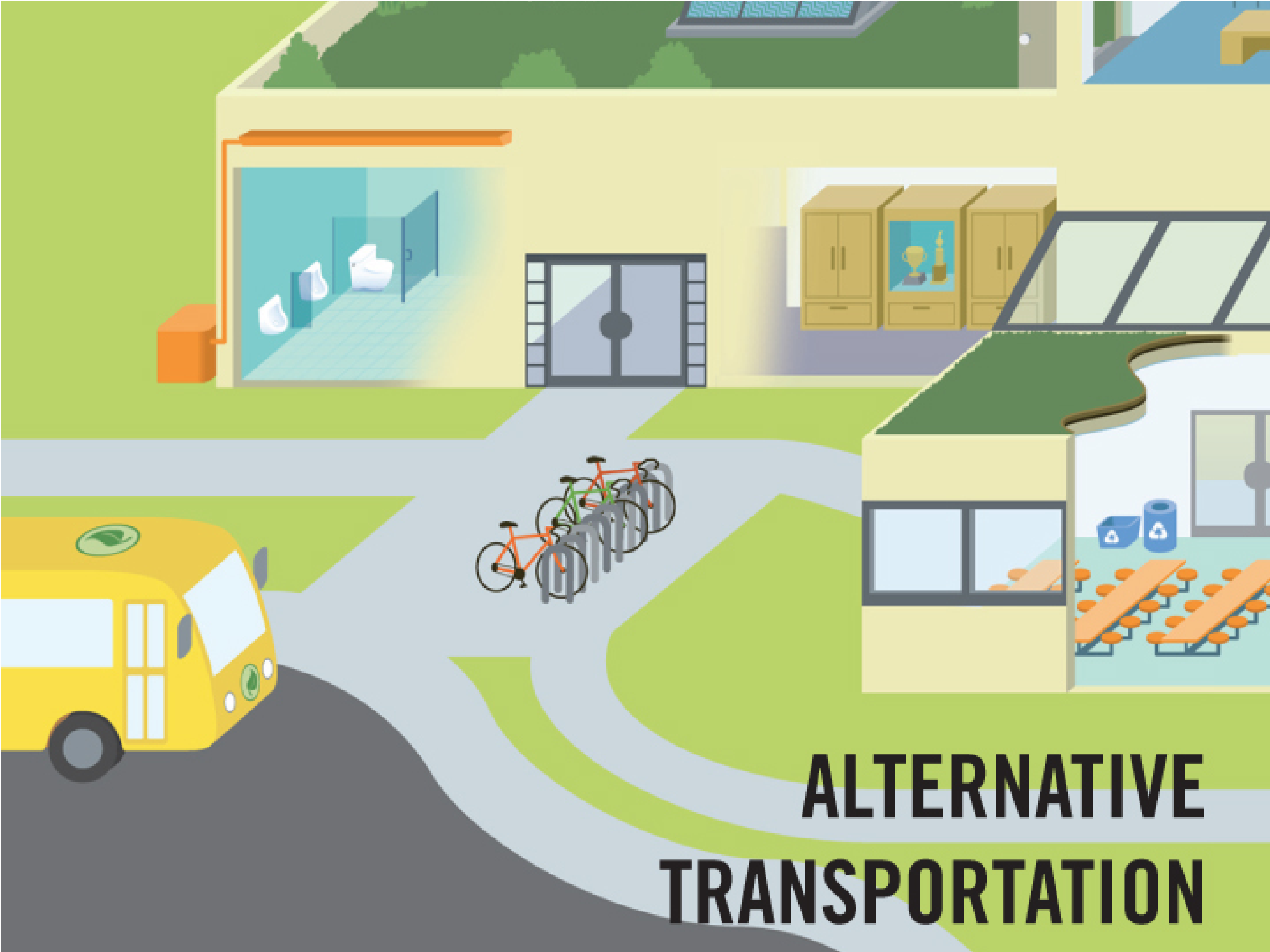
32.1%

Average water savings

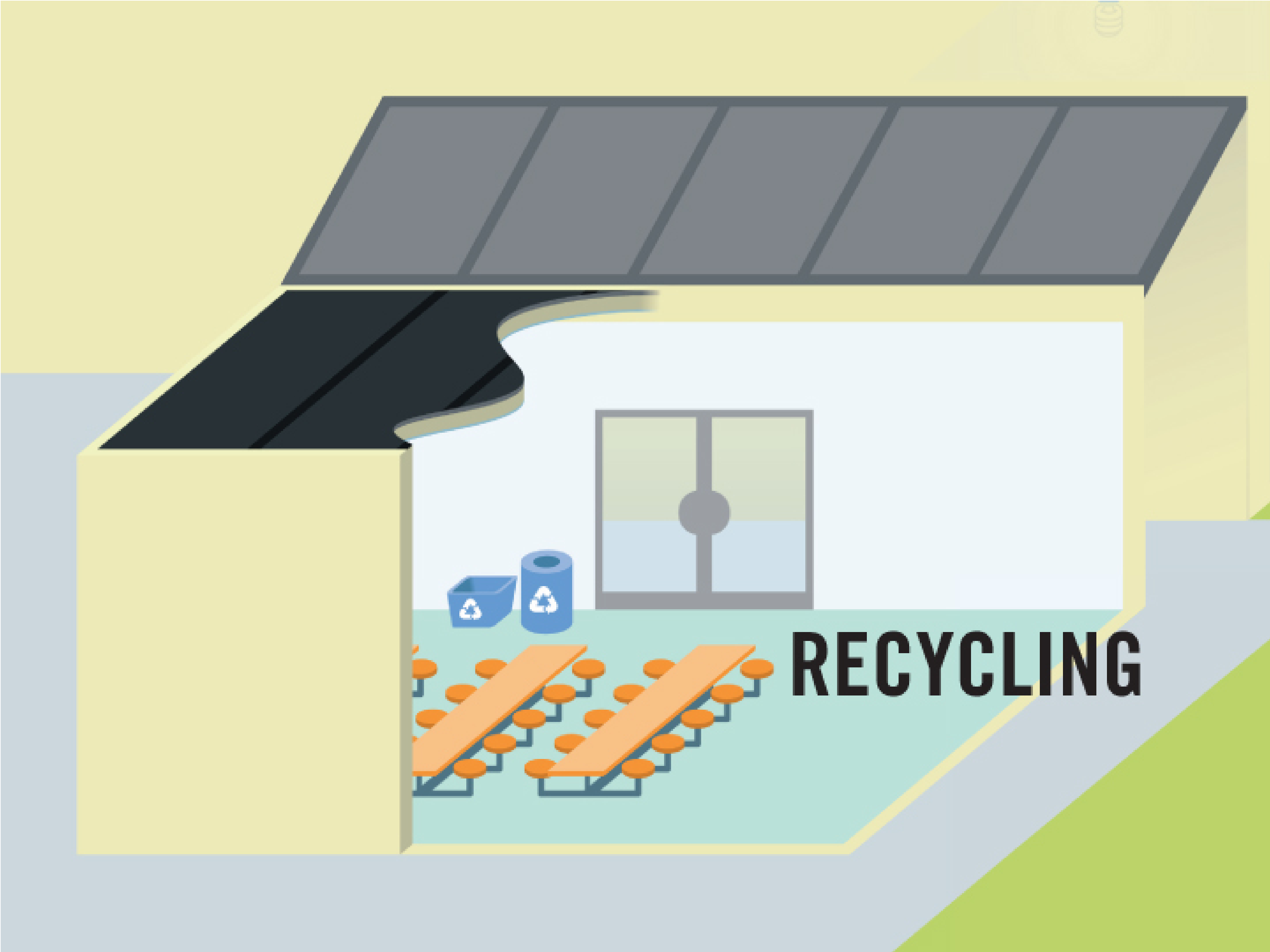

VOTE

SOLAR PANELS


WATER EFFICIENT



ALTERNATIVE TRANSPORTATION

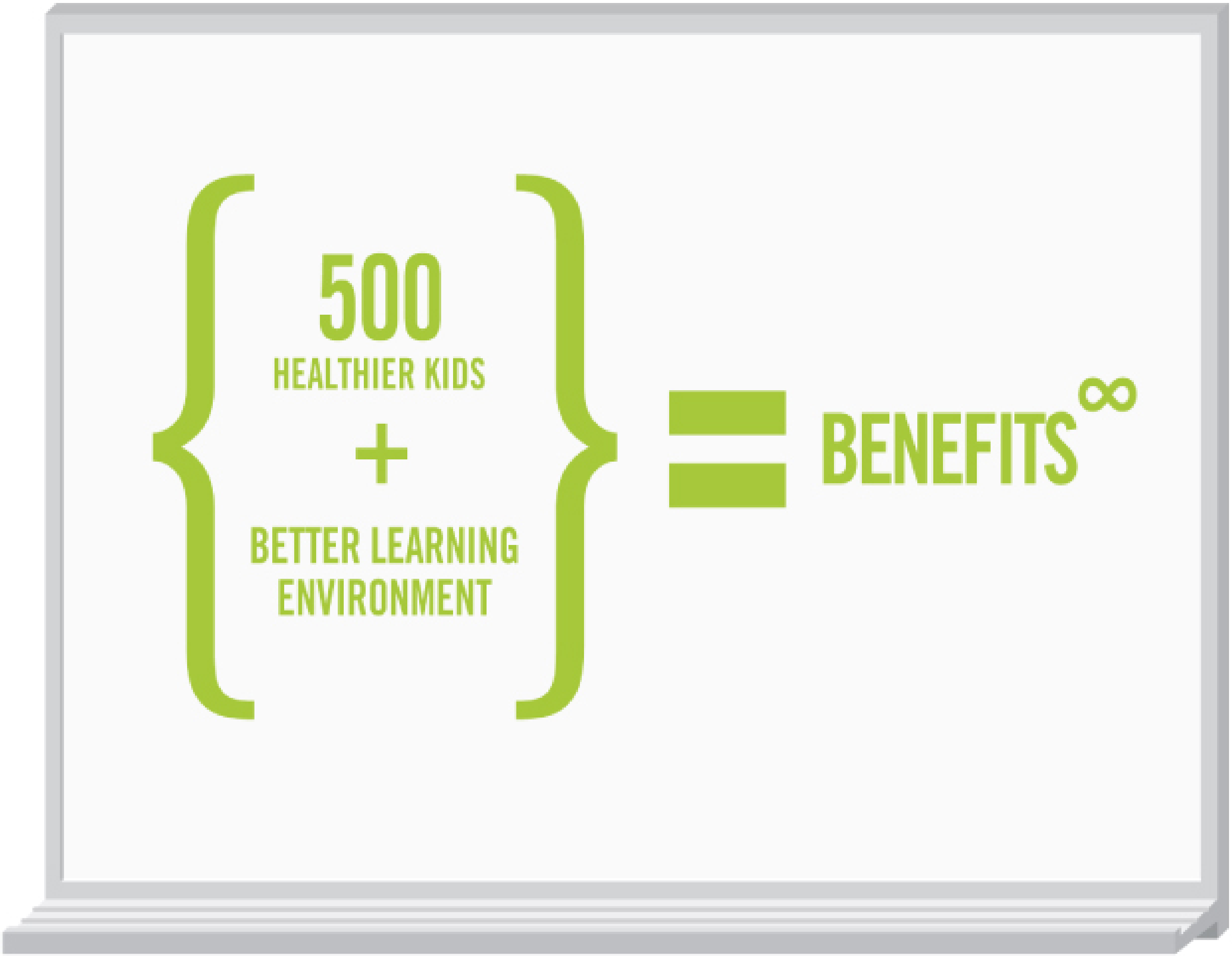

RECYCLING

LEARNING BENEFITS OF GREEN SCHOOLS =

+3%
INCREASE IN PRODUCTIVITY, LEARNING, & PERFORMANCE

AND

-3%
DECREASE IN TEACHER TURNOVER


500
HEALTHIER KIDS
+
BETTER LEARNING
ENVIRONMENT
=
BENEFITS∞


U.S. GREEN BUILDING COUNCIL
LEED GOLD
USGBC
The Willow School
Phase 1
25% energy savings
34% water savings
84% waste diverted
Willow School
Gladstone, NJ


U.S. GREEN BUILDING COUNCIL
LEED SILVER
USGBC
Homewood Middle School
35% energy savings
43% water savings
Homewood Board of Education
Homewood, AL

The fifty/fifty-Project in Berlin

Preconditions for a School to start an energy-saving Project:

- Interest for ecologic behaviour
- Preparedness, to do something
- Financial incentive,
  i.e. gratification if there is a success
- Professional care and consulting

Fifty/fifty – system of incentives

- What is fifty/fifty?
  - Savings by user behaviour,
    i.e. it is not about energy saving investments
  - 50% of the saved money is paid to the schools for free disposition
- Fifty/fifty in Berlin
  - Implementation of the system of incentives
  - Participation of so far 220 schools
  - Savings of more than 600.000 € per year

Saving potential of a school of average size

- Savings of 10 - 15 %
  - 100 MWh warmth
  - 10.000 kWh electric current
  - 40 t CO_2
  - 5.000 Euro

or:
Savings of 80 – 90 %

How it works

- Formation of an „Energy Team“ by participation of all groups of users
- Getting to know the energy situation of the school building
  - Energy round tour
  - Measurements regarding the use of energy
- Tracking of energy saving potentials
- Creation of a catalogue of measures for energy saving

Energy measuring

Measures for saving energy

- Realisation of energy saving measures by the energy team and the caretaker
  - Adjustment of the heating system
  - Adjustment of lighting in corridors and staircases
- Information of the school public (pupils and teachers)
  - Posters about energy consumption, energy saving measures and saving achievements
  - Info sheets regarding all day behaviour
  - Marking of light switches
- Other measures
  - Realisation of energy saving weeks
  - Training of pupils in charge of energy saving in the classes

Informing the school public

Mobility Management in Schools

- Traffic and Mobility Education
- Problems
- Approach
- Campaigns, Projects and Material

Traffic education – Mobility Education

- Traffic Education = Teaching Principle within Safety Education

  (Austrian School Law)

- The Problem: No Correlation with Environmental Education
- The Aim = Safety and Prevention of Accidents

The Problem: To Adapt children as weak traffic participants

TEACHERS ARE CAR-DRIVERS

They believe that the car is the ideal means of transport

Establish Awareness…

- Who is to blame?

5‘ before school starts…

… and 5‘ after

Actions & campaigns: Car Free School Day

schoolyard...

...instead of a parking lot

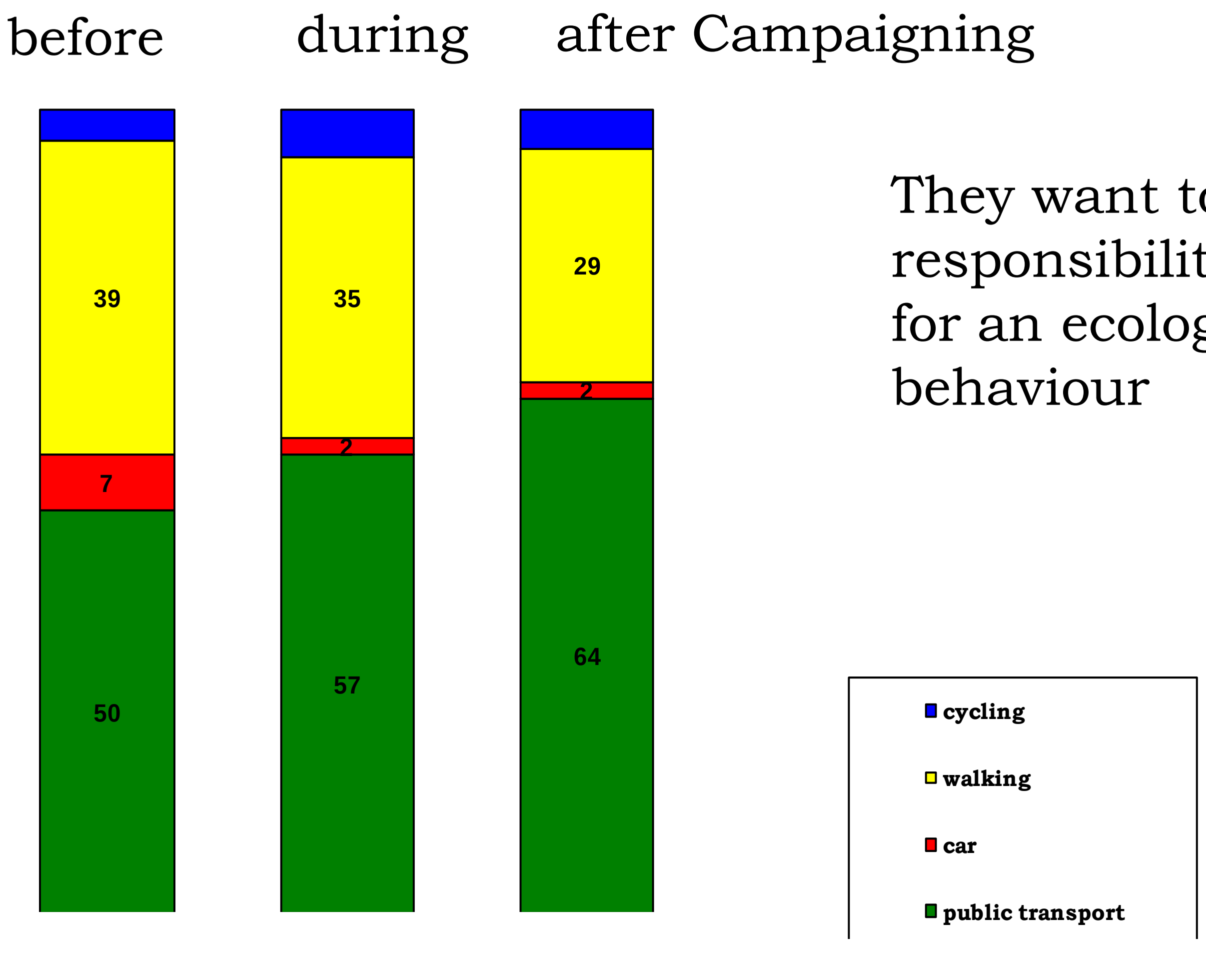
Open air – Lessons and Street Painting

Stimulating Teachers Campaigning

Self-made stickers as a reward...

...for teachers who cycled to school

Results of Pupils' Behaviour



They want to assume responsibility
for an ecologically sound behaviour

Let's VOTE EARTH!

http://www.voteearth2009.org/home/earthhour01.asp

INFLUENCE OF CLIMATE CHANGE ON DIATOMS DIVERSITY INDICES IN LAKE PRESPA

Andreja Naumoski, Kosta Mitreski

Presented by:

MSc. Andreja Naumoski, Faculty of Electrical Engineering and Information Technologies, Skopje, Republic of Macedonia.

Habitat-Suitability Modelling

- Machine Learning Techniques
- Bio-indicators of the habitat
- Regression Trees
- M5P Algorithem
- Climate Change Models for Lake Prespa
- Conclusion
- Q&A Section

Using Machine Learning

- Machine Learning can be useful for:
  - Understanding the domain studied
  - Predicting future values of system variables of interest
  - Decision support for environmental management
  - Automated modelling
  - Discover knowledge

Bio-indicators of the habitat

- Acquired within the monitoring programme of the EU project TRABOREMA
  - Measurement period of 16 months
  - Physical/chemical and biological analyses were performed
- Biological data for Diatoms
- Biodiversity indices are used to express the influence the outside environmental conditions on biological organisms diversity

Bio-indicators of the habitat

- Predicting chemical parameters of water quality from bio-indicator data
- Latter provide information on the presence/absence of the studied diatoms
- Determining ecological requirements of some organisms in Lake Prespa

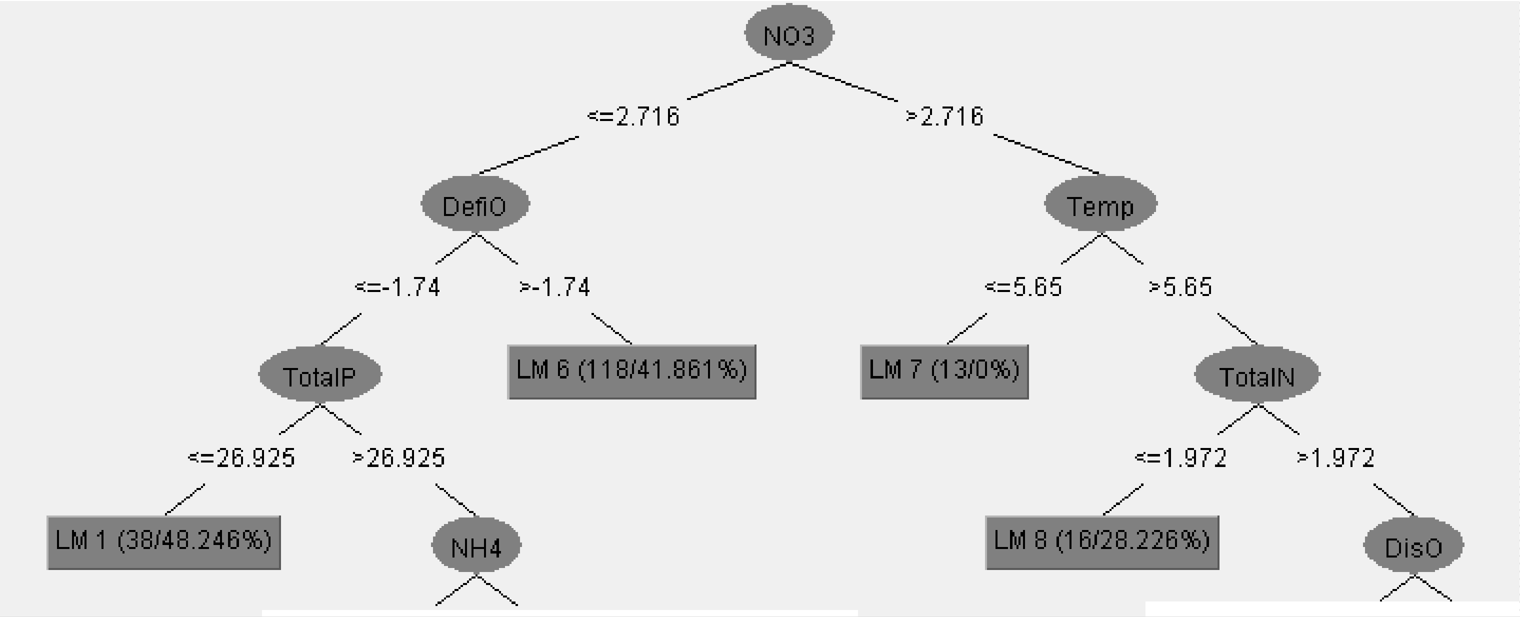
Regression trees

- Decision trees are hierarchical structures
  - Classification trees
  - Regression trees
- Internal node contains a test on an attribute
- Each branch corresponds to an outcome of the test
- Each leaf node gives a prediction for the value of the class variable.

M5P algorithm

- M5P algorithm used for regression trees
- Correlation between physical/chemical and biological data
- Using diatoms as bioindicators of the habitat.
- Easy change of the environmental conditions and detection by diatom community

Regression Model for Lake Prespa – WEKA, Shannon Evenness

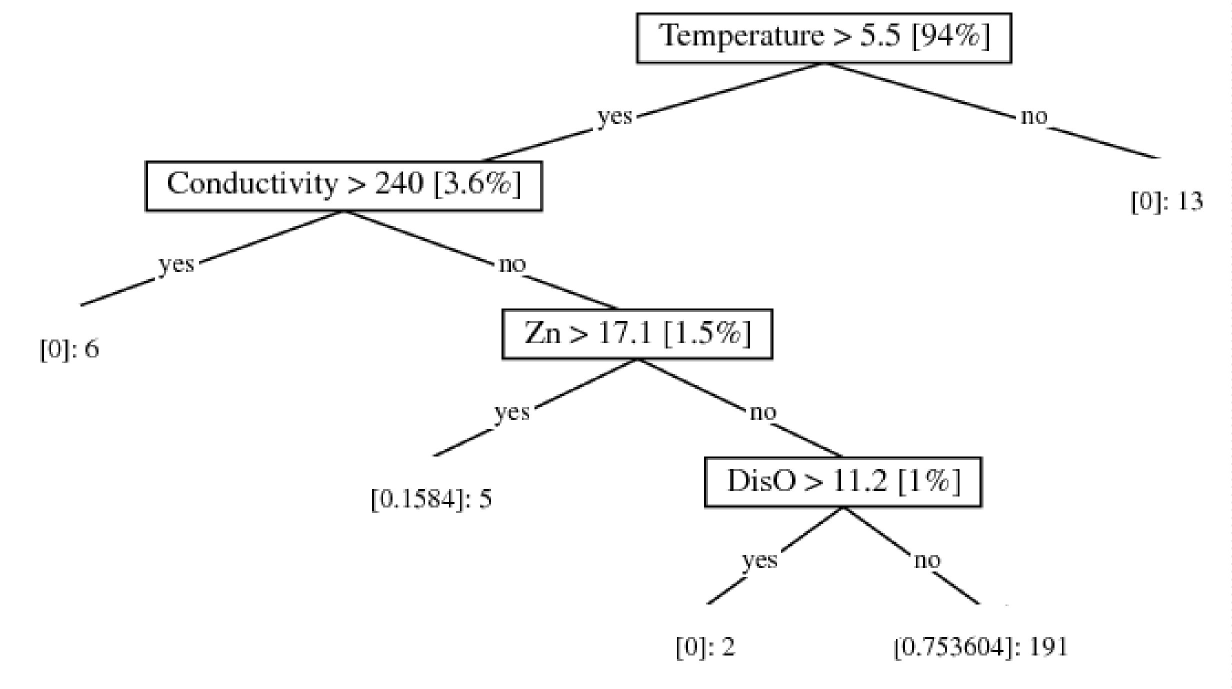


Regression tree predicting the most influence parameters on the diatoms Shannon Evenness for the Lake Prespa

Regression Model for Lake Prespa – WEKA, Shannon Evenness

- From the regression tree it is obvious to see that the most influence parameters on the diatoms evenness are:
  - NO_3.
  - Secondly important physical-chemical parameters are Temperature and Deficit of Oxygen (DefiO).
- According to the generated Linear Models (LM) 1 and 6, has largest value for Shannon Evenness.

Regression Model for Lake Prespa – CLUS, Shannon Evenness

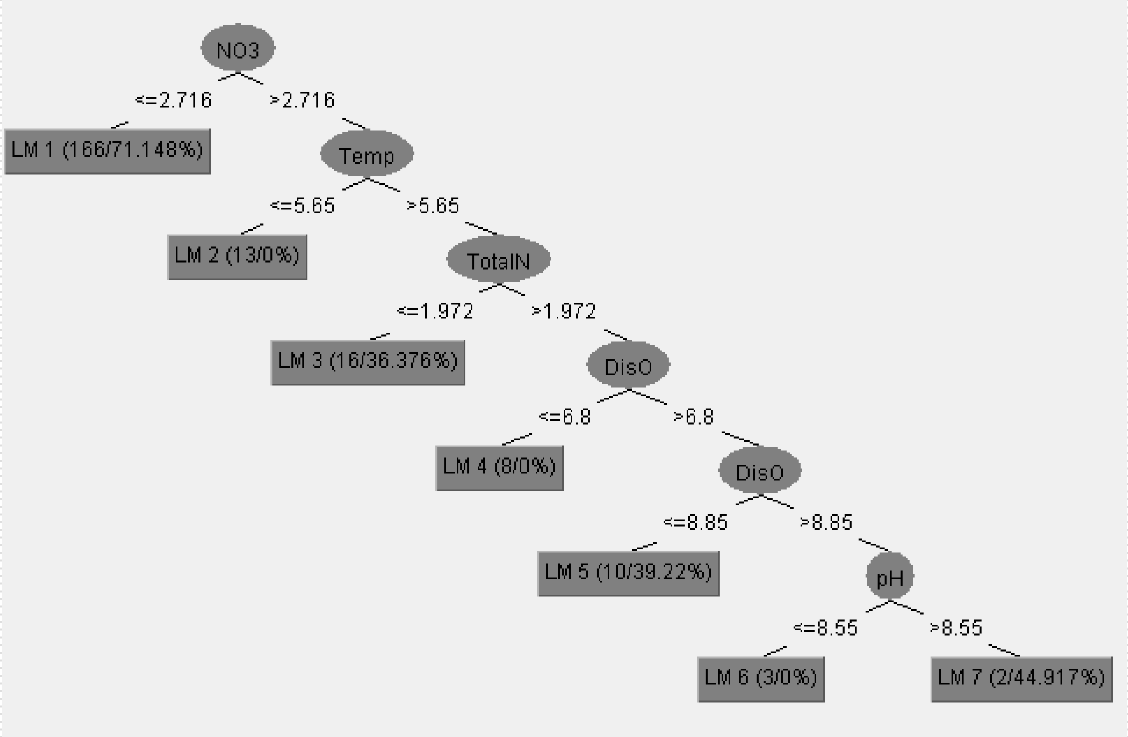


Regression tree predicting the most influence parameters on the diatoms Shannon Evenness for the Lake Prespa

Regression Model for Lake Prespa – CLUS, Shannon Evenness

- From the regression tree it is obvious to see that the most influence parameters on the diatoms evenness is:
  - Temperature.
- This is expected, because the Zn concentration negatively influences on the diatoms. Most of the high concentrations of the heavy metals like Zn are toxically for the diatoms. Only strict concentrations of this chemical element are allowed to coexist with the environment of the diatoms.

Regression Model for Lake Prespa – WEKA, Shannon Diversity Index

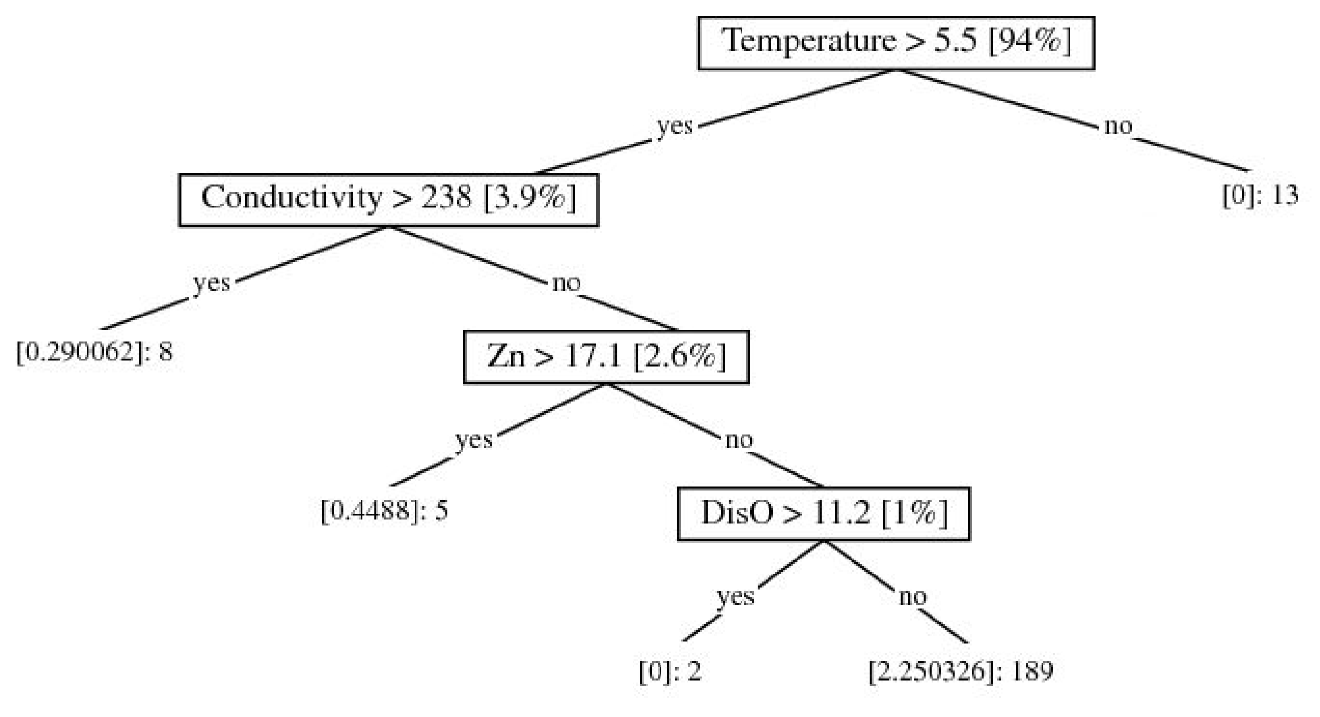


Regression tree predicting the most influence parameters on the diatoms Shannon Diversity Index for the Lake Prespa

Regression Model for Lake Prespa – WEKA, Shannon Diversity Index

- The model shows that
  - NO_3 is the most important environmental parameter,
  - while the Temperature is second.
- This model is very similar to the case for the Shannon Evenness model.
- According the LM (Linear Model) prediction, LM1 have largest value, while the LM2 have the lowest value

Regression Model for Lake Prespa – CLUS, Shannon Diversity Index



Regression tree predicting the most influence parameters on the diatoms Shannon Diversity Index for the Lake Prespa

Regression Model for Lake Prespa – CLUS, Shannon Diversity Index

- The model shows that:
  - temperature is the most important environmental parameter,
  - while the Conductivity is second.
- The lowest values for this index is 0.29 under temperature > 5.5 °C and Zn > 17.1 mg/l, while the highest values of Shannon diversity index of 2.25, if the temperature is greater than 5.5 °C.

Correlation coefficients gained by the CLUS и WEKA - Lake Single Target

Diversity Indices –Lake Data	Training set Lake	Testing set Lake
Shannon DI - CLUS	**0.78**	**0.62**
Shannon Evenness - CLUS	**0.84**	**0.69**
Diversity Indices – Lake Data	Training set Lake	Testing set Lake
Shannon DI - WEKA	**0.62**	**0.50**
Shannon Evenness - WEKA	**0.64**	**0.52**

Correlation coefficients gained by the CLUS и WEKA - River Single Target

Diversity Indices –River Data	Training set Rivers	Testing set Rivers
Shannon DI - CLUS	**0.87**	**0.21**
Shannon Evenness - CLUS	**0.86**	**0.19**
Diversity Indices –River Data	Training set Rivers	Testing set Rivers
Shannon DI - WEKA	**0.55**	**0.08**
Shannon Evenness - WEKA	**0.54**	**0.14**

Conclusion

- The learned models show that the most important factors influencing the diatoms diversity indices are:
  - temperature and NO_3,
  - while the Zn and Dissolved Oxygen (DisO) are second important.
- All the models given in this paper are first attempt to model the diversity indices of the diatoms in Lake Prespa.

Conclusion

- Important to note here, that variable of the temperature and NO_3 concentration highly depends from outside factors.
- Nitrogen loading from the human activates - industry, while the temperature from the human activity - CO_2.
- As the climate models shows the temperature in the next 50 years will increase, which puts in danger existents of the diatoms according these presented models.

Q&A Section

Any Questions?

Thank you for your attention

The Energy Community of South East Europe

Energy and Climate Changes – Southeast Europe in focus
Skopje, 21 March 2009

Josefine Kuhlmann

Agenda

The Energy Community of South East Europe

- Development
- Goals and Methods
- Institutions and Set-up

Has another European Economic Area been born?

- Transformation, Homogeneity, Enforcement

Alternative to EU Membership?

The Energy Community of SEE

Development

- 1996 – 2001 Regional Electricity Market
- 2002 – 2006 Athens Process
- Treaty Establishing the Energy Community (entry into force 1 July 2006)

The Energy Community of SEE

Goals

- Creation of a legal and economic framework in relation to Network Energy
  - Electricity, Gas, and Oil
- leading to
  - Investments in Energy Infrastructure
  - Enhanced Security of Supply
  - Improved Environmental Situation
  - Competition in Network Energy Markets

→ Economic development and social stability

The Energy Community of SEE

Methods

- Extension of the EC‘s Energy *Acquis Communautaire*
  - Network Energy (Electricity, Gas, Oil)
  - Environment & Renewables
  - Competition
- Mechanisms for the Operation of Network Energy Markets
- Creation of a Single Energy Market
  - Free Movement of Goods
  - Mutual Assistance Obligation
  - External Energy Trade Policy

The Energy Community of SEE

Institutions

- Ministerial Council
  - Policy Guidelines, Budget, Dispute Settlement
- Permanent High Level Group
- Regulatory Board
- Secretariat
  - Acts in Sole Interest of the Energy Community; Dispute Settlement
- Fora
  - Electricity, Gas, Oil, Social

Parties, Participants and Observers

Filling gaps with the EEA model?

Transformation

- Reference Technique with Adaptions

- **Homogeneity**
  - Dynamic Development of *Acquis*
  - Interpretation Monopoly of ECJ

→ Analogies allowed?

Dispute Settlement

- Direct Effect and Primacy
- Ministerial Council

Alternative to EU Membership?

Thanks!

Energy efficiency in public Institutions

Kadire Murati (Master- environmental management-SEEU)
Lulzime Pajaziti (Master-environmental management-SEEU)

March, 2009

- Introduction
- Environment and Energy Efficiency
- Energy and its forms
- Energy policy
- Technology and Sustainable Development
- Energy efficiency in School and University Campuses
- Results of the interview
- Conclusion

Introduction

- Energy is one of the most fundamental parts of our universe. We use energy to do work, energy lights our cities, powers our vehicles, trains, planes etc, we also use energy to warm our homes, for cooking, and a lot of other activities.

1. Environment and Energy Efficiency

- Energy is part of many environmental problems, including climate change, and must be part of the solution. It’s very important to use technologies and practices that are currently commercially available and promotion of clean technologies to achieve more success in reducing the greenhouse gases emissions and local air pollution.

2. Energy and its forms

- Some of the energy we can use is called renewable energy. These include solar, wind, geothermal and hydro. These types of energy are constantly being renewed or restored.

- But we have non-renewable energy sources, that means they cannot be renewed or replenished. So, we must all do our part in saving as much energy as we can.

3. Energy Policy

- Working towards sustainable energy policies requires cooperation with all departments of local and regional government.
- Macedonia plans to harmonize its policies, including the ones on environment, with those of EU so as to promote closer integration with other European countries.

4. Technology and Sustainable Development

- Efficient energy use, sometimes simply called energy efficiency, is using less energy to provide the same level of energy service.
- An example would be insulating a home to use less heating and cooling energy to achieve the same temperature.
- Another example would be installing fluorescent lights instead of incandescent lights to attain the same level of illumination.
- So efficient energy use is achieved primarily by means of a more efficient technology or process rather than by changes in individual behavior.

5. Energy efficiency in School and University Campuses

- Everything starts with education. School and university campuses need lighting — for security, safety, aesthetics and navigation. Except lighting students use different kinds of energy resources for other activities such us heating and warm water. That’s why students need to be more energy conscious using energy sources.
- Even that we are aware that the education starts in the early years in the way how we manage the use of electricity, all we know that institutions are the key for achieving better education and how to use energy in more efficient manner.

6. Presentation of the results from the interview made in the SEEU and Perparimi

- The interview made in these two institutions gave us a review that shows a big difference in using energy and energy efficiency, although they are too closer in distance. We made the interview with the Facility Directors in both institutions and we are going to present these results:

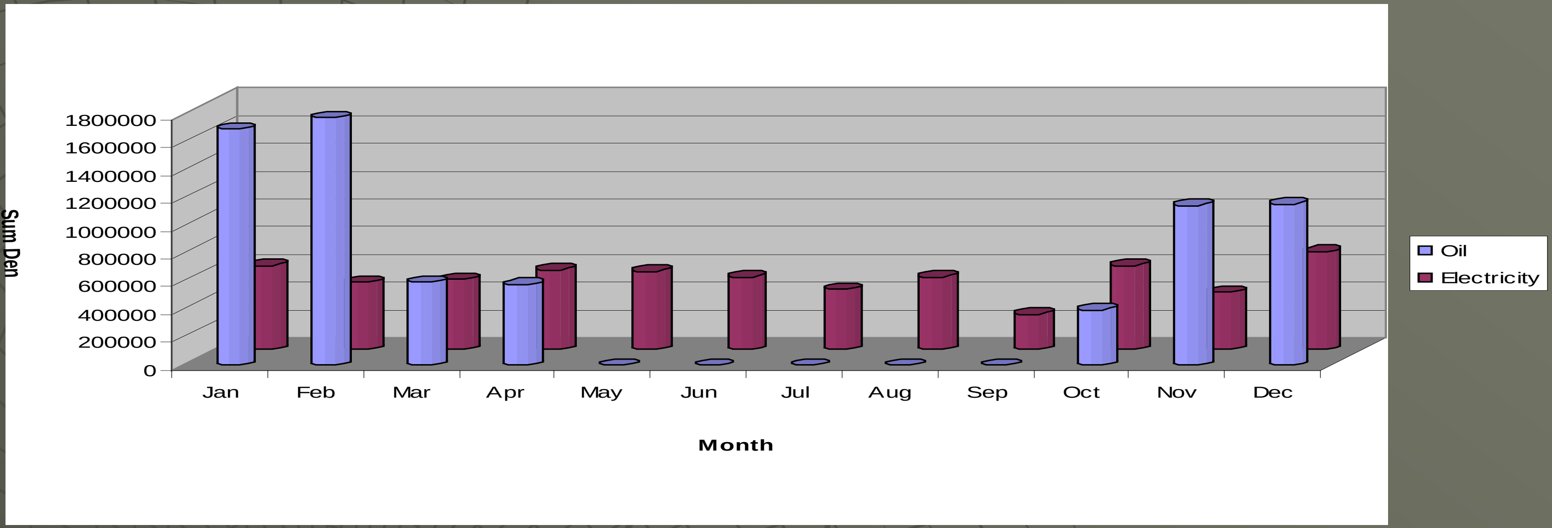
6.1. The result from the SEE-University:

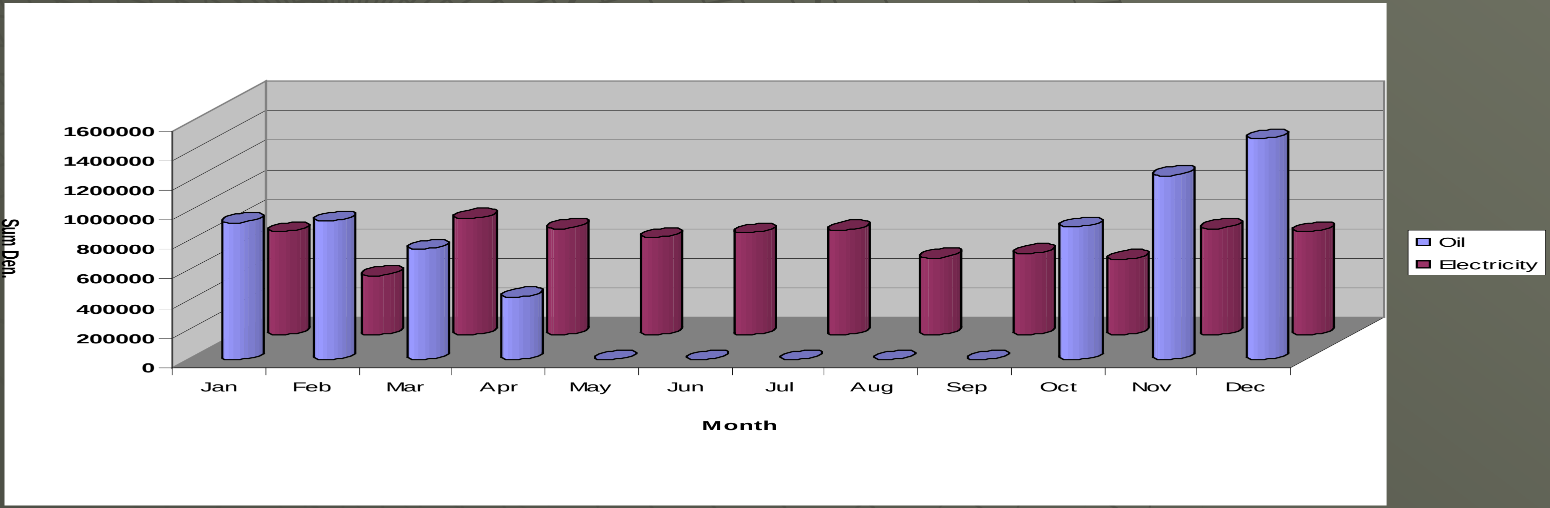
- The need for energy at SEEU is for lighting, warm water, heating, cooling and other electrical appliances (which are from the latest generation products that increase electrical efficiency), but in the new building, central cooling system contributes for more efficiency.
- We have two types of insulation in the building: prefabricate elements (made according to standard with high coefficient of isolation) and classical structure. The first group includes 58% of all building area, and in the second group 42%. All construction is made in that way to have more windows in buildings and to have maximum natural light.

- The lightning is from fluorescent so that gives us high efficiency, the outside lightning is automatic with non affect of human factor and they are from last generate, with high lightning and less spending of electricity – metal halogen. Till the night the light aglow is in minimum, which is refund with security system.

- The building areas cover 29 000 m2 and all of them are heated with oil-central heating, so we use technology with manual system for regulation of energy. The dormitory buildings cover 24% of all building area, and are heated non-stop. The other areas are heated with quote practice through the day, and in night they are leaving in stand-by.

The year consumption of the electricity and oil are shown below and we can see that the difference between two graphics is evident, because in 2007 we have the new building with 5000m2 which affects in the yearly bills.



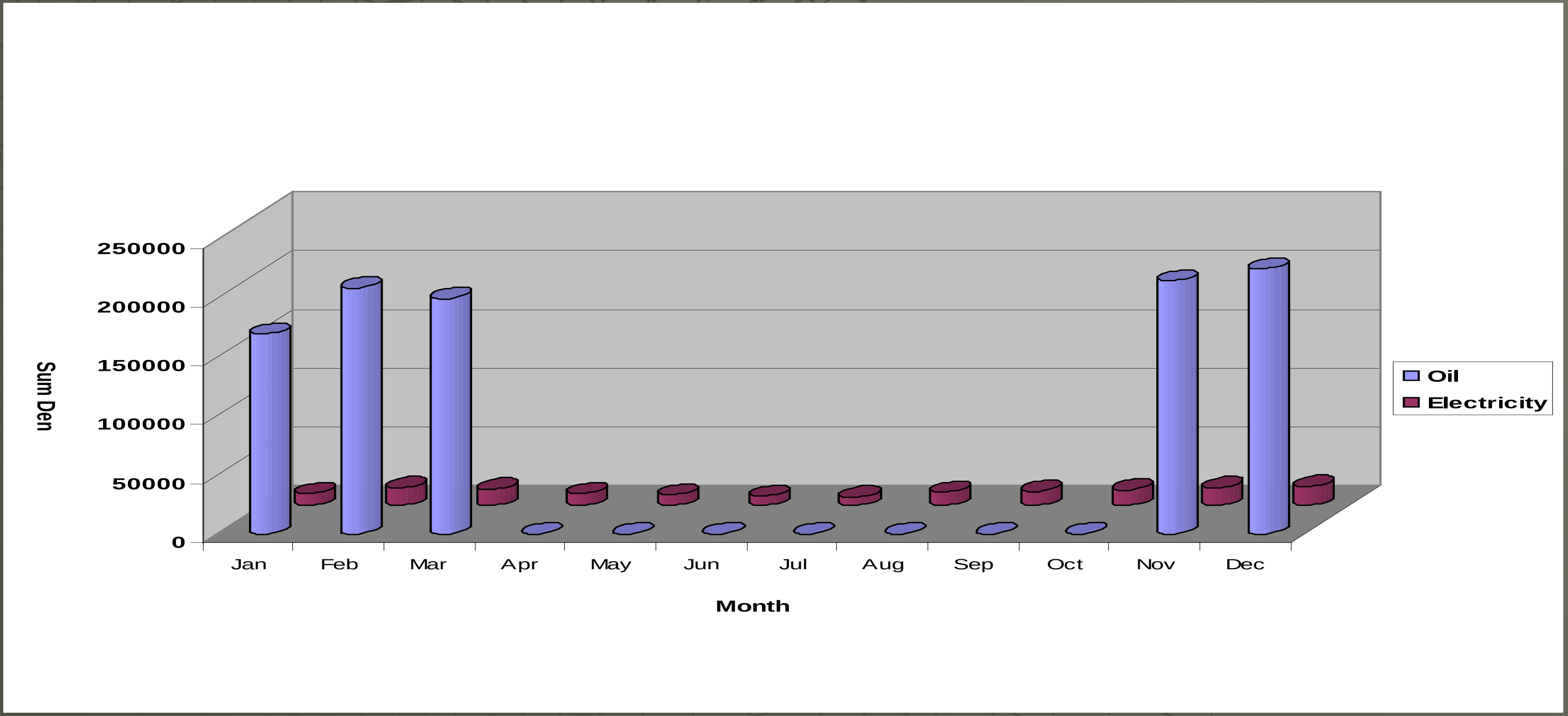


6.2. The result from the Primary School - Perparimi:

- The need for energy in Perparimi is for lighting, heating, and some electrical appliances which are not efficient.
- The type of insulation in the building is made from classical structure, 100% of building area is covered by this type of insulation, also a part of windows and doors are made from wood and are old and damaged. In this case we could not have efficient energy use.
- The lightning is from classical bulbs so that don’t give us high efficiency, the outside lightning is damage and few of bulbs are in good conditions. The heating energy is used during the day and at night they are switched off.

- The building areas cover 931 m2 and all of them are heated with oil-central heating, so we use technology with manual system for regulation of energy. The central heating is active during the day and in night they are switched off.

- The year consumption of the electricity and oil is shown in the graphic below and we can see that the electricity consumption is higher due to inefficient insulation and inefficient energy use.



7. Conclusion

- From the interview made in this two institution we can conclude that there is a big difference between them, although they are near in distance but so far in efficiency energy use.
- There are lots of simple things that we can do to save energy right now, which will reduce carbon dioxide emissions and help fight climate change. The same thing can be done and in school buildings if energy consumption is under control. The schools are responsible for managing their energy that’s why they need to do it in an efficient way.
- We hope that in nearly future, we will do the right step to use renewable resources which are available in our region, and with this we can contribute in energy efficiency and will save energy for future generations with no use of non-renewable resources.

Thank you for Your attention

Energy and Climate change – Southeast Europe in focus
Skopje, 21 March 2009

Financing of CDM Projects

Trajce Andreevski

Legal advisor

OVERVIEW

1. Introduction to Kyoto Protocol and Clean Development Mechanism
2. CDM Environment in Macedonia
3. CDM Project development and financing
4. Challenges and perspectives for implementing CDM projects in Macedonia

CDM: INTRODUCTION

Kyoto Protocol

Clean Development Mechanism

Goals of CDM: reduction of GHG emissions and contribution to sustainable development

CDM: INTRODUCTION

Principles of CDM:

- Voluntary participation
- Measurable reduction of GHG
- Additionallity ***
- Sustainable development

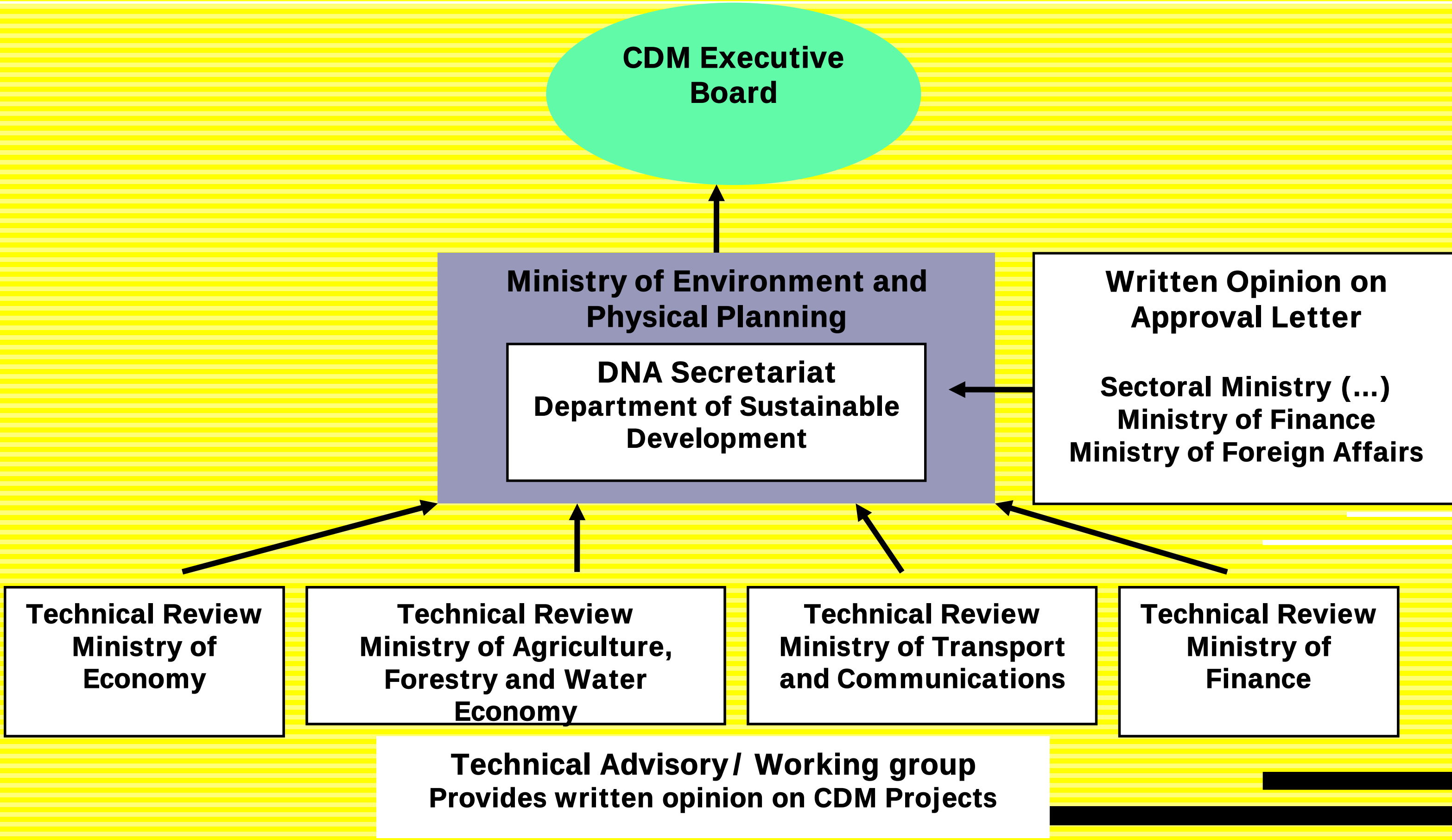
CDM-related activities in Macedonia

Ratification of Kyoto Protocol - July 2004

National Strategy for Clean Development Mechanism 2008 - 2012

Designated National Authority (DNA) – Ministry of Environment and Physical Planning – June 2006

Institutional structure for CDM



Priority areas for CDM in Macedonia

- Reduction of GHG emissions
- Renewable energy/ energy efficiency
- Waste management
- Forestation

List of concrete CDM projects

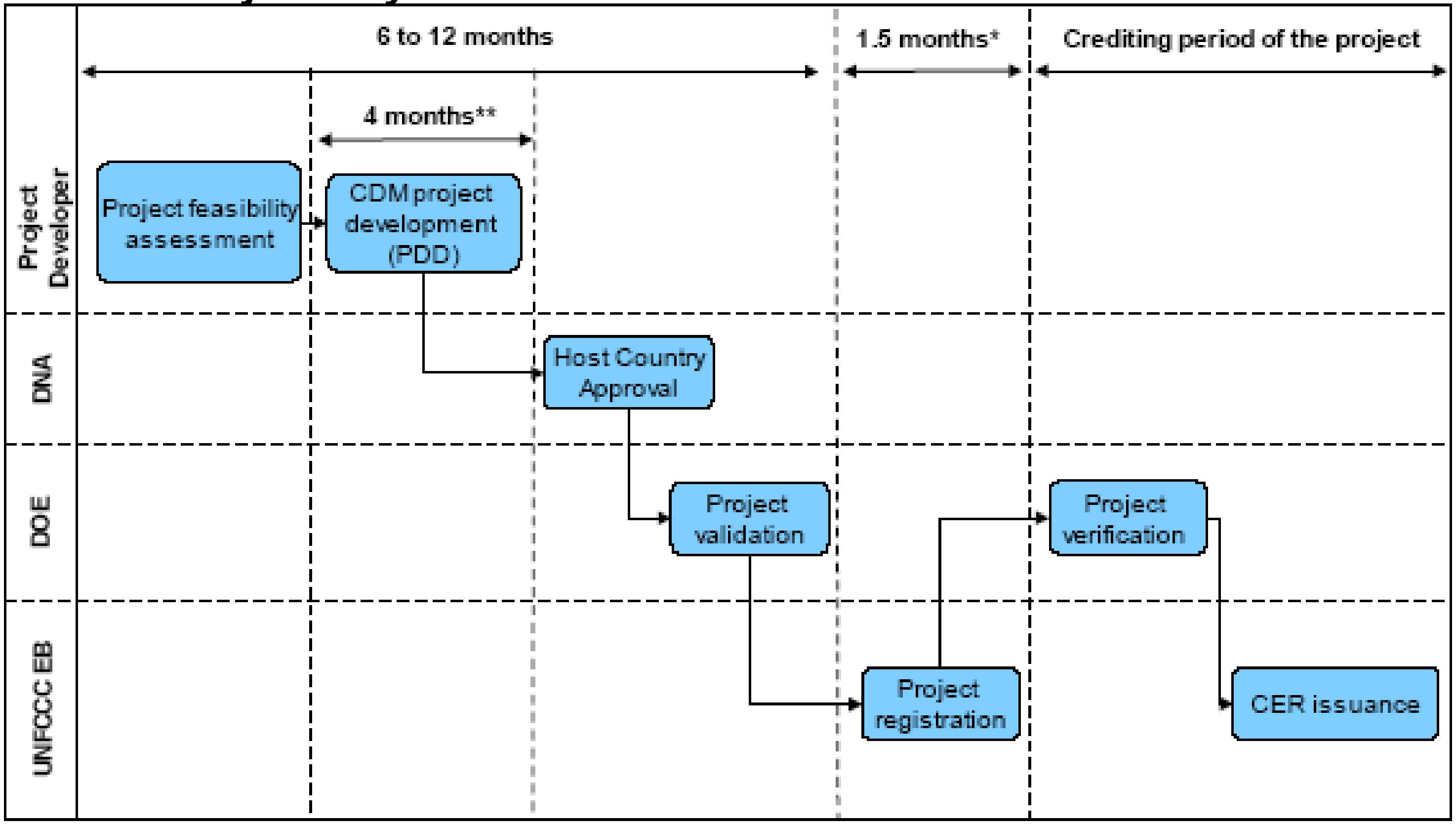
- Waste collection and incineration (Drisla Landfill)
- Hydro power plant 36 MW (Matka 2)
- Co-generation heat-power plant 340 MW
- Small hydro power plants
- Two CDM Projects already “in the pipeline"

Basics of carbon financing

- CER – equivalent to securities
- Emissions trading (“cap and trade“)
- Developed country sponsors a GHG reduction project in a developing country – for lower cost, but same global effect
- Developed country: credits for meeting GHG emission reduction targets
- Developing country: capital investment, clean technology.....

Stages of CDM project development

CDM Project cycle



Types and sources of finance for CDM Projects

Grants	Government, IFIs
Loans (Debt financing)	Banks
Equity	Project sponsors, IFIs, Investment Funds

Models for financing CDM Projects

Project finance

Benefits:
Ability to raise large amount of capital
Non or limited recourse

Disadvantages:
Set-up costs
High level of risk/ complex management

Models for financing CDM Projects

Corporate finance

Benefits:

Faster access to capital

Confidentiality (*** suitable for less complex projects)

Disadvantages:

Full liability

Limited financial ability

Limited ability to transfer risks

Models for financing CDM Projects

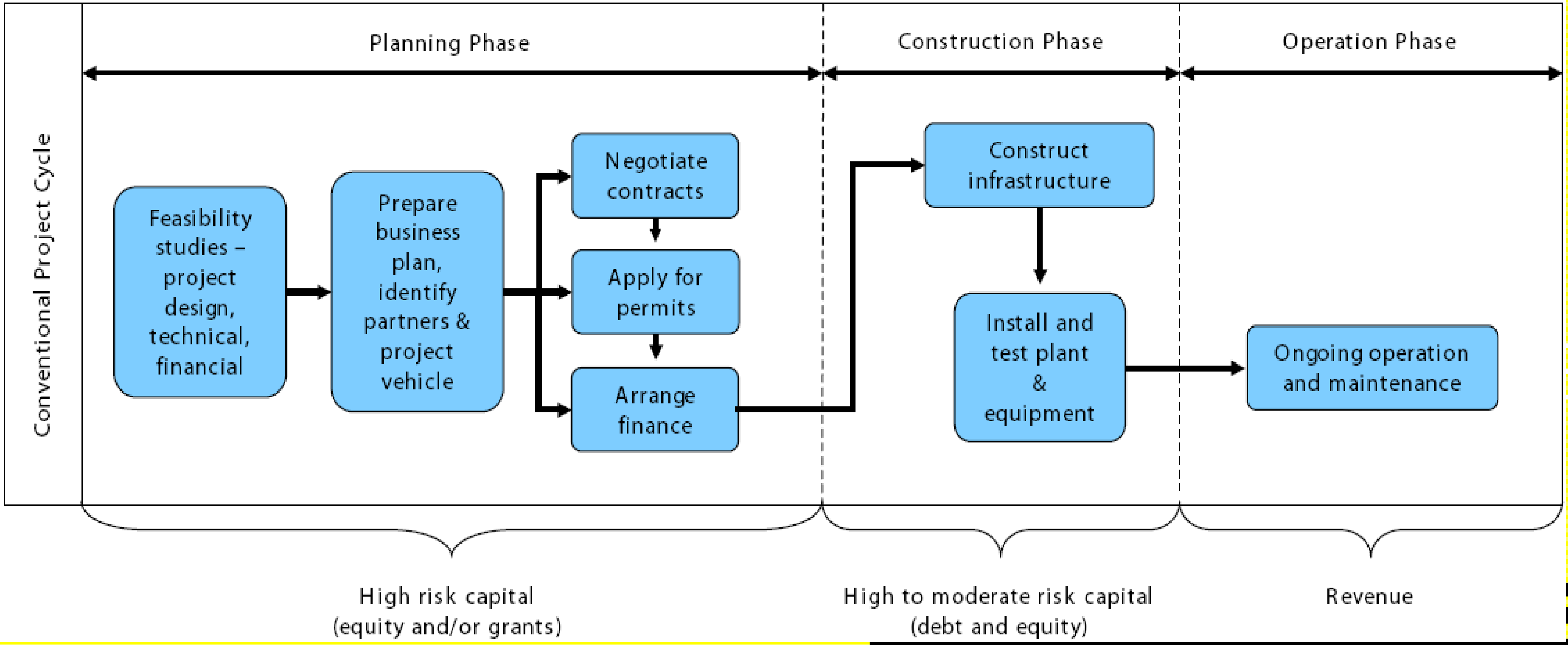
Lease financing

Benefits:
Less stringent requirements
Limited liability

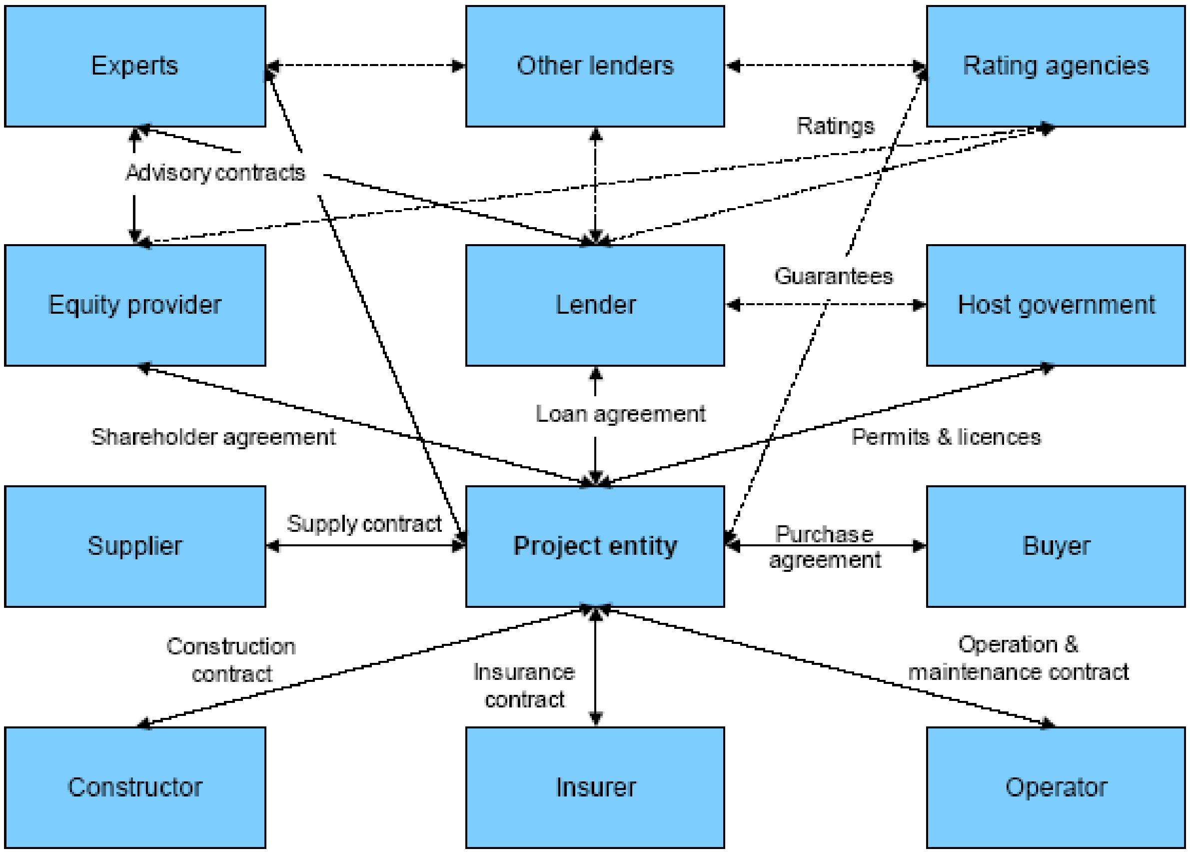
Disadvantages:
Need for minimum level of credit-worthiness

Mechanics of CDM project financing

Conventional Project cycle



Principle parties of CDM project financing



Challenges for implementing CDM projects in Macedonia

- Lack of knowledge (CDM, project financing)
- Considerable risk (political, legal, financial, technical)

These challenges are not unsolvable ...

Thank you for your attention

Cost and Environmental Effectiveness of Climate Change Mitigation Measures

Natasa Markovska

Research Center for Energy, Informatics and Materials
Macedonian Academy of Sciences and Arts
ICEIM-MANU
Skopje, Macedonia

Outline

1. Up-to-date Assessments of Global Climate Change Mitigation

2. Climate Change Mitigation in Macedonian Conditions

   2.1. Examined Mitigation Measures

   2.2. Economic and Environmental Evaluation

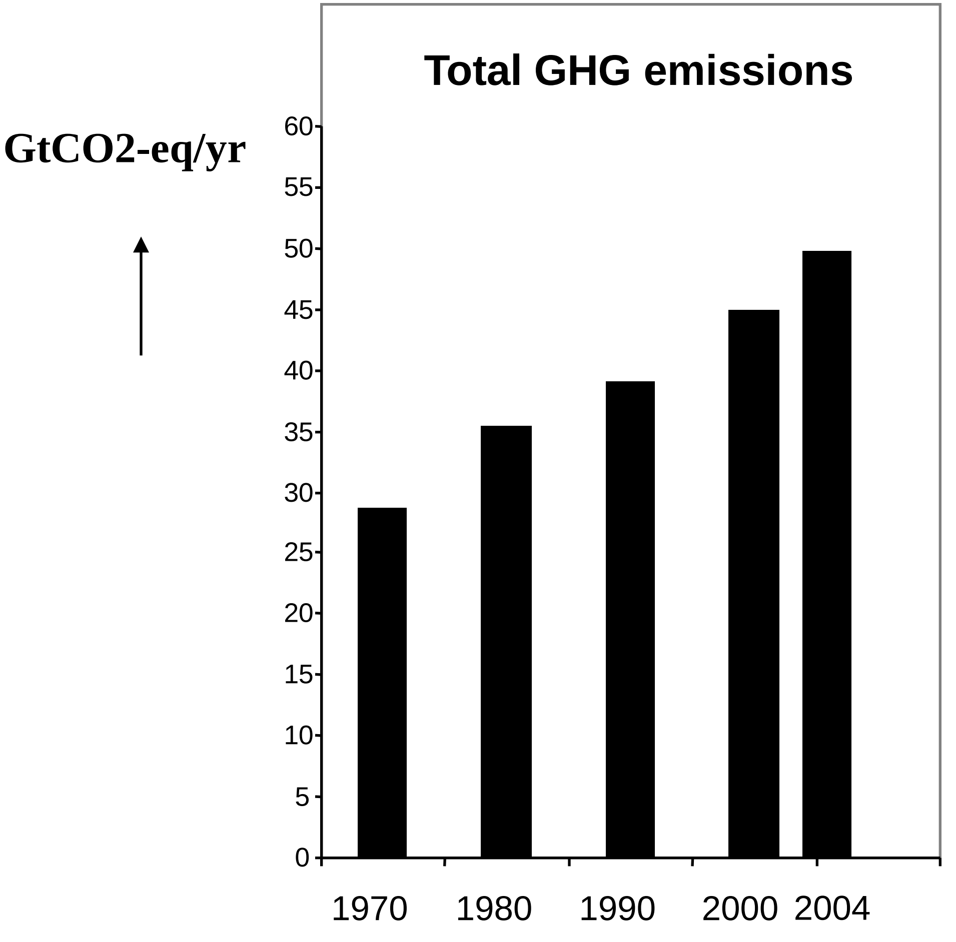
1. Up-to-date Assessments of Global Climate Change Mitigation

Mitigation of Climate Change

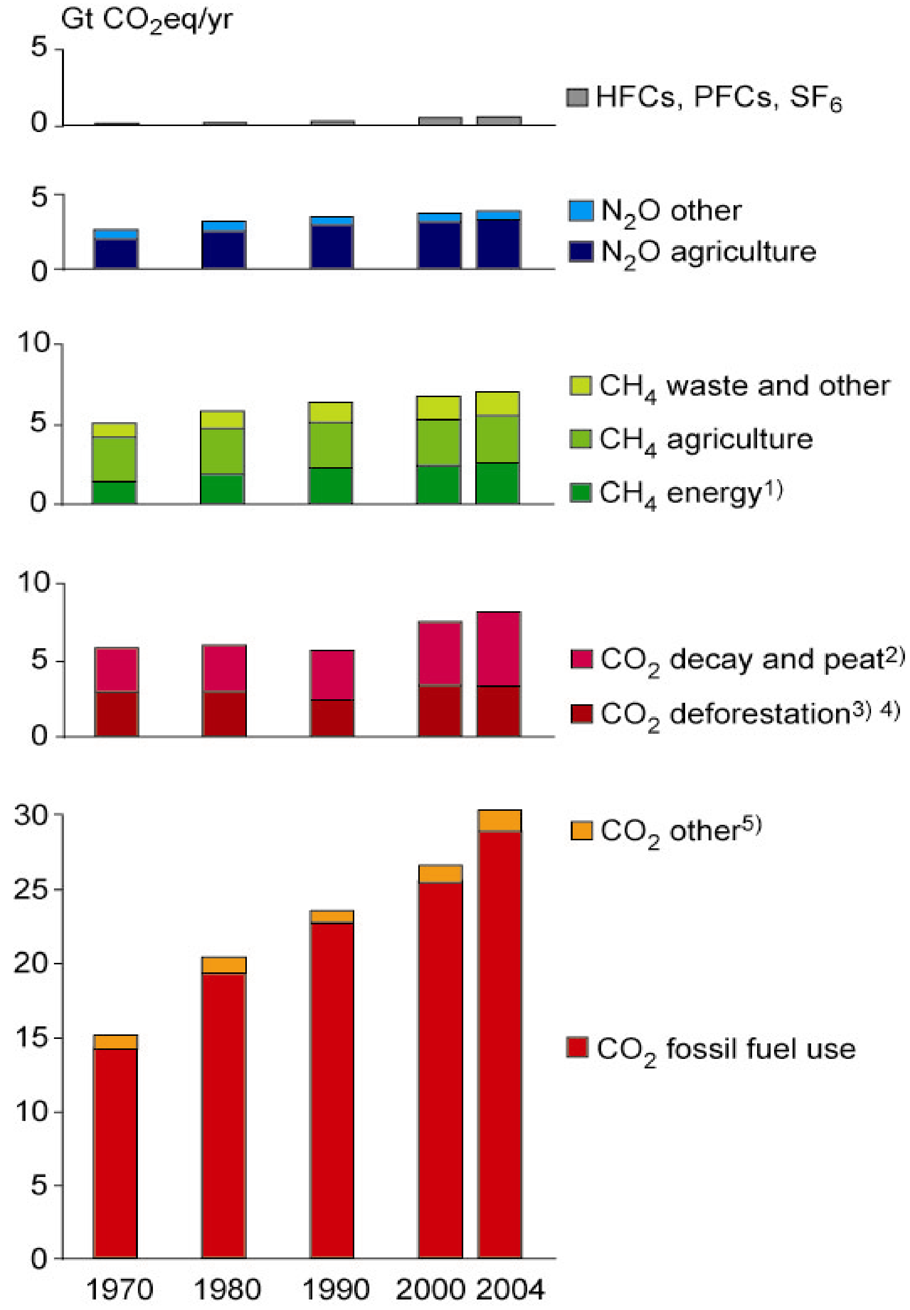
Intergovernmental Panel of Climate Change (IPCC)
Working Group III contribution to
the Fourth Assessment Report

(Summary for Policy Makers, Bangkok, May 2007)

Between 1970 and 2004 global greenhouse gas emissions have increased by 70 %

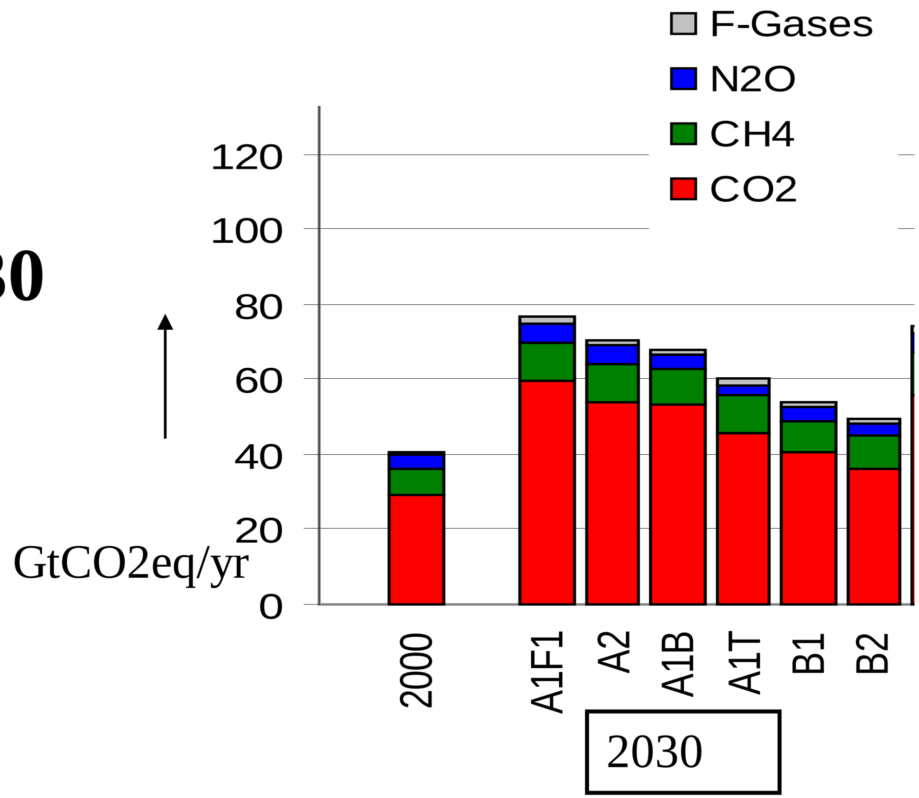


Carbon dioxide is the largest contributor

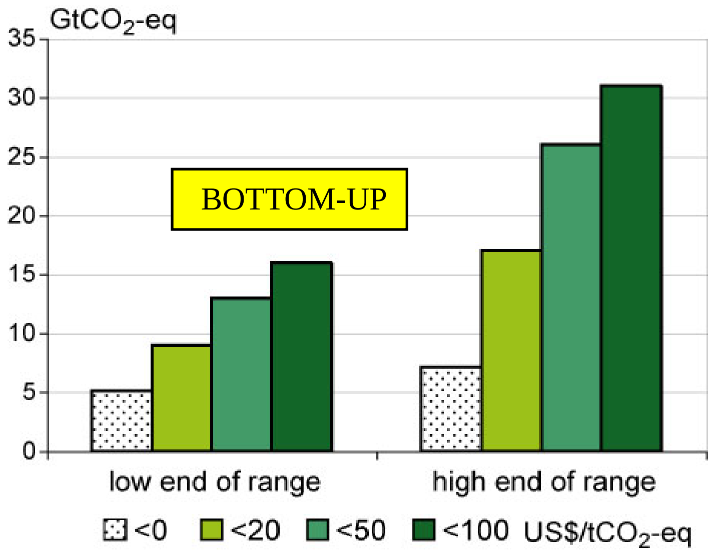


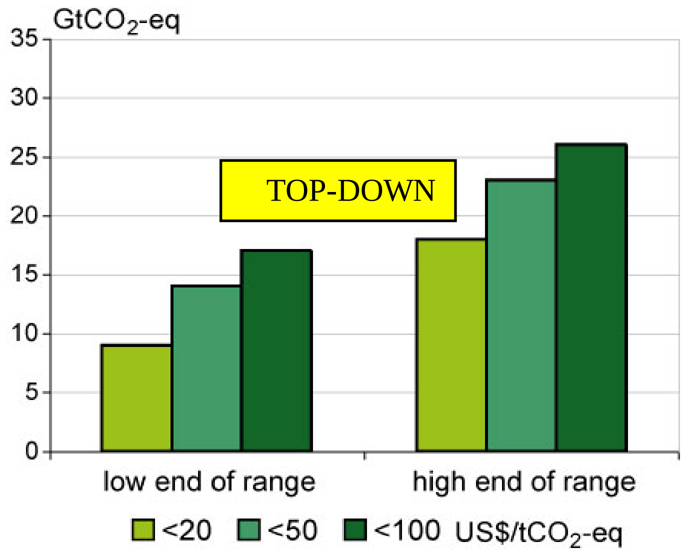
With current climate change mitigation policies and related sustainable development practices, **global GHG emissions will continue to grow over the next few decades**

IPCC SRES scenarios:
25-90 % increase of GHG emissions in 2030 relative to 2000

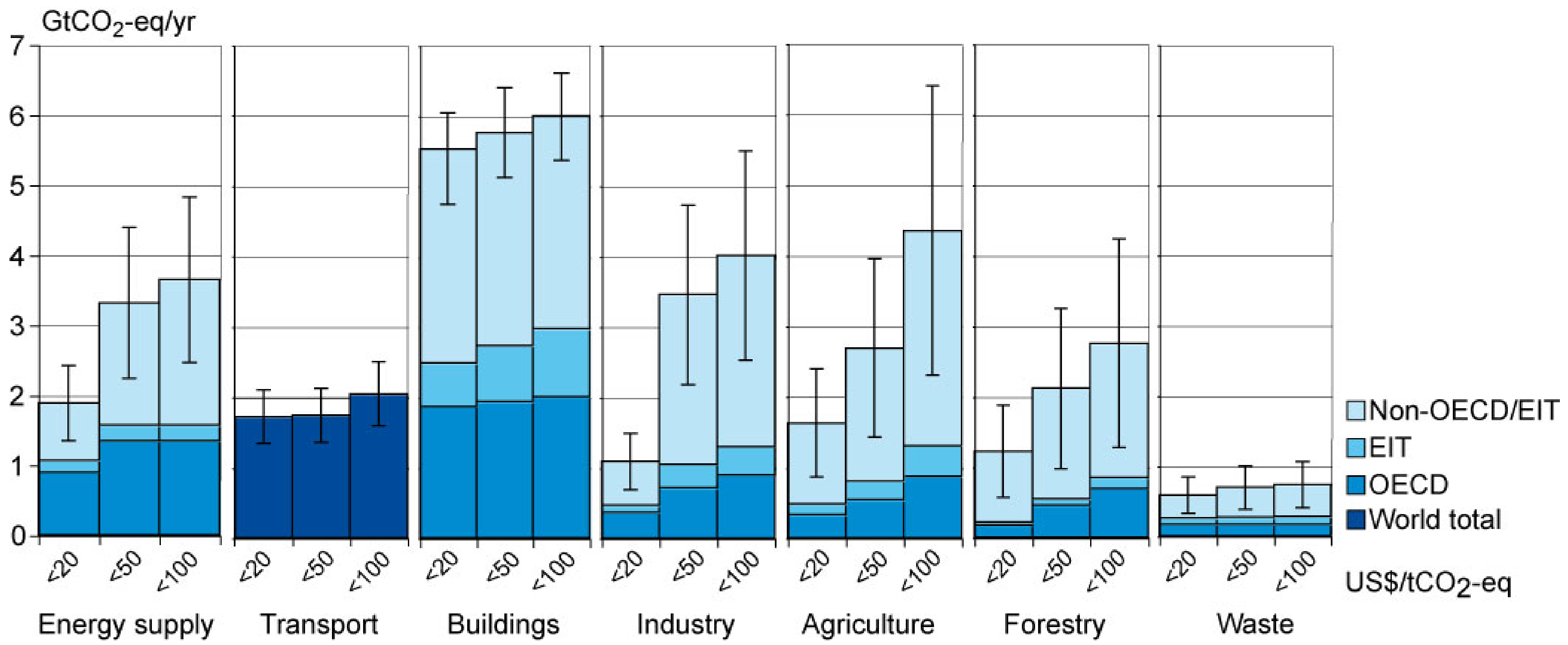


Global economic potential in 2030





All sectors and regions have the potential to contribute!

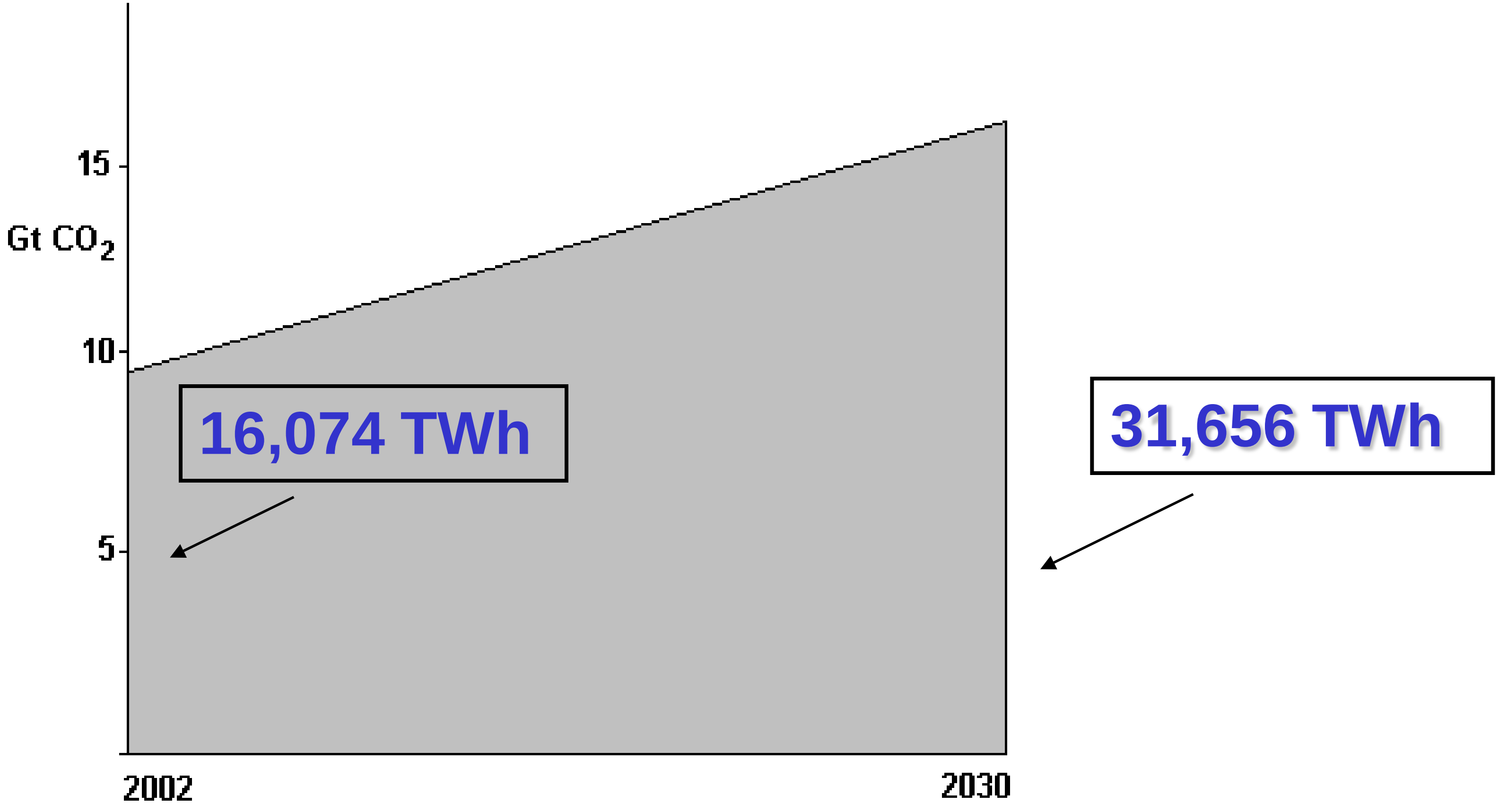


How can emissions be reduced?

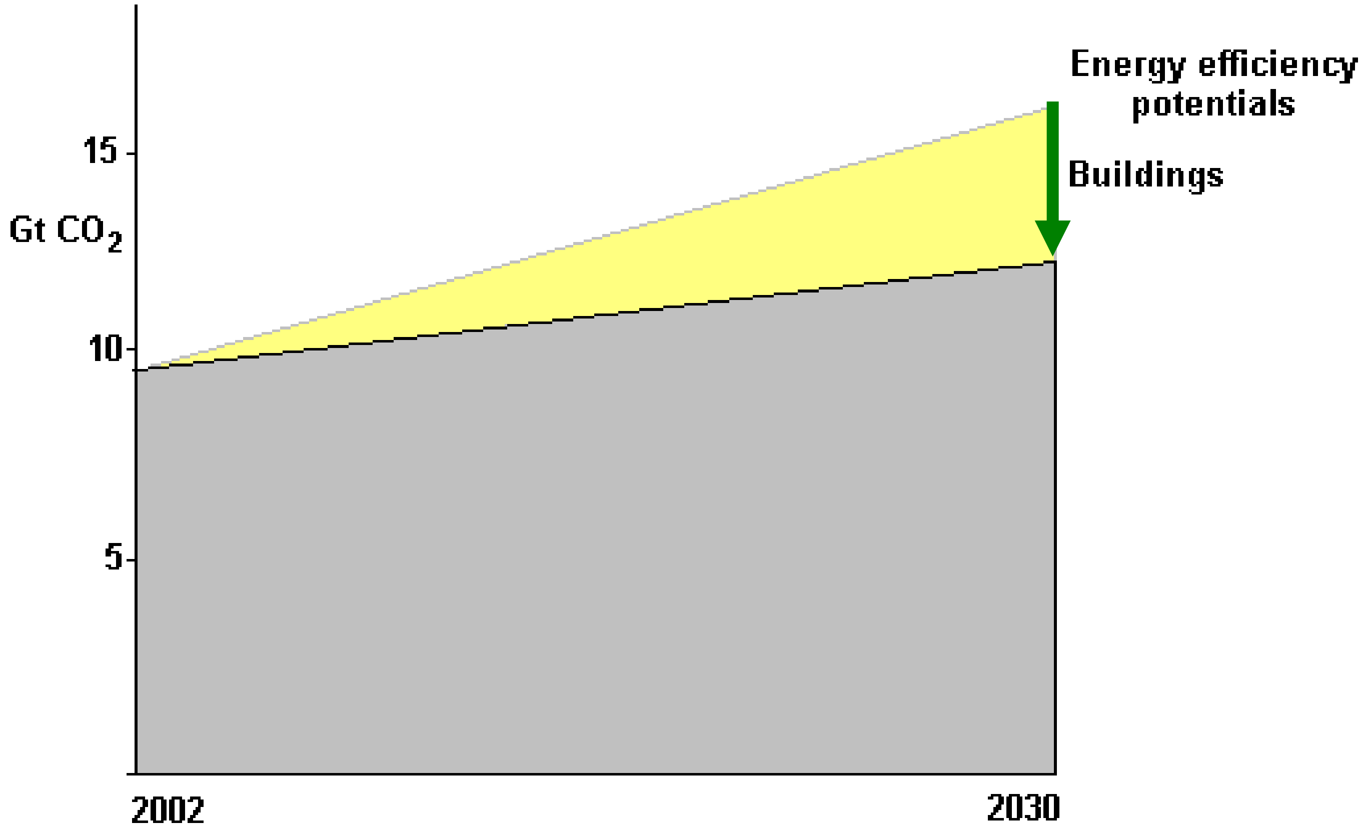
Sector	Key mitigation technologies and practices currently commercially available. (Selected)	**Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)**
Energy Supply	efficiency; fuel switching; nuclear power; renewable (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of CO2 Capture and Storage (CCS)	CCS for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewables (tidal and wave energy, concentrating solar, solar PV)

Electricity sector emissions, 2002 to 2030

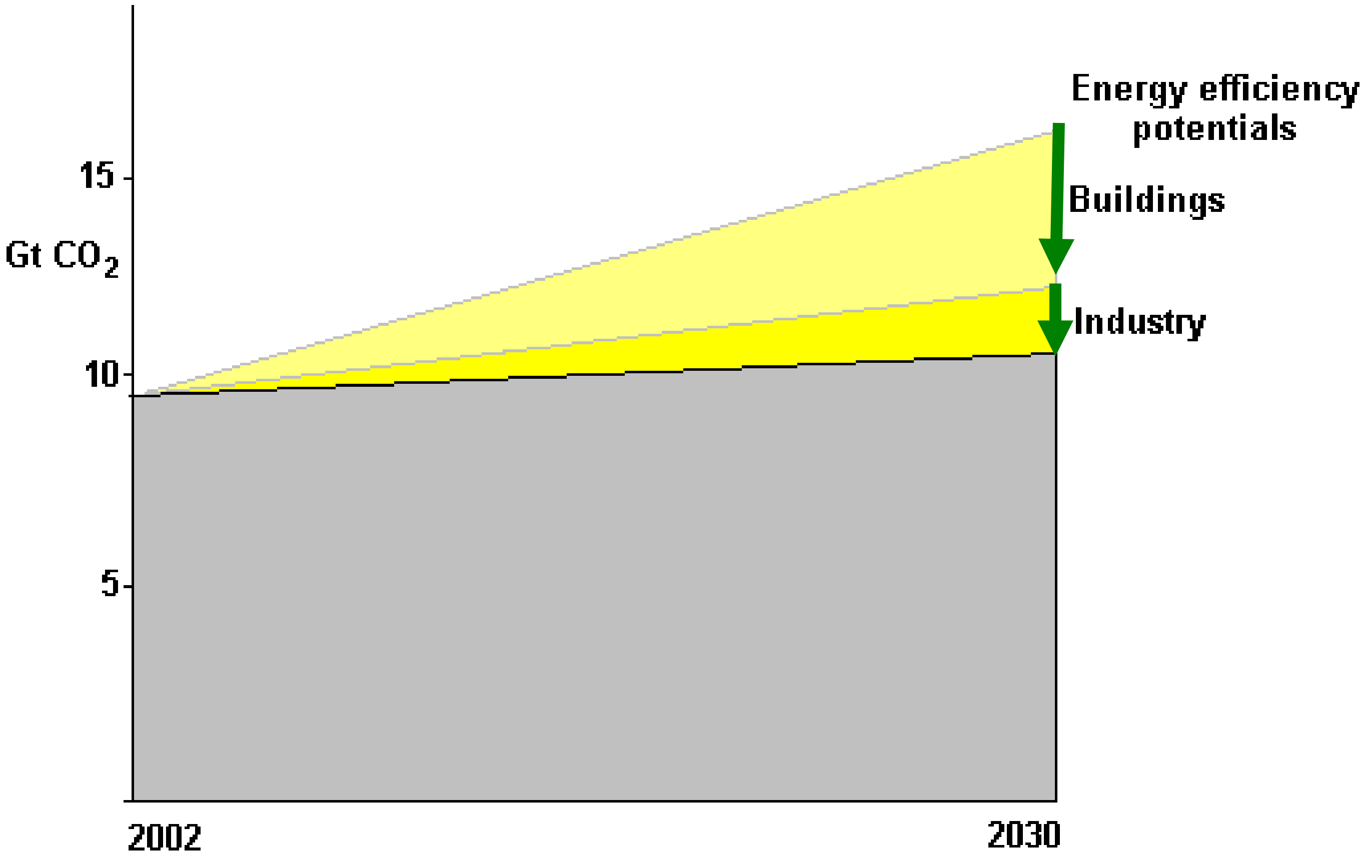
(IEA/WEO 2004 baseline)



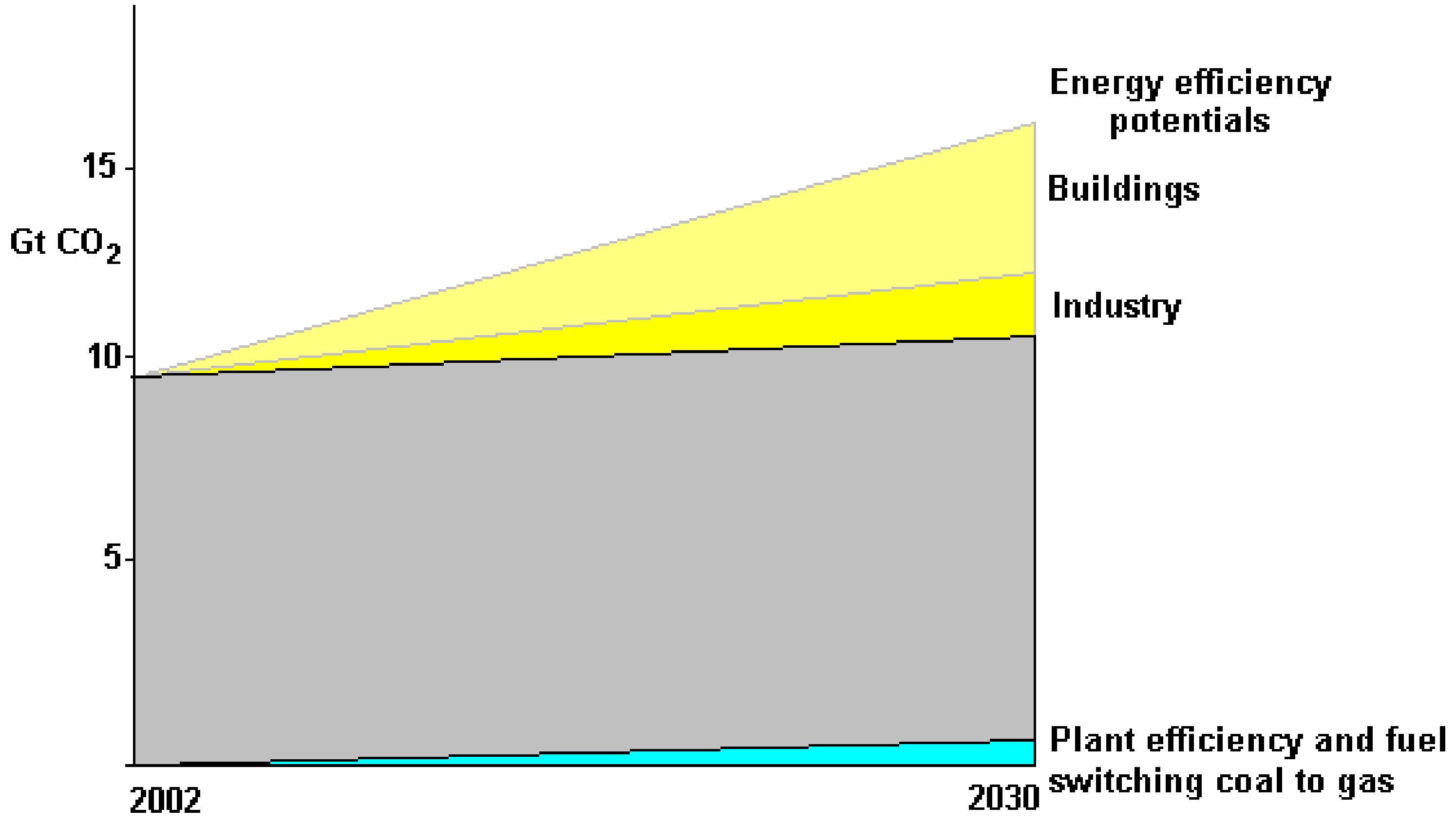
Potential emission reductions from additional electricity saving in Building sector at <US$ 50 /t CO_2



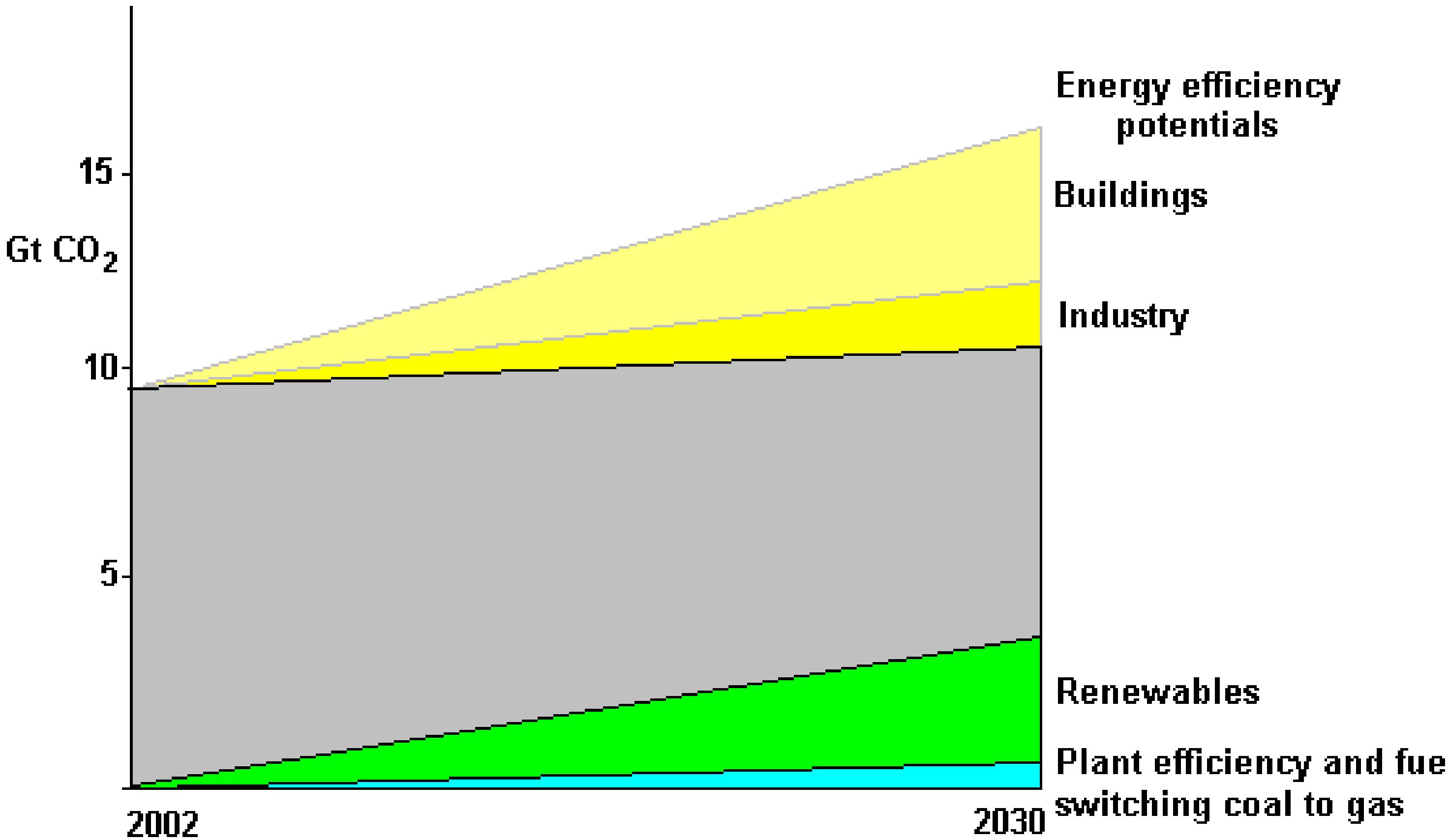
Potential emission reductions from additional electricity saving in the industrial sector at <US$ 50 /t CO2



Potential emission reductions from additional improved generation plant efficiency and fuel switching at <US$50 /tCO2

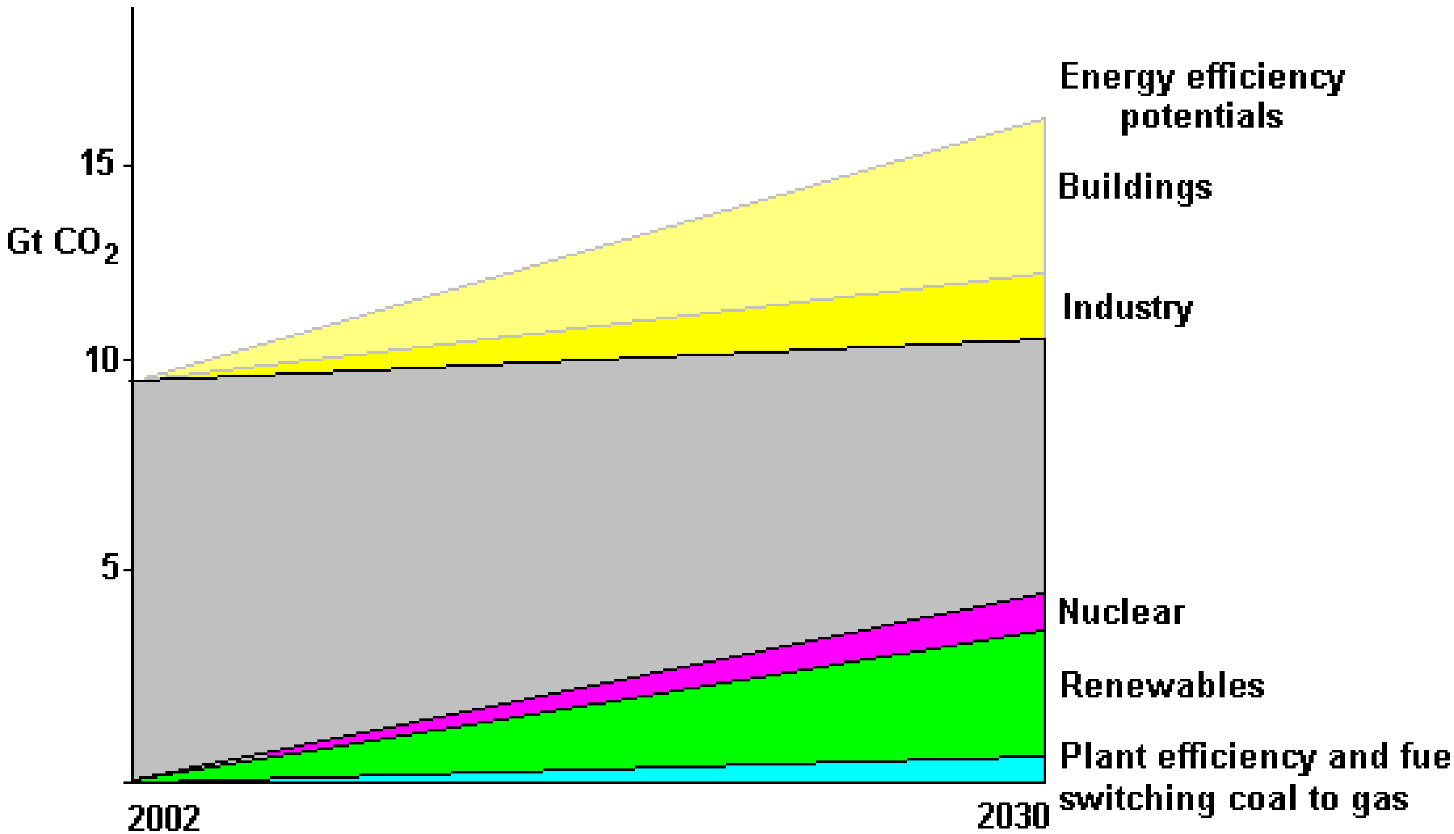


Potential emission reductions from additional hydro, wind, geothermal, bioenergy, solar at <US$ 50 /tCO2



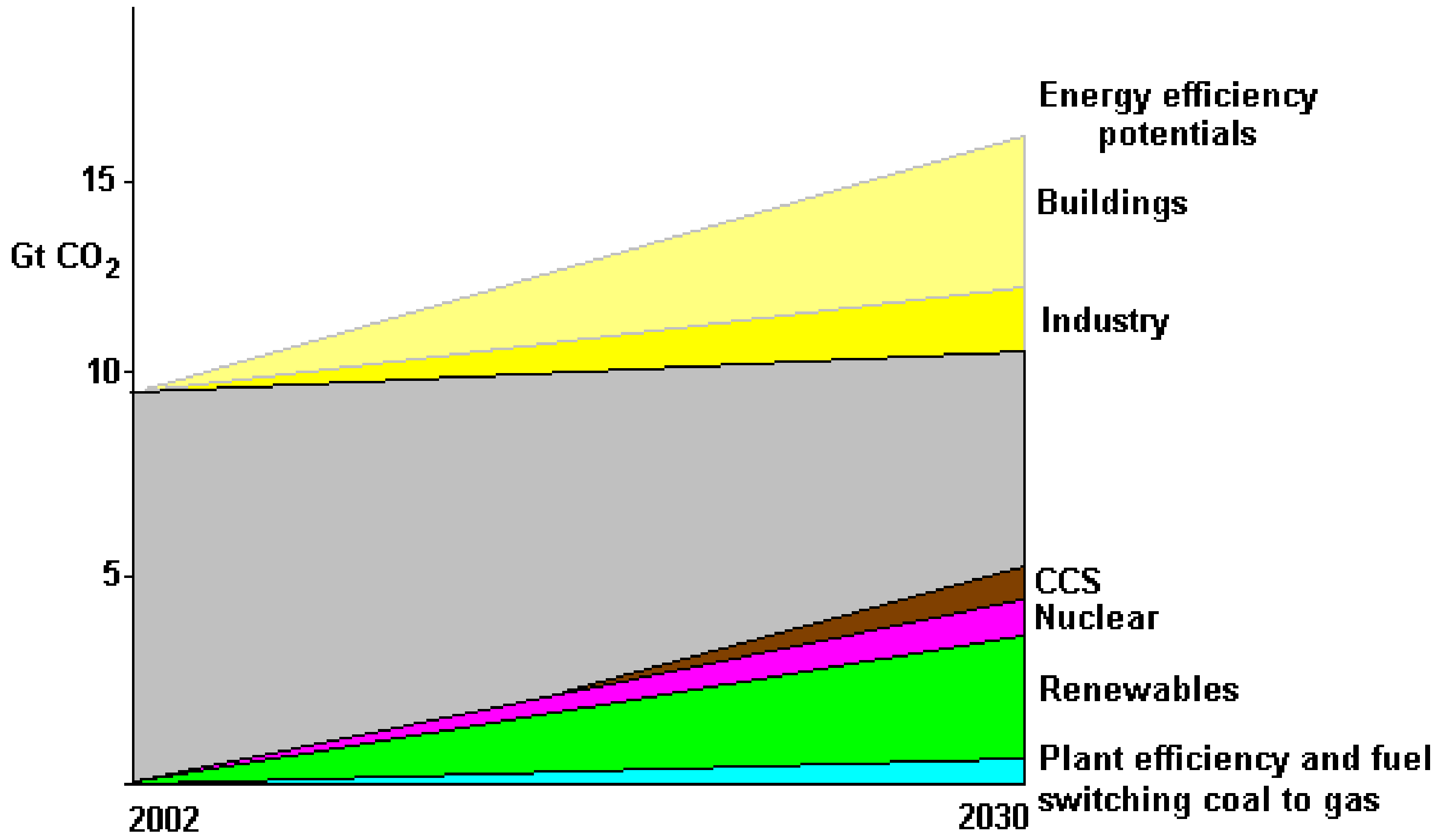
The share of renewables in the total electricity supply can rise from 18% in 2005 to 30 – 35% by 2030 (at carbon price < US$50/tCO2eq)

Potential emission reductions from additional nuclear power at <US$ 50 /tCO2



Nuclear share can increase from 16% of the electricity supply in 2005 up to 18% in 2030 (at carbon price < US$50/tCO2eq).

Potential emission reductions from additional CCS in new coal and gas plants at <US$ 50 /tCO2



Fossil fuel share of electricity generation without CCS drops to < 50% of total supply by 2030 (at carbon price < US$50/tCO2eq).

Macro-economic costs in 2030

Trajectories towards stabilization levels (ppm CO_2-eq)	Median GDP reduction (%)	Range of GDP reduction (%)	Reduction of average annual GDP growth rates (percentage points)
590-710	0.2	-0.6 – 1.2	< 0.06
535-590	0.6	0.2 – 2.5	< 0.1
445-535	Not available	< 3	< 0.12

For stabilisation at around 550 ppm CO2eq carbon prices should reach 20-80 US$/tCO2eq by 2030 (5-65 if “induced technological change” happens)

Long term mitigation (after 2030)

Stab level (ppm CO_2-eq)	Global Mean temp. increase at equilibrium (ºC)	Year global CO_2 needs to peak	Year global CO_2 emissions back at 2000 level	Reduction in 2050 global CO_2 emissions compared to 2000
445 – 490	2.0 – 2.4	2000 - 2015	2000- 2030	-85 to -50
490 – 535	2.4 – 2.8	2000 - 2020	2000- 2040	-60 to -30
535 – 590	2.8 – 3.2	2010 - 2030	2020- 2060	-30 to +5
590 – 710	3.2 – 4.0	2020 - 2060	2050- 2100	+10 to +60
710 – 855	4.0 – 4.9	2050 - 2080		+25 to +85
855 – 1130	4.9 – 6.1	2060 - 2090		+90 to +140

Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

2. Climate Change Mitigation in Macedonian Conditions

Underlying national studies, conducted at ICEIM-MANU

- Inventory of Greenhouse Gases Emissions, *First National Communication under the UNFCCC*
- GHG Mitigation Analysis and Projections of Emissions, *First National Communication under the UNFCCC*
- Inventory of Greenhouse Gases Emissions, *Second National Communication under the UNFCCC*
- Evaluation of Technology Needs for GHG Mitigation in the Energy Sector

The energy sector

- Accounts for about 70% of the total GHG emissions
- The main domestic sources of energy: lignite and firewood
- Hydropower is about 8-10% of energy supply
- Over 40% of the energy imported in the last years
- The most important problems:
  - unfavorable energy mix with high prevalence of lignite
  - strong dependence on energy import
  - poor condition of the energy systems
  - high degree of inefficiency in energy production and use
  - absence of strategy and long-term lack of strategic planning

the most important national target sector for climate change mitigation

2.1. Examined Mitigation Measures

No.	Technology	Base unit
(1)	Introduction of liquid fuel in power generation	1 plant
(2)	New hydro power at Boskov Most	70 MW plant
(3)	Mini hydro power (4 plants of 1 MW)	4 MW plant
(4)	Wind power plants	1 MW
(5)	Landfill gas power plant	1 plant
(6)	Geothermal heating for greenhouses and hotels	1 plant
(7)	Biogas from small agricultural industries	1 plant
(8)	Grid-connected solar PVs	1 kW
(9)	Solar heater for hot water in individual houses	1 unit
(10)	Air conditioning	1 unit
(11)	Efficient refrigerators	1 unit
(12)	Large solar heaters for hot water in hotels, hospitals	1 unit
(13)	Efficient lighting	1000 bulbs
(14)	Efficient motors	1 kW
(15)	Efficient boilers	1 boiler
(16)	Replacement of bus diesel motors	1 bus

2.2. Economic and Environmental Evaluation

Use of the software tool GACMO (GHG costing model)

Outputs:

- Economic effectiveness (US$/t CO2-eq)
- Environmental effectiveness (reduced tons CO2-eq)

Example

Mini hydro power plants

General inputs:		
Discount rate	6%	
Reduction option: Hydro power plants		
O&M	1.0%	
Activity	4	MW
Investment in hydro power	1,500	US$/kW
Capacity factor	2,000	hours
Electricity production	8,000	MWh

Reference option: Lignite fueled power plant		
O&M	2.0%	
Investment saved	1,200	US$/kW
Efficiency	0.33	
Annual fuel saved	87,273	GJ
Cost of fuel saved	24.00	US$/ton
Cost of fuel saved	3.20	US$/GJ
CO_2-eq. emission coefficient	0.142	tons CO_2-eq/GJ
Capacity factor	7,000	hours

Costs in US$	Reduction Option	Reference Option	Increase (Red.-Ref.)
Total investment	6,000,000	4,800,000	
Project life	30	30	
Lev. investment	435,893	348,715	87,179
Annual O&M	60,000	96,000	-36,000
Corrected lev. investment	435,893	99,633	336,261
Corrected annual O&M	60,000	27,429	32,571
Annual fuel cost		279,273	-279,273
Total annual cost	495,893	406,334	89,559
Annual emissions (tons)	Tons	Tons	Reduction
Total CO_2-eq. emission	0	12,424	**12,424**
US$/ton CO_2-eq.			**7.21**

a. Win-win implementation

Mitigation option	Specific costs (US$/t CO_2eq)	Unit type	Emission reduction (t CO_2-eq per unit)	Units in 2010	Emission reduction in 2010		
						Cumulative	
					Per option Mt/year	Mt/year	Percentage of baseline emissions in 2010
Geothermal heating	-187.15	1 unit	2,269.34	1	0.0023	0.0023	0.01%
Replacem. bus diesel motors	-171.49	1 bus	22.75	2,000	0.0455	0.0478	0.27%
Efficient lighting	-24.98	1000 bulbs	87.60	200	0.0175	0.0653	0.36%
Efficient refrigerators	-8.63	1 refrig.	0.58	150,000	0.0876	0.1529	0.85%
Hydro power (Boskov Most)	-4.09	1 plant	202,195.87	1	0.2022	0.3551	1.97%
Efficient motors	-3.22	1 kW	0.78	25,000	0.0194	0.3745	2.08%
Landfill gas power	-2.85	1 plant	112,232.58	1	0.1122	0.4868	2.70%

b. Small specific costs

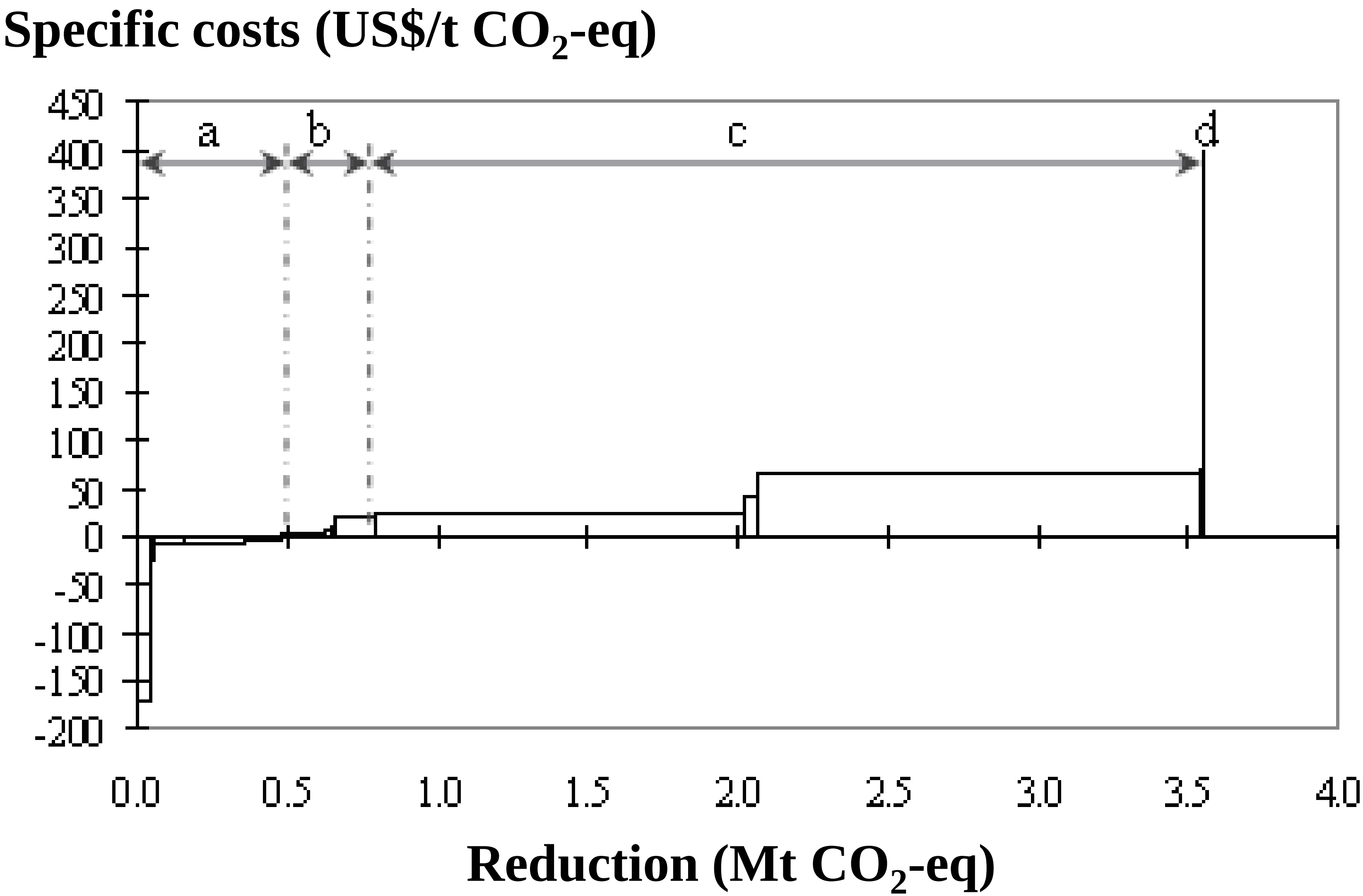
Mitigation option	Specific costs (US$/t CO_2-eq)	Unit type	Emission reduction (t CO_2-eq per unit)	Units in 2010	Emission reduction in 2010		
						Cumulative	
					Per option Mt/year	Mt/year	Percentage of baseline emissions in 2010
Wind turbines	4.16	1 MW	2,872.98	50	0.1436	0.6304	3.50%
Mini hydro power	7.21	4 MW plant	12,423.71	1	0.0124	0.6428	3.57%
Large solar heater	11.70	1unit	62.16	200	0.0124	0.6553	3.64%
Resid. solar water heating	19.35	1 unit	1.32	100,000	0.1320	0.7873	4.37%

c. Medium specific costs

Mitigation option	Specific costs (US$/t CO_2-eq)	Unit type	Emission reduction (t CO_2-eq per unit)	Units in 2010	Emission reduction in 2010		
						Cumulative	
					Per option Mt/year	Mt/year	Percentage of baseline emissions in 2010
Liquid fuel in power generat.	22.71	1 plant	1,238,139.75	1	1.2381	2.0254	11.25%
Biogas from agro-industry	43.21	1 digester	11,699.89	3	0.0351	2.0605	11.45%
Efficient indust. boilers	63.93	2 tones steam	29,652.40	50	1.4826	3.5431	19.68%

d. High specific costs

Mitigation option	Specific costs (US$/t CO_2-eq)	Unit type	Emission reduction (t CO_2-eq per unit)	Units in 2010	Emission reduction in 2010		
						Cumulative	
					Per option Mt/year	Mt/year	Percentage of baseline emissions in 2010
Air condit. (residential)	70.51	1 air conditioner	0.16	60,000	0.0094	3.5525	19.74%
PVs connected to electric grid	398.22	1 kW	1.10	500	0.0006	3.5531	19.74%



Marginal cost curve for the considered mitigation measures

Conclusions

(A) Economic effectiveness:

- The most cost effective option appears to be the application of geothermal energy in greenhouses and hotels.

- The replacement of old bus engines with more efficient ones is on the second place.

- PVs connected to electric grid is by

(B) Mitigation potential

- The total achievable reduction 3.55 Mt CO2-eq, (19.74% of the baseline emissions)
- The application of efficient industrial boilers (annual reduction of 1.48 Mt CO2-eq) and the introduction of liquid fuel in electricity production (annual reduction of 1.24 Mt CO2-eq) are the greatest contributors to the overall emission reduction
- The cumulative reduction of all other options amounts to 0.83 Mt CO2-eq.
- The largest portion of achievable reduction can be realized at price between 20 and 70 US$/t CO2-eq

(C) Win-win implementation

- Almost half of the examined options have negative specific costs
- Relatively low environmental effectiveness (cumulative potential to reduce the total baseline emissions for 2.7%)
- Even if climate change is not an issue, there will be still a strong case for implementing these options on the grounds of their economic benefits alone
- Still, the problem of finding financial sources for initial investments remains to be resolved

(D) The other mitigation measures

- Options with the largest mitigation potential are shown to be most difficult for implementation (mainly due to the lack of financing and low prospects for attracting foreign investments, as well as legislative and administrative barriers)

- The implementation can be supported combining administrative policies, which focus on the necessary regulations, with economic policies, which strive to modify the behavior of the stakeholders, and the criteria according to which their energy-related decisions are adopted.

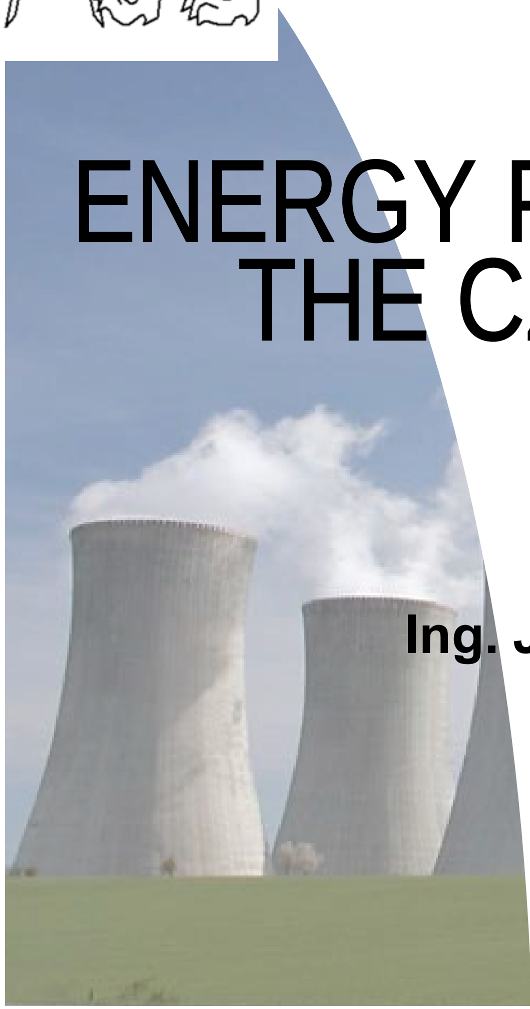
Research Center for Energy, Informatics and Materials of the Macedonian Academy of Sciences and Arts ICEIM-MANU (www.manu.edu.mk/icei)

Mission: to initiate and coordinate national research programs and to perform high-level research in selected fields, both applied and basic.

Applied research : devoted to energy strategies, energy efficiency and renewable energy sources, as well as the environmental impacts of various energy technologies, including greenhouse gases emissions and climate change.

The research staff: four academicians, two senior scientists, one junior scientist and two research assistants, as well as three postgraduate students. Over twenty collaborators from other national scientific institutions.

Czech Technical University in Prague
Faculty of Mechanical Engineering
Department of Fluid Dynamics and Power Engineering



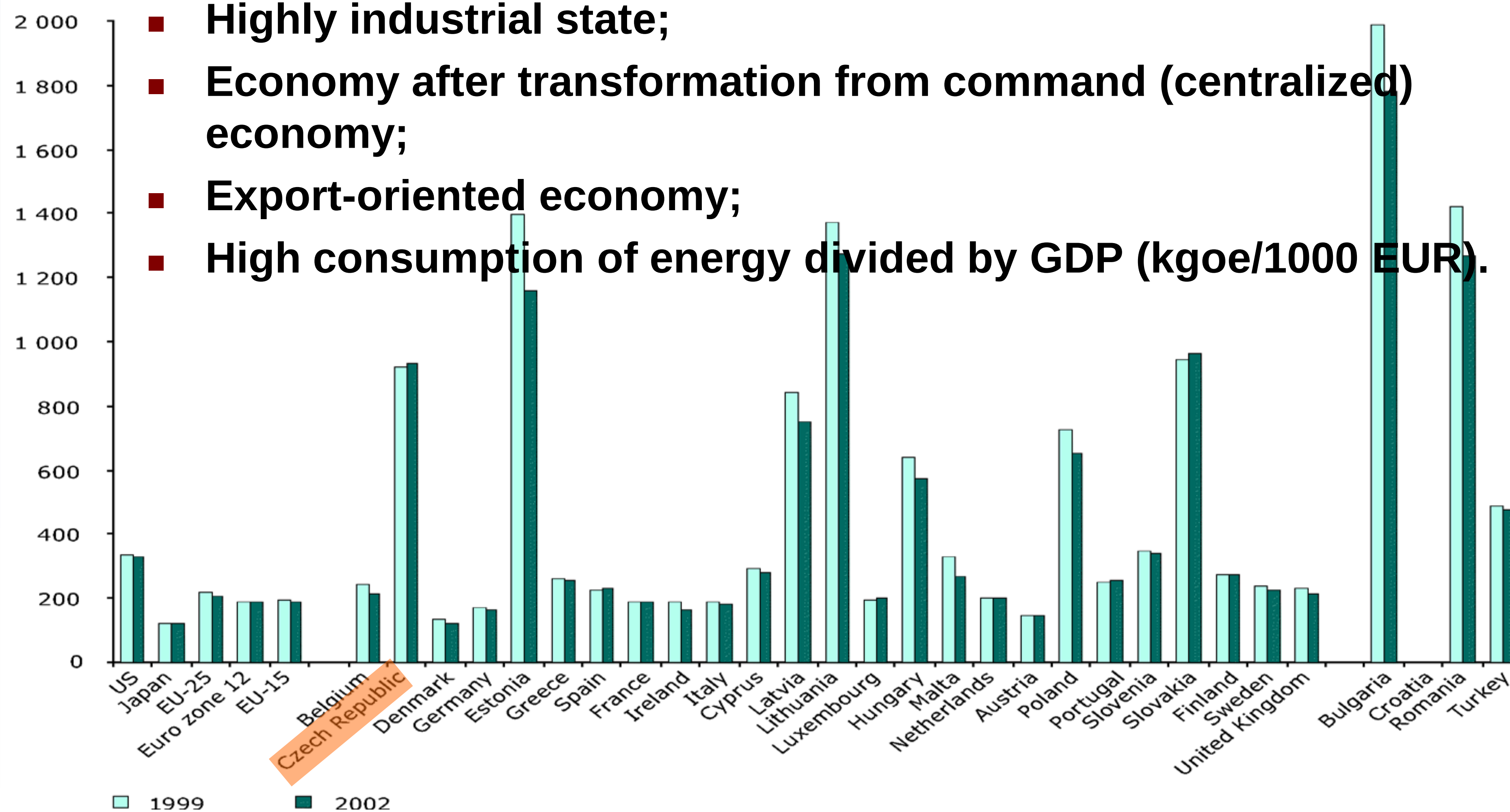
ENERGY POLICY AND RESOURCES: THE CZECH REPUBLIC CASE

Ing. Jakub Maščuch, Ing. Edmond Zeneli

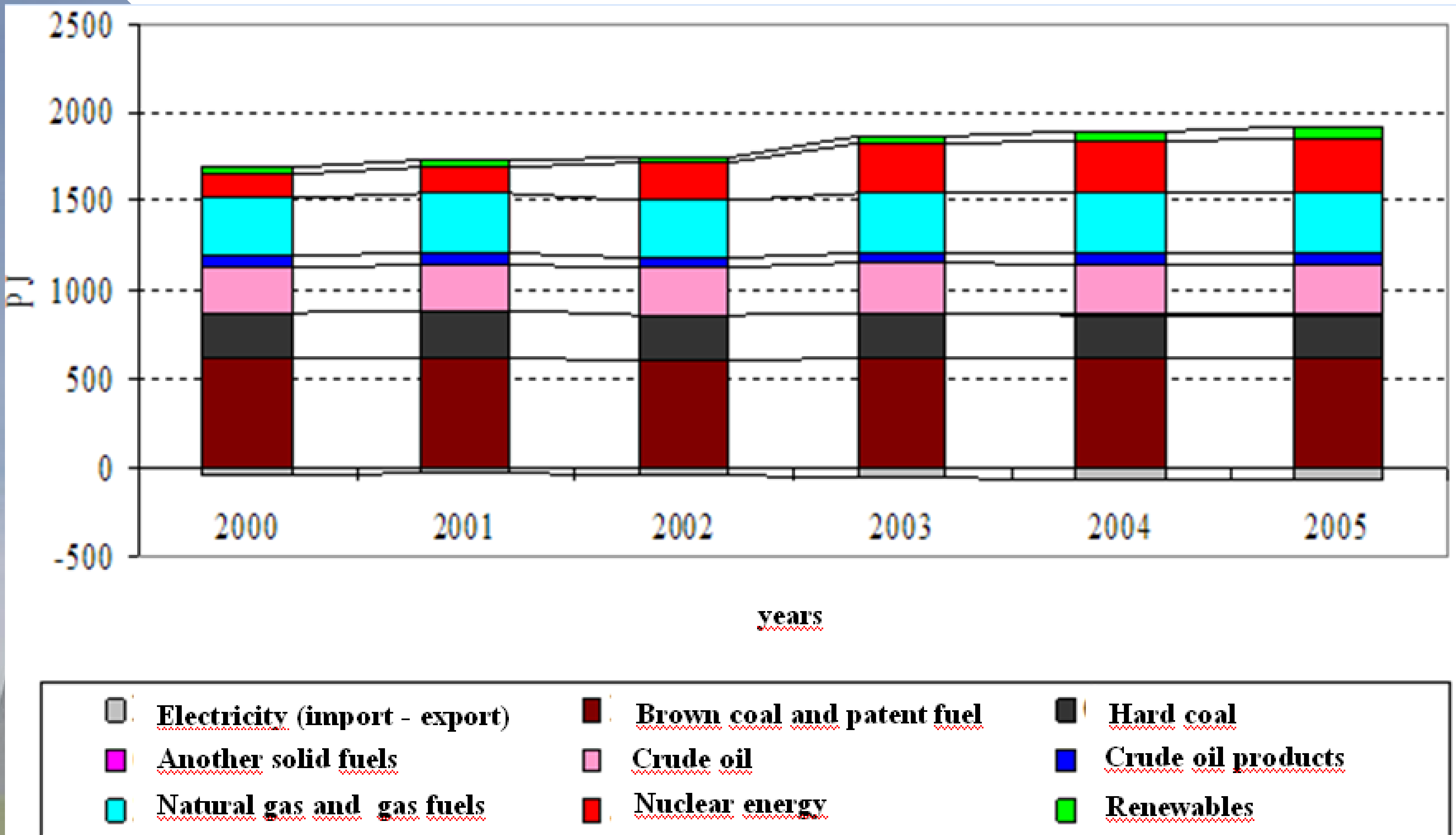
21.3.2009

Basic facts about CZECH REP.

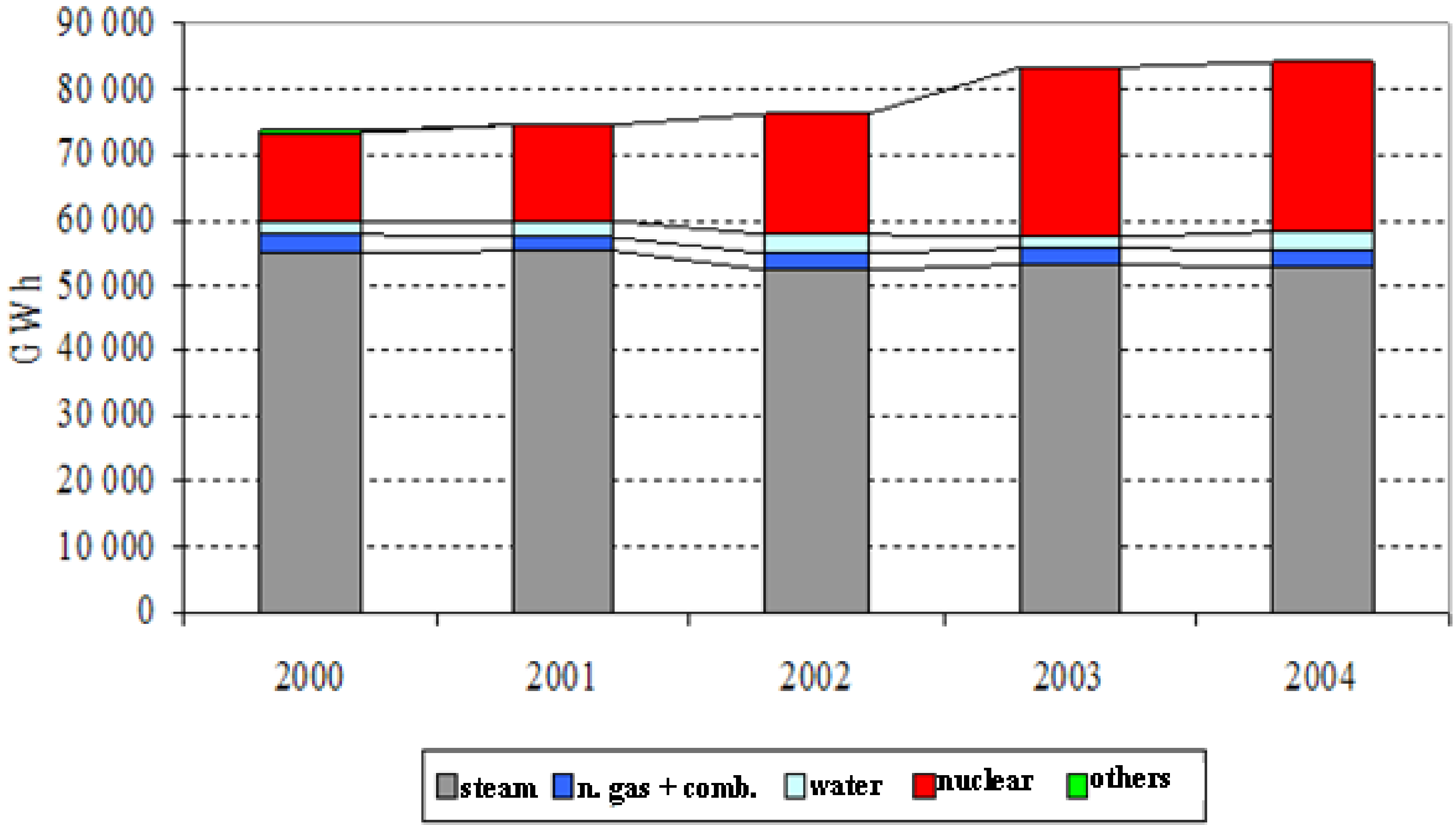
- **Area:** **78 864 km², inland state;**
- **Population:** **10 200 000;**
- **Highly industrial state;**
- **Economy after transformation from command (centralized) economy;**
- **Export-oriented economy;**
- **High consumption of energy divided by GDP (kgoe/1000 EUR).**



Energy consumption



Gross electricity production



Coal

- **Lignite coal plays a non-replaceable role as energy source;**
- **Source for heavy industry, power production and central heating systems (extensive use of CHP);**
- **There are limitations in lignite coal mining laid down by law;**
- **Reserves for 40 – 60 years – computed using actual consumption.**

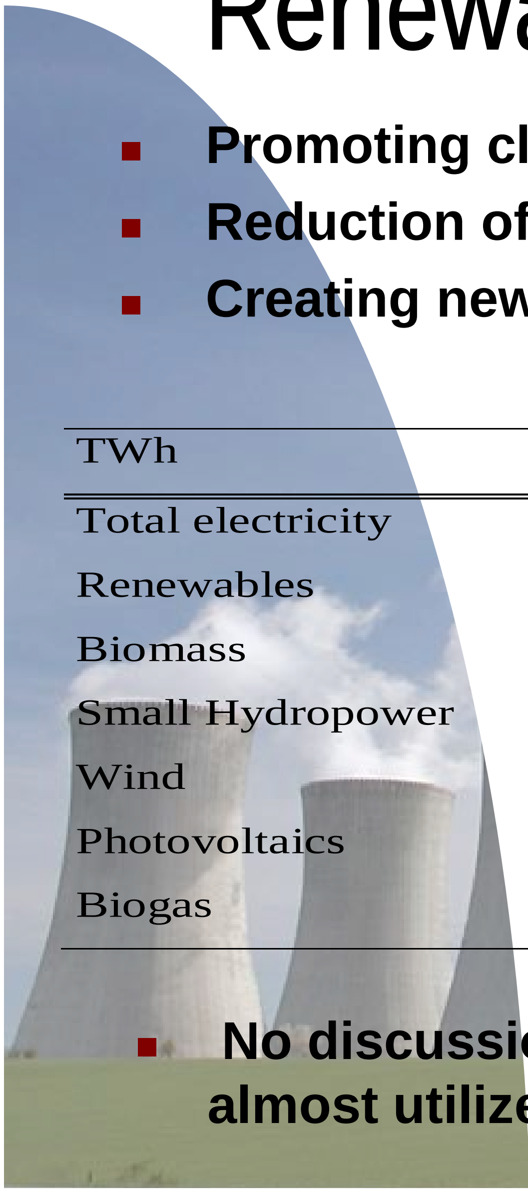
- **Hard coal is main source for important metallurgical industry;**
- **It is not common in power production and central heating systems;**
- **Large reserves in new areas (no safe technology for mining).**

- **Replacement?**
  - **by biomass – not sufficient;**
  - **by natural gas - expensive and unsafe;**
  - **conversion into individual heat supply = ↓ CHP operation**
    ↑ ecological impacts

Nuclear energy? Yes, thank you!

- Situation in EU is turning from NO to YES;
- New steps in harmonization of regulations were made in EU;
- The Czechs approve atom (>70 % of population have positive reaction);
- Nuclear energy is efficient and flexible source;
- Support of nuclear energy, reduction of greenhouse gases by 20% by 2020;
- Closer cooperation among EU members and other countries, common investments, projects (Balkan countries);
- Support of R&D programs, support of training and education;
- Familiarization of communities with nuclear energy.

Renewable energy as an option

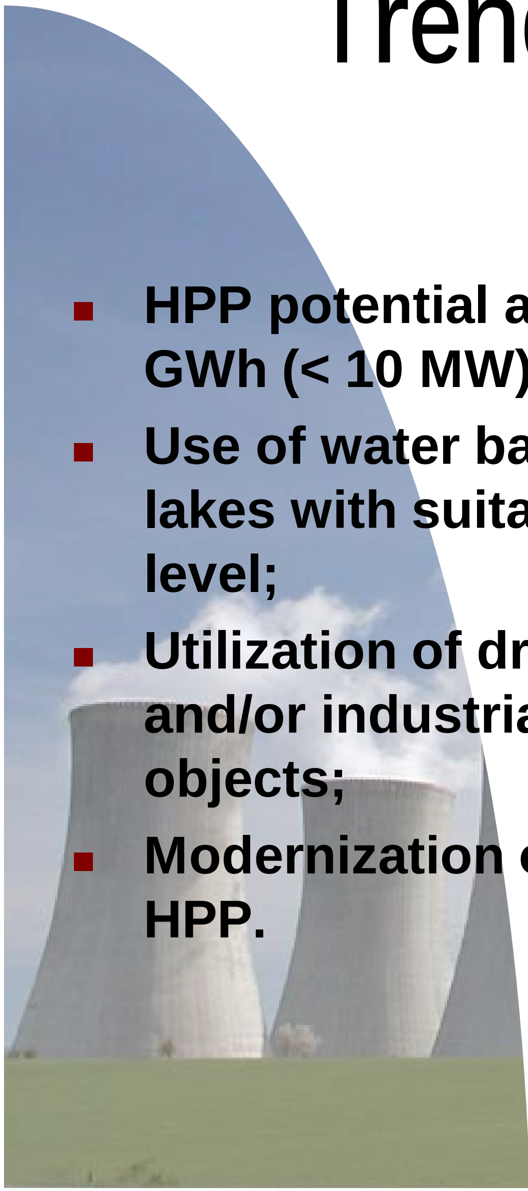


- **Promoting clean energy is a high priority;**
- **Reduction of dependency on fossil fuels = energy safety;**
- **Creating new job opportunities.**

TWh	2000	2005	2010	2015	2020	2025	2030
Total electricity	73,73	78,2	82,37	80,85	84,95	87,49	89,17
Renewables	1,71	4,16	8,17	9,84	11,58	14,2	15,06
Biomass	0,01	1,60	4,86	6,32	7,81	10,25	10,96
Small Hydropower	0,52	0,80	1,05	1,05	1,05	1,05	1,05
Wind	0,01	0,57	0,93	1,01	1,25	1,44	1,44
Photovoltaics	0,00	0,00	0,00	0,00	0,00	0,01	0,01
Biogas	0,01	0,01	0,01	0,01	0,01	0,01	0,16

- **No discussion about large hydropower = potential is almost utilized.**

Trend of renewable energy



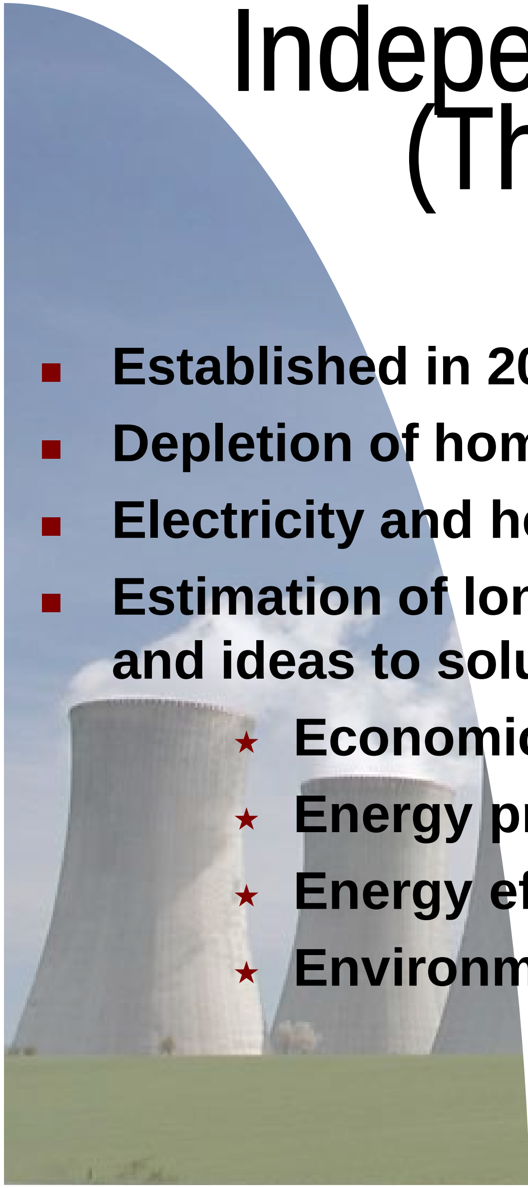
- **HPP potential approx.1500 GWh (< 10 MW);**
- **Use of water basins and lakes with suitable water level;**
- **Utilization of drinking water and/or industrial water objects;**
- **Modernization of outdated HPP.**
- **Up to 2002 variable development of wind turbines;**
- **Since 2002 growing interest in wind power due to regulated electricity price;**
- **Wind power capacity installed 55 680 kW (2006);**
- **Dominant role in CR energy system is not expected.**

Biomass and solar energy

- **Biomass is the leading source among RES;**
- **Electricity production is estimated 403.706 GWh (2007);**
- **Heat production 45.52 PJ (2007);**
- **A considerable role in energy supply is expected.**

- **Geographical position and climate are not generous with CR with respect to solar energy;**
- **2127 MWh gross energy produced by solar systems (2007) with a 0.02% contribution on RES;**
- **Photovoltaic future in Czech conditions remains unforeseen.**

Independent energy commission (The Paces' commission)

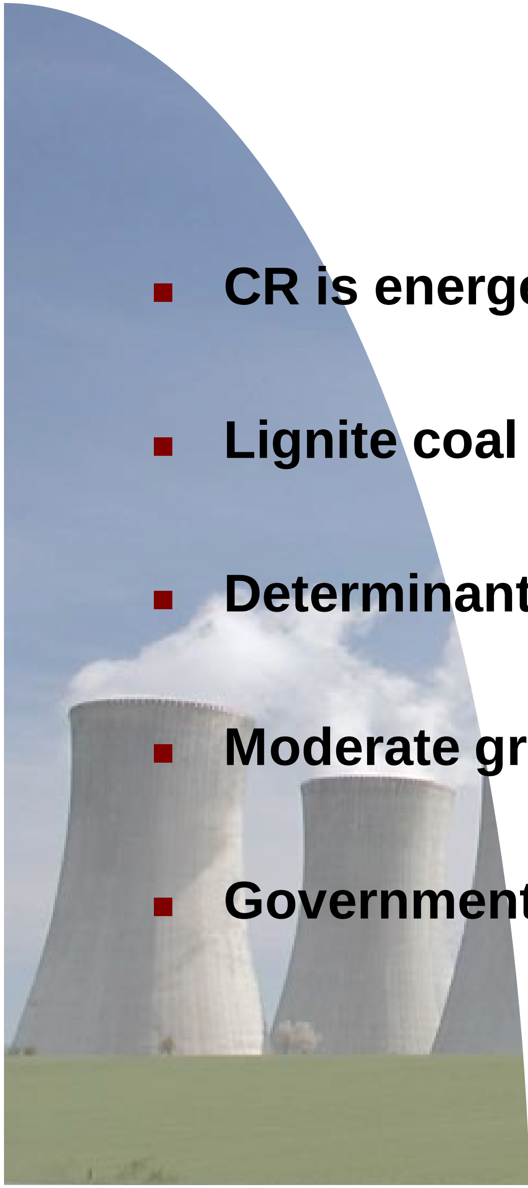


- Established in 2007 by government;
- Depletion of home energy sources (lignite coal, hard coal);
- Electricity and heat insufficiency is possible during 2015-2020;
- Estimation of long-term energy strategy, recommendations, and ideas to solution considering:
  - Economic & demographic growth;
  - Energy prices;
  - Energy efficiency and saving;
  - Environmental aspects.

The Commission's statements and proposals

- A slightly increase of PES by 2030 (+5%);
- Fully utilization of fossil fuels, nuclear and renewable resources;
- No dependency on foreign electricity sources;
- Continuing emissions reduction;
- A significant growth of PES imports by 70% by 2030;
- Development & propagation of energy market;
- Promotion of domestic & foreign capital;
- No intervention of government in energy sector;
- No support of electricity import in long-term view.

Conclusions



- **CR is energetically stable and an exporter of electricity**
- **Lignite coal & gas for electricity and heat production**
- **Determinant role of nuclear energy**
- **Moderate growth of renewable energy sector**
- **Government policy considering the IEC proposals.**

Energy security in a legal context – some remarks in the light of the Treaty establishing the Energy Community

Energy and Climate Changes – Southeast Europe in focus ,
Skopje 21 March 2009

Piotr Bogdanowicz
Ph. D. candidate, Faculty of Law, Warsaw University

Introduction

- Three pillars of the energy in the European Union
  - **security of supply**,
  - environmental protection,
  - equivalent levels of competition
- **Energy security = adequacy of energy supply at a reasonable price**
- **Energy security** is becoming an issue of increasing importance to the EuropeanUnion

Introduction (2)

- The multi-faceted nature of energy security:
  - **legal** aspect (e.g. definitions and regulations),
  - political aspect (e.g. dependence of the European Union on supplies from outside sources) and
  - technical aspect (e.g. physical availability of energy, satisfactory operation of the grid)

- **The Treaty establishing the Energy Community** as a good illustration of the issue

Energy security in the Community law

NOTION

- There are many definitions of “energy security”, however, only few of them are legal ones:
  - Directive 2003/54/EC
  - Directive 2005/89/EC
  - The Energy Treaty
- Definitions proposed by representatives of legal doctrine or appearing in non-binding documents of international organizations or institutions
- “Security of supply” = “energy security”?

Energy security in the Community law (2)

ENERGY SECURITY AND THE ENERGY MARKET LIBERALISATION

- Measures that are aimed at ensuring Member States' energy security **at the current stage:**

  - the supply/demand balance in individual Member States should be monitored
  - Member States shall ensure that technical safety criteria are defined and that technical rules are developed and made public
  - Member States shall ensure the possibility of providing for new capacity or energy efficiency/demand-side management measure

- **The proposal** of the directive amending Directive 2003/54

Energy security in the Community law (3)

ENERGY SECURITY AND THE DIRECTIVE 2005/89

- The directive establishes measures to ensure:
  - **proper functioning of the internal market for electricity**
  - an adequate level of generation capacity
  - an adequate balance between supply and demand
  - an appropriate level of interconnection between Member States for the development of internal markets.

Energy security in the Community law (4)

ENERGY SECURITY AND THE LISBON TREATY

- The first document introducing a legal basis for the activities of the European Union in the energy sector
- It contains provisions regarding energy security!

Energy security and the Energy Treaty

ENERGY SECURITY AND THE ENERGY TREATY

- The Energy Treaty represents a major step forward in the development of the internal market policy in the European Union and its extension to its neighbours
- The *raison d'être* of the Energy Community was to facilitate the process of utilisation of existing supply and production capacities as well as optimising future investments

Energy security and the Energy Treaty (2)

- …to organise relations between the Parties and create a legal and economic framework in relation to Network Energy **in order to enhance the security of supply of the single regulatory space** …by providing a stable investment climate in which connections to Caspian, North African and Middle East gas reserves can be developed, and indigenous sources of energy such as natural gas, coal and hydropower can be exploited.

Energy security and the Energy Treaty (3)

- At the current stage the Energy Treaty does **not** provide relevant measures in order to enhance the security of supply of the single regulatory space:
  - there are no activities to be carried out
  - the Energy Treaty does not provide parties thereto with any operational measures
  - there are no clear rules on how such issues as security of supply should be taken into account to foster development in areas of renewable energy sources and energy efficiency

Conclusion

- **On the one hand**, the enhancing of energy security is one the tasks of the Energy Community, **on the other**, except for the obligation to update every two years the security of supply statements there are no separate operational measures to safeguard the security of energy supply in the text of the Energy Treaty

- **On the one hand**, there is a process of energy market liberalisation; and an integration of national energy markets into internal energy market could substantially increase the energy security of Member States. **On the other**, for a long time there were no operational measures that could enhance future energy security

Conclusion (2)

„One step forward, two steps aside"

- the European Union policy on energy security

Contact

Blagodaram!
Thank you!

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Educational, research and development capacities at FEIT on solar cells

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First International Postgraduate Student Conference-Analytica
21 March 2009, Skopje

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Faculty of Electrical Engineering and Information Technologies

Institute of Mathematics and Physics

Republic of Macedonia

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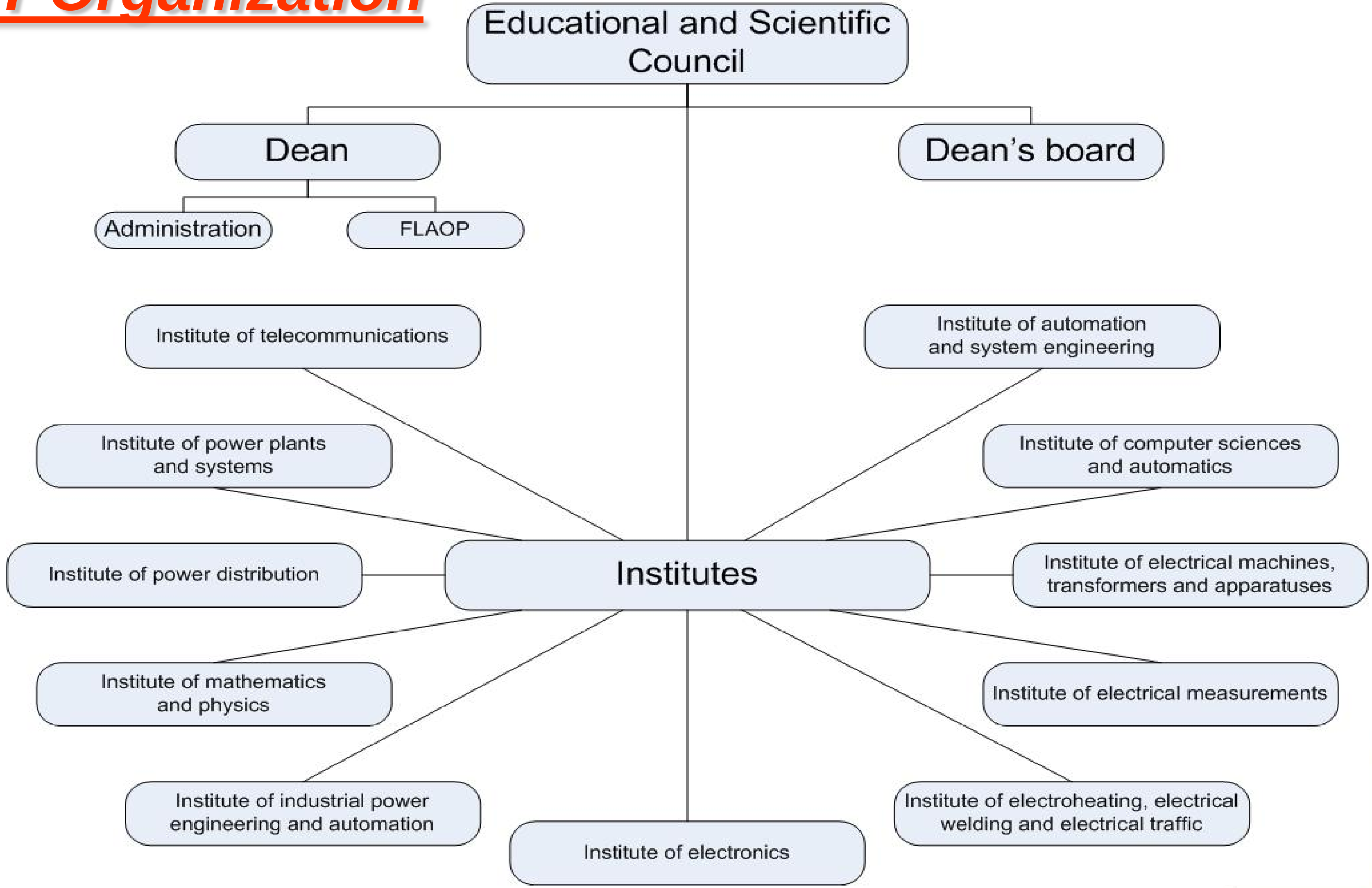
Summary

- **Introduction**
  - FEIT Capacities & Organization
- Education
- Research interests
- Projects
  - Workshop" New Frontiers of Low-Cost Photovoltaic Solar Cells 2008 "
- Developing capacities
  - Centre for implementation of low-cost technologies for solar cells in Macedonia
    - Aims & Goal
    - Objectives
    - Main activities of the Centre

FEIT Capacities

- Fifty years tradition 1959-2009
- Education of new generation creative, competent and entrepreneurship professionals able to give sufficient rise in the quality of life
- 11 Institutes
- 13 Laboratories
- 15 Faculty Centres and one Library
- 68 professors
- 50 teaching and research assistants
- 29 administrative and technical staff
- 3500 undergraduate
- 250 postgraduate students

FEIT Organization



Education

Undergraduate studies

- Computer System Engineering and Automation
- Informatics and Computer Engineering
- Conversion and Application of Electric Power
- Power Engineering and Management
- Electric Power Systems
- Electric Power Devices
- Telecommunications
- Electronics, Radiotechnics and Signal Processing

Postgraduate studies

- **Renewable Energy Sources**
- **Solar Technology**
- **Electric Power and Ecology**

Education

Renewable Energy Sources - Solar Cells

Compulsory course:

- Solar energy (fundamentals, design and application of solar energy)

Elective courses:

- Photovoltaic conversion of solar energy
- Fabrication technologies of solar cells
- Materials for renewable energy sources
- Design and applications of low-cost solar cells

Research interest

1 Deposition of thin films and their characterisation for solar cells. Solid state dye synthesized solar cells, hybrid and inorganic, based on titanium mesoporous and nanocrystallites.

2 Producing of thin films (Cu_2O, ZnO, ZnSe) by electrochemical deposition, investigation of their characteristics (XRD, SEM, optical characteristics)

3 Photovoltaic application of thin films

4 Investigation of the solar cells parameters

Ongoing projects

Electrical, photoelectrical and optical characteristics of nanocrystalline semiconductor thin films, National project, 2006-2009

Establishing Centre for implementation of low-cost technologies for solar cells in Macedonia, KEP Project, 2008-2009

Submitted projects:

- Structural and dynamical analysis of supramolecular materials, used in nanotechnologies, National project
- Low-cost solar cells from nanostructural semiconducting materials, National project

Recently completed projects

- Low-price amorphous microcrystalline silicon solar cells, FP6 European Integrated project, FP6-INCO-MPC-1, coordinator ECN-Nl, 2004-2007
- Renewables for Isolated Systems-Energy supply and waste water treatment, FP6-509161, coordinator Technical University of Athens (ICCS/NTUA), 2005-2007
- **Workshop “New frontiers of low-cost photovolatic solar cells 2008”, Skopje, May-2008**

WORKSHOP

NEW FRONTIERS OF LOW-COST PHOTOVOLTAIC SOLAR CELLS 2008

May 29 - 31. 2008 Skopje, Macedonia

Topics

- New materials and processes: nanotechnologies dye sensitized cells and organic materials
- New substrates and new photovoltaic cell concepts
- Design and synthesis of novel organic and molecular semiconductors for photovoltaic energy conversion
- Hybrid photovoltaic devices: solid state dye sensitized devices and inorganic/organic nanocomposite devices
- Device evaluation and technological perspectives

WORKSHOP

NEW FRONTIERS OF LOW-COST PHOTOVOLTAIC SOLAR CELLS 2008

May 29 - 31. 2008 Skopje, Macedonia

Goals

- Establishing a network in region toward research and development activities in the field of low-cost photovoltaic solar cells
- Achievement of knowledge, experience and strategy partnership between scientists from the region for future cooperation activities
- Presenting Industrial Companies from Macedonia, potential users of research and application results
- Improvement and implementation of low-cost technologies in Macedonian Companies
- Capacity building at national and regional relevant institutions

Technical Presentations

WORKSHOP

NEW FRONTIERS OF LOW-COST PHOTOVOLTAIC SOLAR CELLS 2008

May 29 - 31. 2008 Skopje, Macedonia

Students


AEROPOSTALE

Development capacities

Centre for implementation of low-cost technologies for solar cells in Macedonia

Project Fact Sheet

CEI Know-how Exchange Programme (KEP)

Project Ref. Number	1206.024-08	
Duration	01/11/2008 - 01/112009	
Total Budget	88072 €	
CEI Contribution	40000 €	
Partners Contribution	28172 €	19900 €
	CNR-ISMN	UKIM-FEIT

Project partners

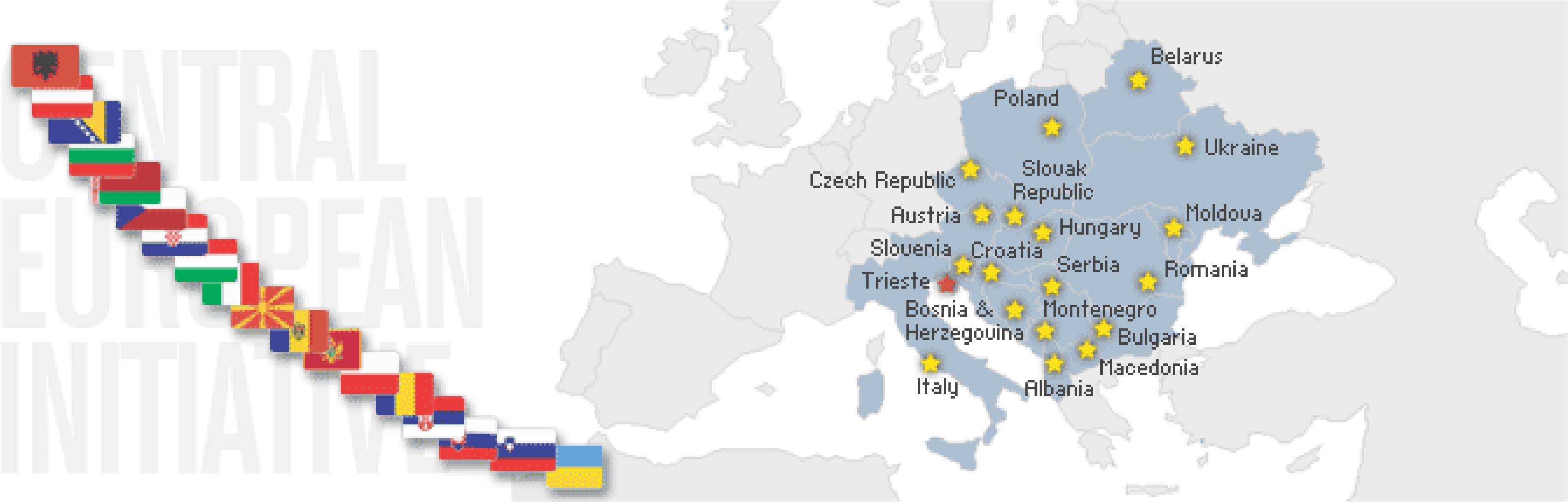
Donor Institution

CNR-ISMN
Consiglio Nazionale delle Ricerche
Istituto per lo Studio dei Materiali Nanostrutturati
Bologna-ITALY

Benefitiary Institution

UKIM-FEIT
Ss Cyril and Methodius University
Faculty of Electrical Engineering and Information Technologies
Skopje-MACEDONIA

Sponsors



CEI
CENTRAL EUROPEAN INITIATIVE

Austrian
Development Cooperation

Aims

Promotion of solar cells technologies and their low-cost production in Macedonia trough:

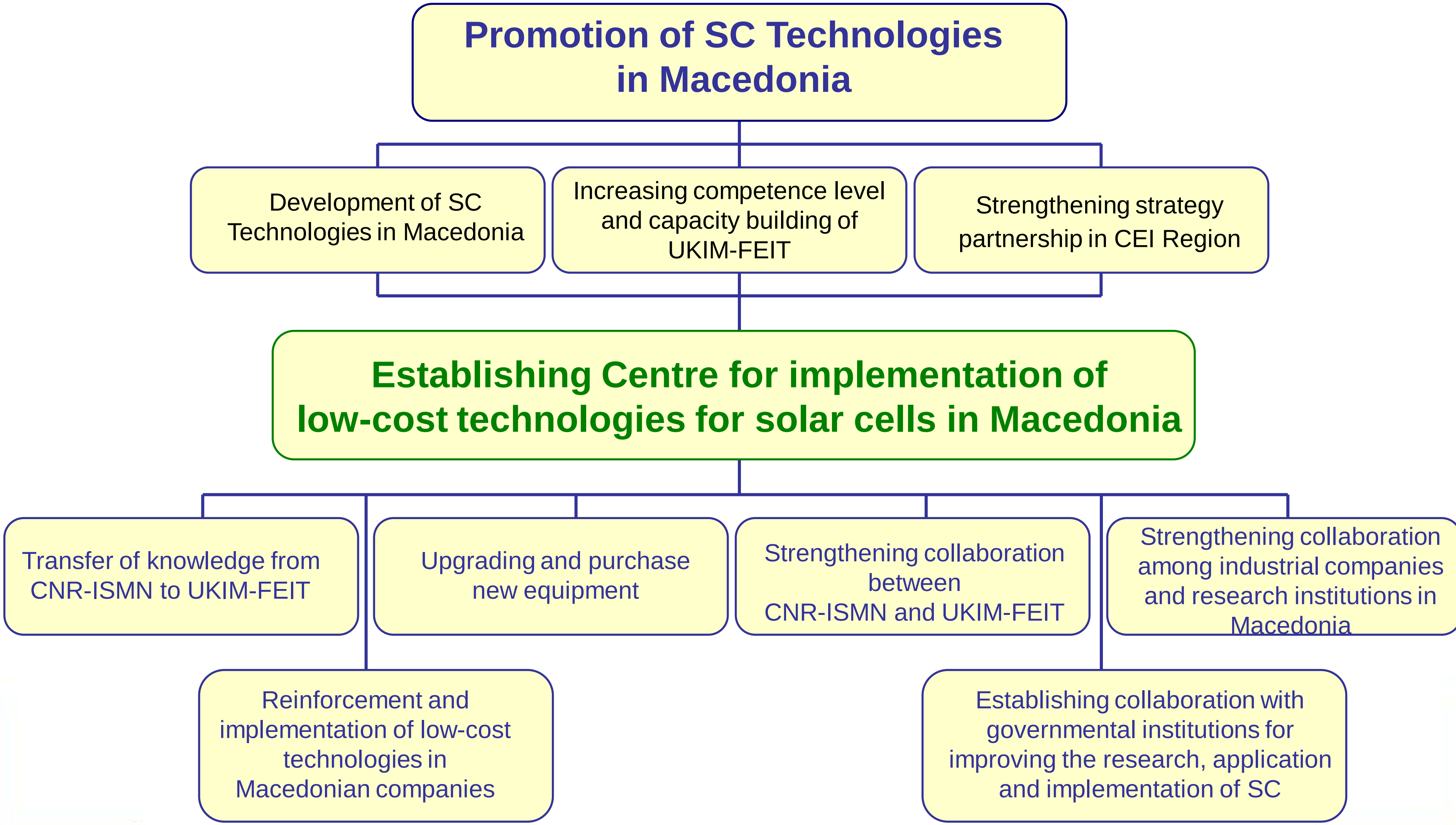
- supporting the collaboration among scientific institutions, government and industries
- improving the research, application and implementation of solar cells

Goal

Achieving high level of competence and capacities building of UKIM-FEIT through the Centre, as the first and unique institution of this kind in the field of solar cells in Macedonia

ACTIVITIES		Estimate cost	1	2	3	4	5	6	7	8	9	10	11	12
			Months											
1	**Organisation of meetings**	**9.2 %**	■	■									■	■
1a	Kick-off meeting at the CNR-ISMN, Italy		■											
1b	Meeting at the UKIM-FEIT, Macedonia												■	
1c	Preparation of feasibility elaborate for Centre needs		■	■										
1d	Meeting reports			■										■
2	**Upgrading equipment and purchase new for the Centre**	**29.8 %**	■	■	■	■	■	■	■	■	■	■	■	
2a	Consultations among partner institutions for equipment upgrading		■	■										
2b	Selection of new equipment performances				■									
2c	Purchasing selected equipment					■	■							
2d	Equipment establishing								■	■	■	■	■	
3	**Training of research and technical personnel from UKIM-FEIT**	**7.1 %**	■	■	■	■	■	■	■	■	■	■	■	
3a	Seminar at the CNR-ISMN, Italy		■											
3b	Seminar at the UKIM-FEIT, Macedonia												■	
3c	One month training in CNR-ISMN							■						
4	**Training of young researchers, Master and PhD students**	**2.5 %**									■	■	■	■
4a	Preparation of manuals and working procedure for the equipment							■	■	■				
5	**Set up the mediatory role of the Centre**	**8.4 %**			■	■	■	■	■	■	■	■	■	■
5a	Organisation of meetings with participation of industries and research institutions									■				
5b	Transfer of new relevant information in the field				■	■	■	■	■	■	■	■	■	■
5c	Presenting the research and developing results									■	■	■	■	■
5d	Working on strategy partnership for feature collaboration in application and developing projects									■	■	■	■	■
6	**Promotion of the Centre**	**11.4 %**	■	■	■	■	■	■	■	■	■	■	■	■
6a	Promotion of the project during two anticipated meetings in Macedonia and Italy by advertising		■										■	
6b	Opening ceremony of the Centre													■
6c	Organization of the Workshop, as a satellite event of the Centre Opening													■
6d	Preparation and printing of promotion material		■	■	■	■	■	■	■	■	■	■	■	■
7	**Creation web site of the Centre (design, maintenance and hosting)**	**0.1 %**	■	■	■	■	■	■	■	■	■	■	■	■
8	**Project management**	**31.5 %**	■	■	■	■	■	■	■	■	■	■	■	■
8a	Dissemination of project results					■	■	■	■	■	■	■	■	■
8b	Final report													■

Objectives Tree



Main activities of the Centre

Recognizing of the Centre by government, industries and research community in Macedonia and the region as:

- **Tool for implementation and developing of low-cost technologies for solar cells**
- **Specialized institution for the promotion of conventional low-cost solar cells technologies in Macedonia**
- **Mediator in communication and collaboration among scientific institutions and industrial companies in Macedonia working in the field of solar cells**
- **Institution for training of Master and PhD students in the field of solar cells**

Thank you for your attention.....

ENERGY EFFICIENCY IN HOUSEHOLDS

Introduction

- The increase of the energetic efficiency and the utilization of renewable sources of energy are some of the basic challenges of modern economy and energy sector of the EU countries.
- In these countries, the consumption of energy per capita and the economical GDP has been constantly declining in the last years.
- Macedonia holds the highest energy consumption per capita and GDP in Europe and in the same time it is import-dependant for supplying with energy.

Work Methodology

- The purpose of this research is to find efficient solutions for improvement of the energy efficiency in households.
- The inquiry is used as a research method
- The questionnaire consists of 19 questions
- The inquiry was made in September 2008 in 110 households in Tetovo.
- From all of the inquired, 66 live in individual houses and the other 44 live in building apartments.
- The survey sample is extracted by random selection.

Results and discussion

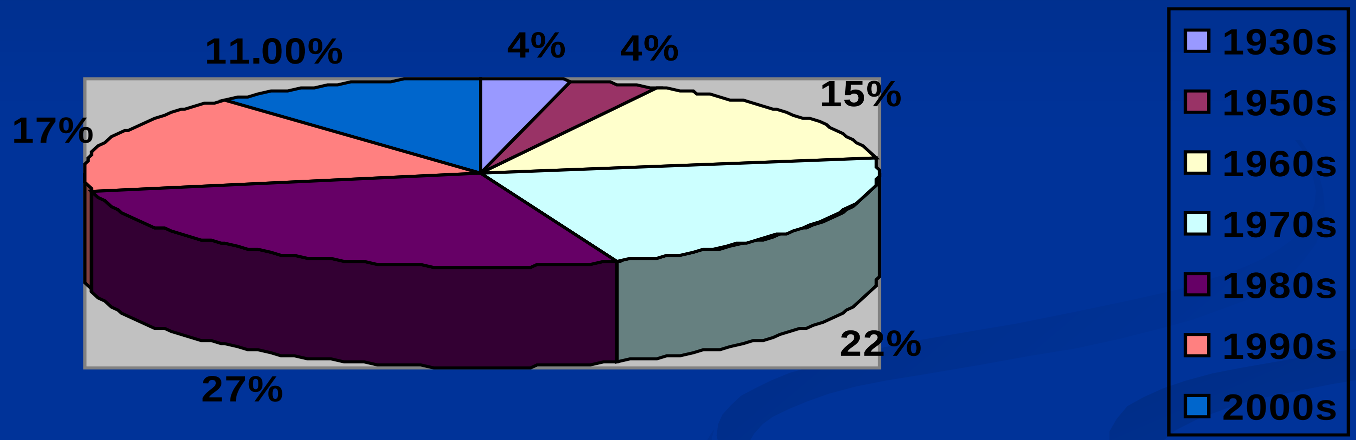
- From the first question regarding the gender, the following results were acquired: 58 % are men and 42% are women.
- From the second question regarding the age of the inquired people, the following results were acquired: 3.63 % of the inquired are aged to 15 years,12.72 % of the inquired are aged 16-25 years,41.81 % of the inquired are aged 26-45, 39.09 % are aged 45-65 and 2.72 % of the inquired are aged over 65.
- From the third question regarding the living place, the following results were acquired: 60 % of the inquired live in an individual house, and 40 % in a building apartment.

- From the fourth question regarding the number of people in a household, the following results were acquired

Table 1. Number of people in a household

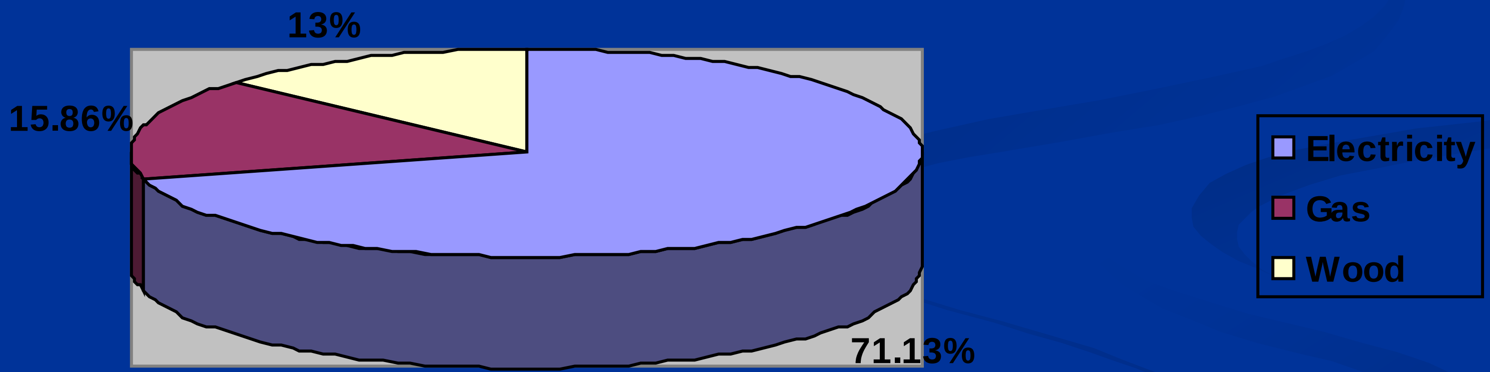
Number of people in a household	Number of households	Expressed in percents
1	1	0.9
2	8	7.27
3	26	23.63
4	41	37.27
5	19	17.27
6	9	8.18
7	4	3.63
8	1	0.9
10	1	0.9
Total	110	100

- From the fifth question regarding the time of construction of the home, the following data were acquired



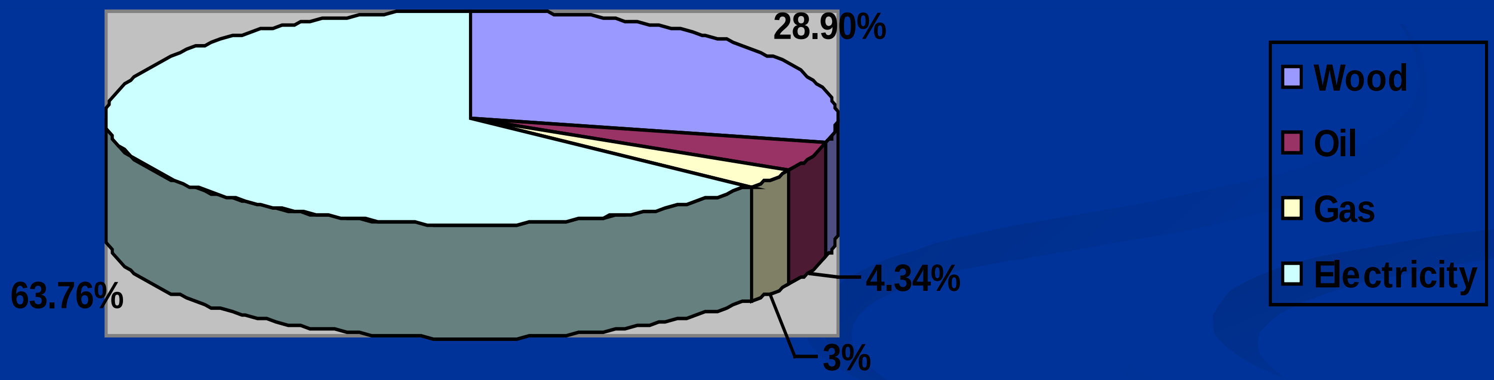
Picture 1. Year of construction of the home

- From the sixth question regarding the square surface of the home, the following data were acquired: the square surface of the apartments varies from 38 – 120 m2, whereas the square surface of the individual houses varies form 60 – 250 m2.
- From the seventh question regarding the way of food preparation in the households, the following data were acquired:



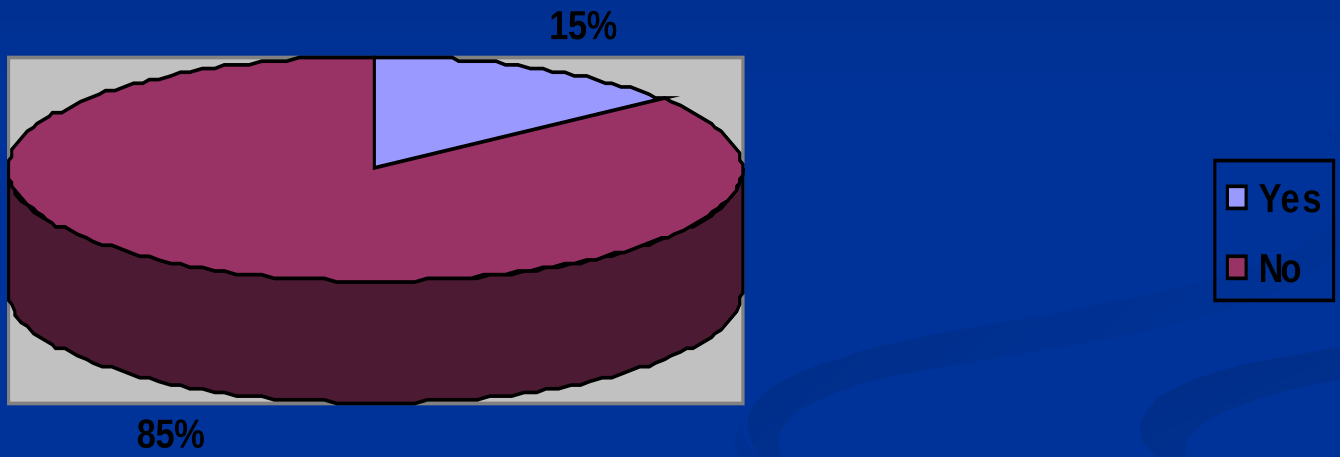
Picture 2. Way of food preparation

- From the eight question regarding the type of the heating resources which are used in the home, the following data were acquired:



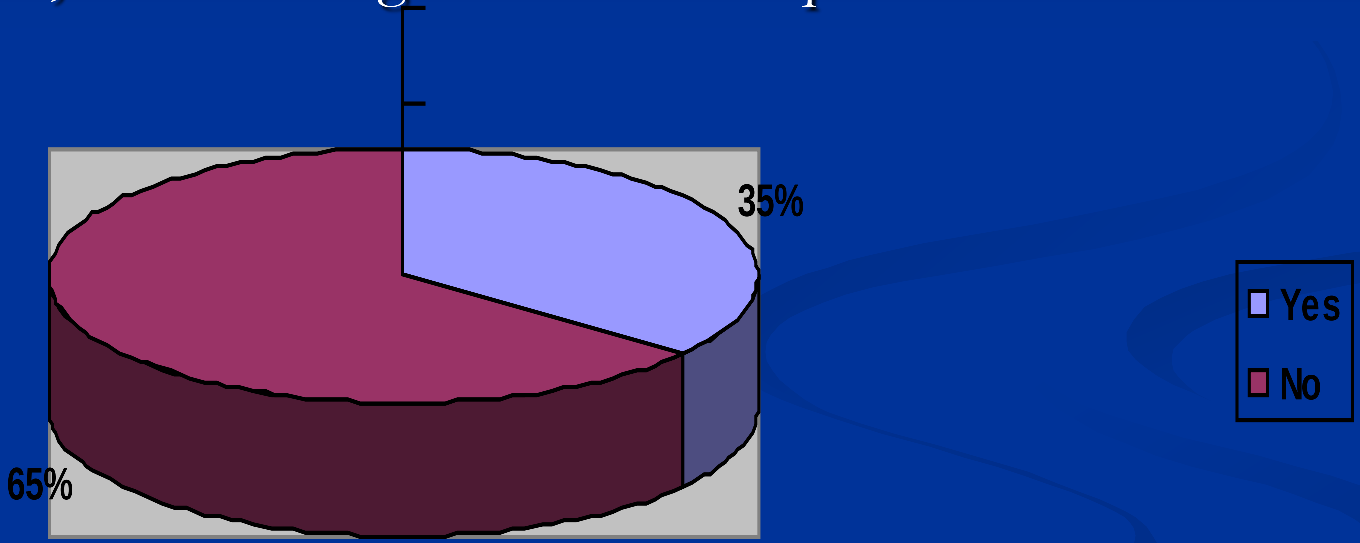
Picture 3. Heating resources used in a home

- From the ninth question regarding the utilization of a central heating system in the home, the following data were acquired:



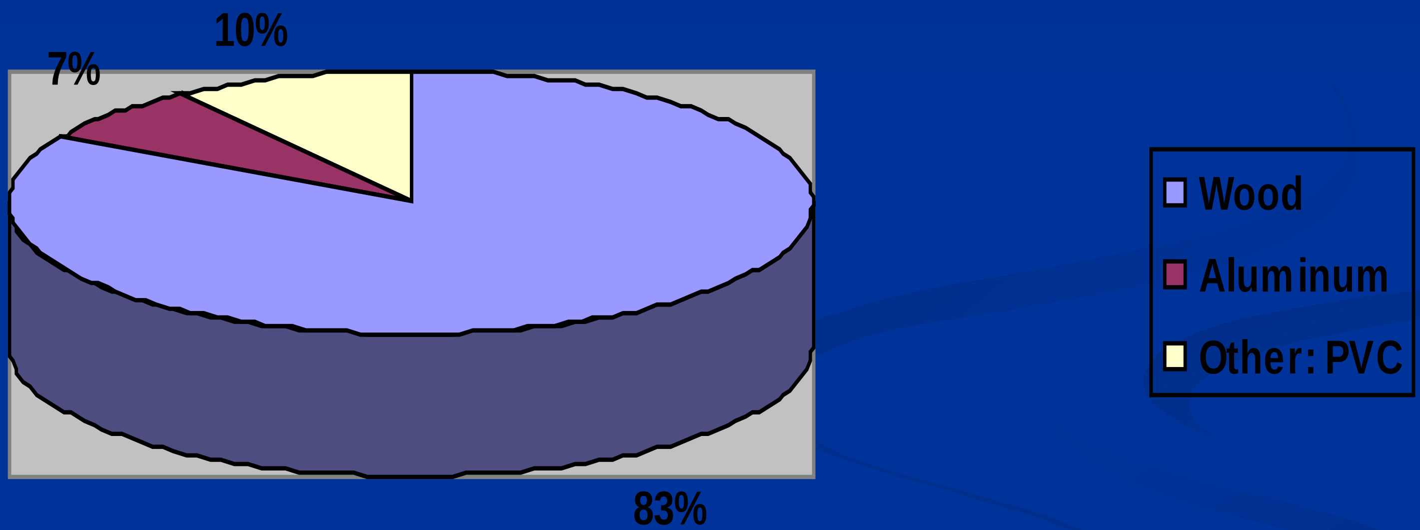
Picture 4. Utilization of central heating in the home

- From the tenth question regarding the usage of solar panels in the home, the following data were acquired: 96.35 % of the inquired do not have solar panels, and only 3.63 % have solar panels in their homes.
- From the eleventh question regarding the thermal isolation of the home, the following results were acquired:



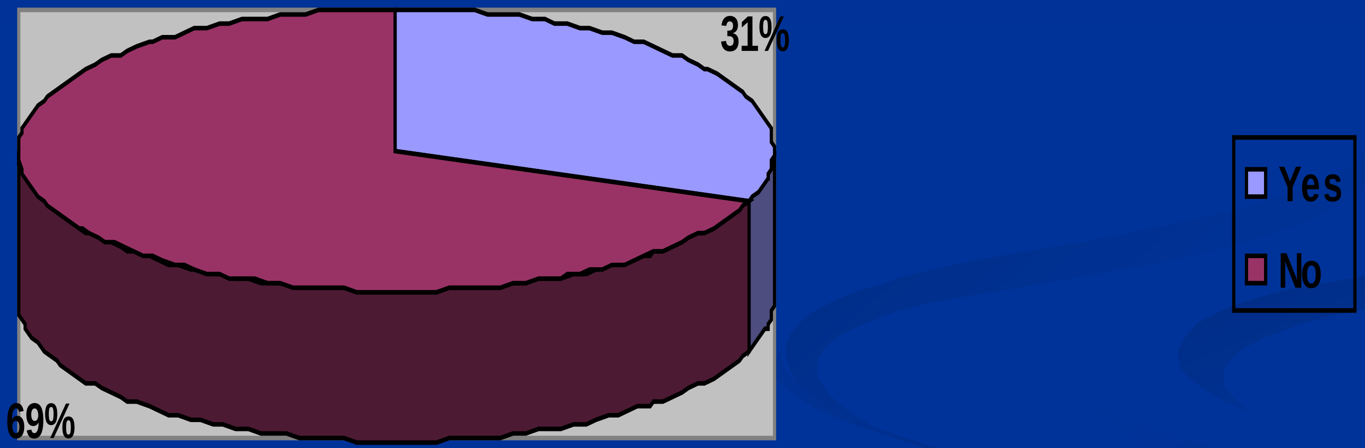
Picture 5. The home is thermally isolated

- From the twelfth question regarding the type of windows and external doors that are used in the home, the following data were acquired:



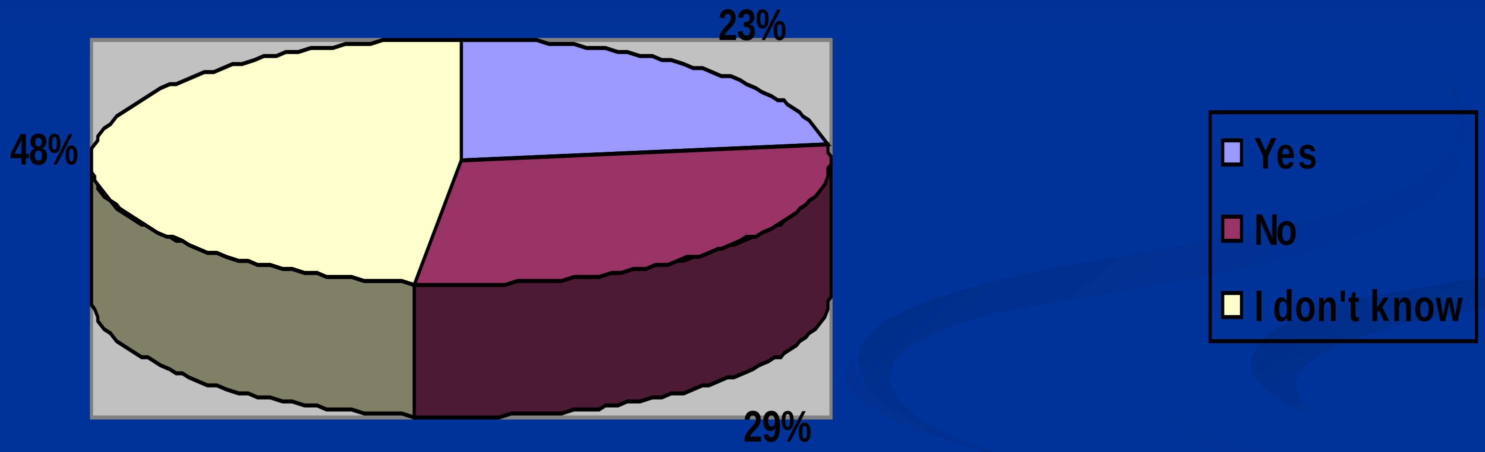
Picture 6. Type of windows and external doors in the homes

- From the thirteenth question, regarding the awareness of class A electrical appliances, the following data were acquired:



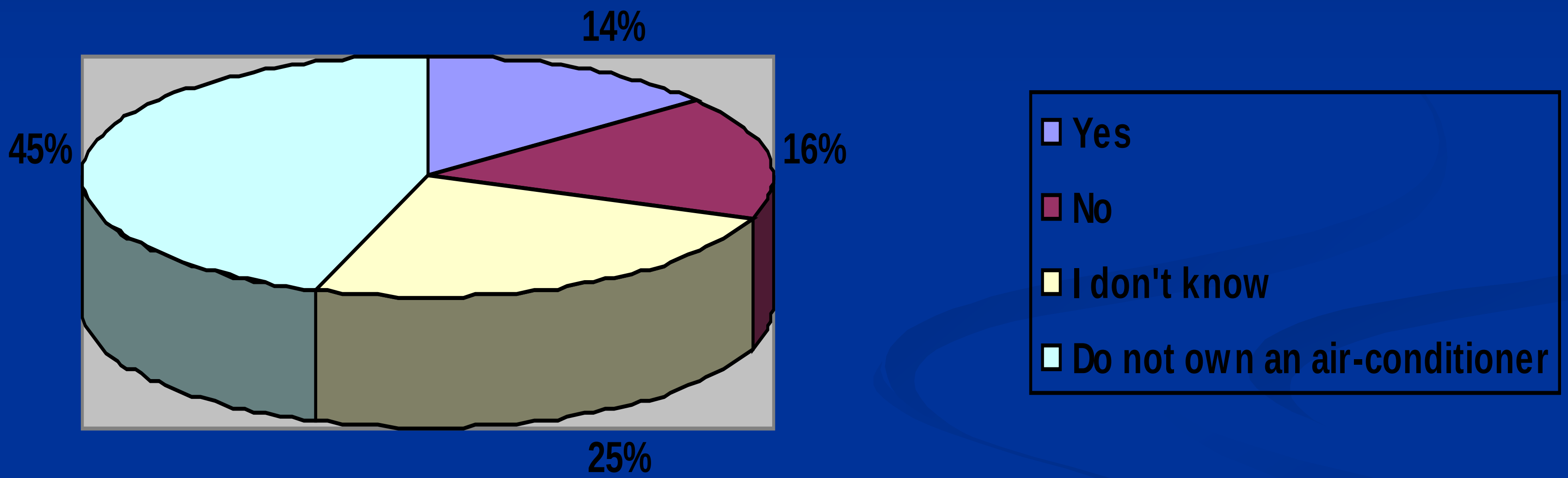
Picture 7. Awareness of class A electrical appliances

- From the fourteenth question regarding the usage of class A electrical appliances, the following data were acquired:



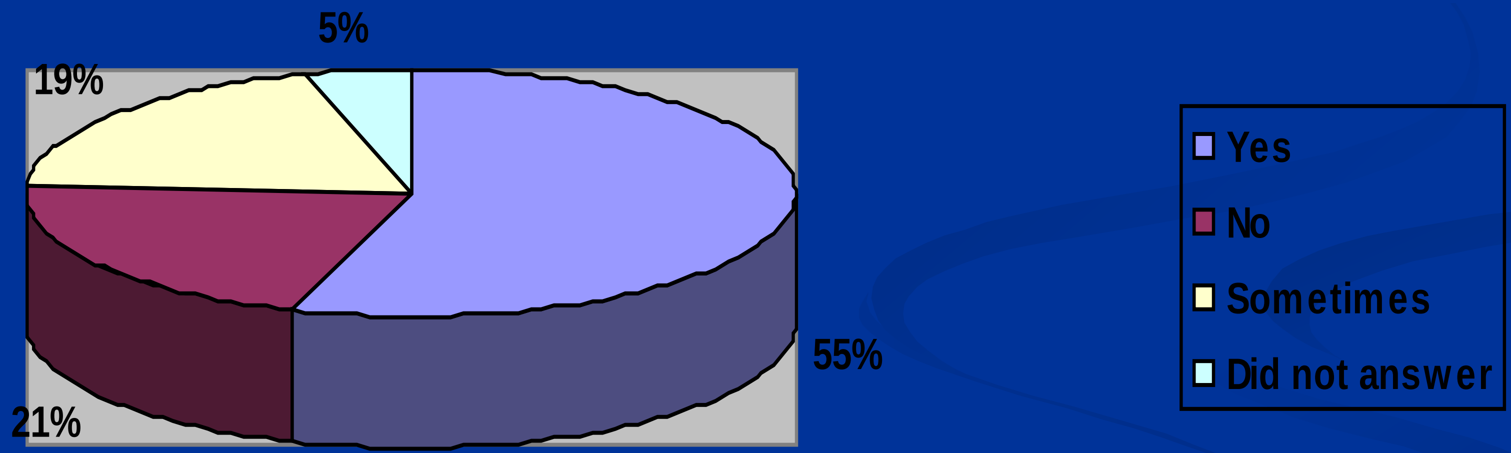
Picture 8. Usage of class A electrical appliances

- From the fifteenth question regarding the usage of air-conditioner class A in the home, the following data were acquired:



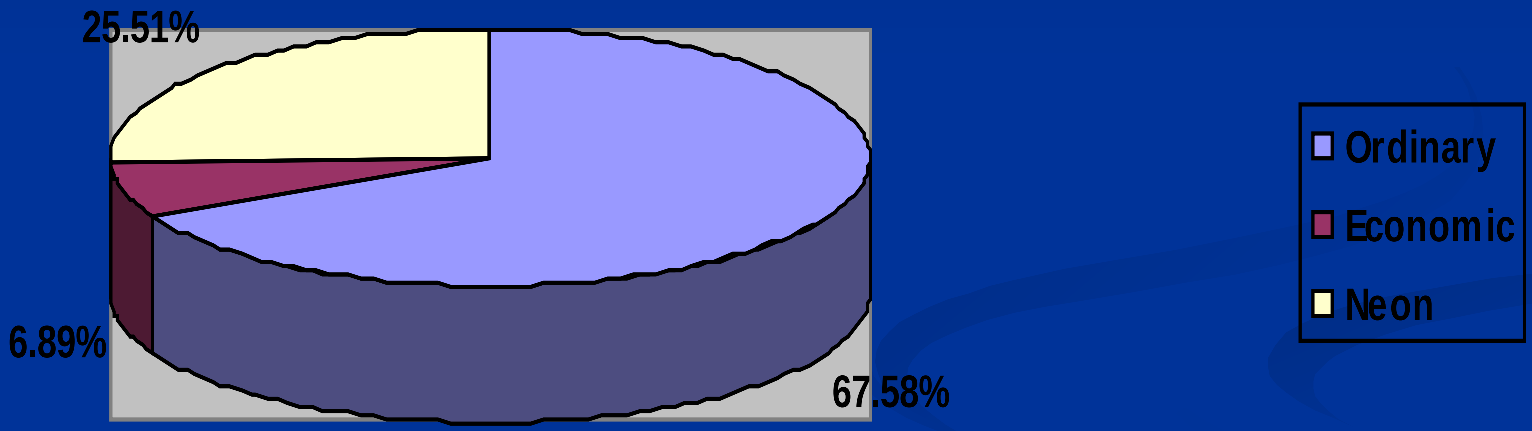
Picture 9. Usage of class A air-conditioner

- From the sixteenth question regarding the operation of the electrical appliances, such as TV, DVD, Computer… on stand-by, the following data were acquired:



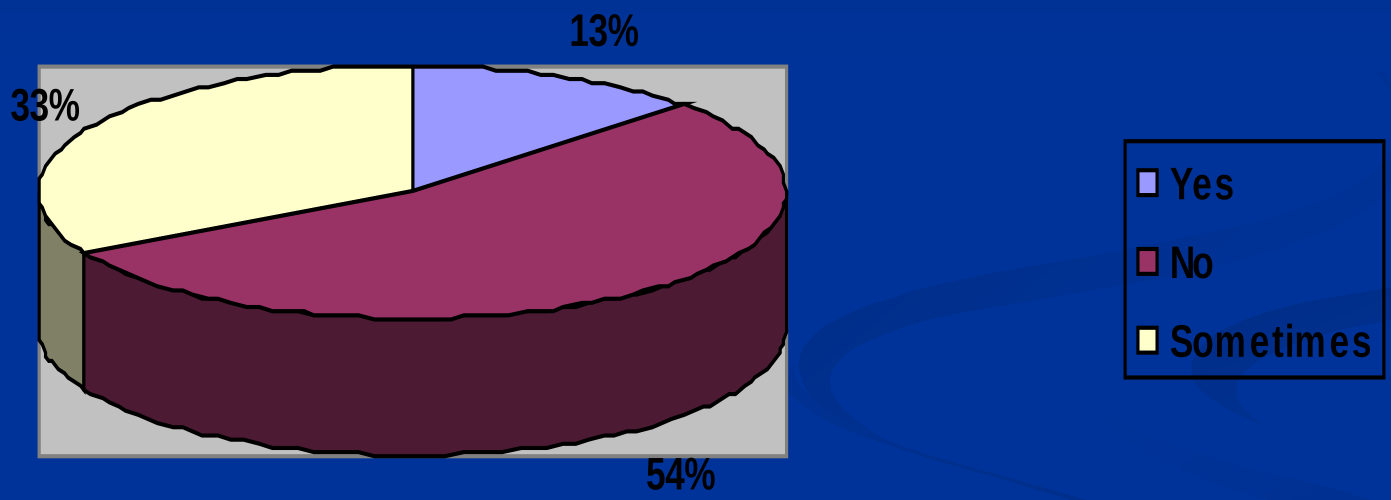
Picture 10. Operation of electrical appliances on stand-by

- From the seventeenth question regarding the type of bulbs that are used, the following data were acquired:



Picture 11. Type of bulbs used in the home

- From the eighteenth question regarding the operation of the lights in the premises not used, the following results were acquired:



Picture 12. The lights are on in the unattended premises

- From the nineteenth question regarding the six-month average price of the bill for electricity in the winter and summer periods of the year, the following data were acquired: the six-month average price of the bill for electricity in the winter part of year varies from 1.000 to 16.000 denars, and the six-month average value of the price of the bill for electricity in the summer part of year varies from 500 to 4.800 denars.

Respondents comments

At the end of the inquiry, in the part for remarks, 12.72% of the respondents gave their comments and expressed their opinions:

- There is a central heating system in the home, but the city of Tetovo does not have central heating, so that it does not function.
- We should use solar energy and we will do that in near future.
- Expensive power for our wages.
- The questions are related to ecology and global worming.
- Interesting topic. This questionnaire made me consider how I can save electricity.
- In future I will use natural gas
- Energy should be saved.

Conclusion

- The food preparation on gas is more economical, saving electricity in the same time.
- The usage of wood as a heating resource is a good choice, as long as the wood is bought from the forest companies entitled of chopping wood.
- The central heating system is a good choice, because the room temperature is even in all rooms and can be regulated.
- The solar system is a good choice, because it uses a renewable source of energy. The weather conditions in the Republic of Macedonia are suitable for the usage of such systems.
- The homes that are not thermally isolated to undergo this process, from the internal or external side, because in this way energy is saved, both in summer and winter.
- The usage of PVC windows and external doors is a very good decision, because much more energy is saved in comparison to wooden windows.

- More information to the population about class A electric appliances by the manufacturers and resellers.
- Using class A electrical appliances is a good choice. Because they save electricity.
- Usage of class A air-conditioners.
- Not to leave electrical appliances switched to stand-by in order to save energy.
- Usage of neon and economic bulbs, because they save electricity.
- Turning off the lights in the unattended premises.
- The usage of all previous recommendation, the price of the bill for electricity is expected to drop.