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Climate Change and the Kyoto Protocol

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Outline of Presentation

- The global challenge of Climate Change and
- the international response: the UNFCCC and The Kyoto Protocol
- Flexibility Mechanisms
- Carbon market and market participants
- CDM Project cycle and transaction costs
- Key Terms: Baseline and Additionality
- UNIDO work in CDM and JI



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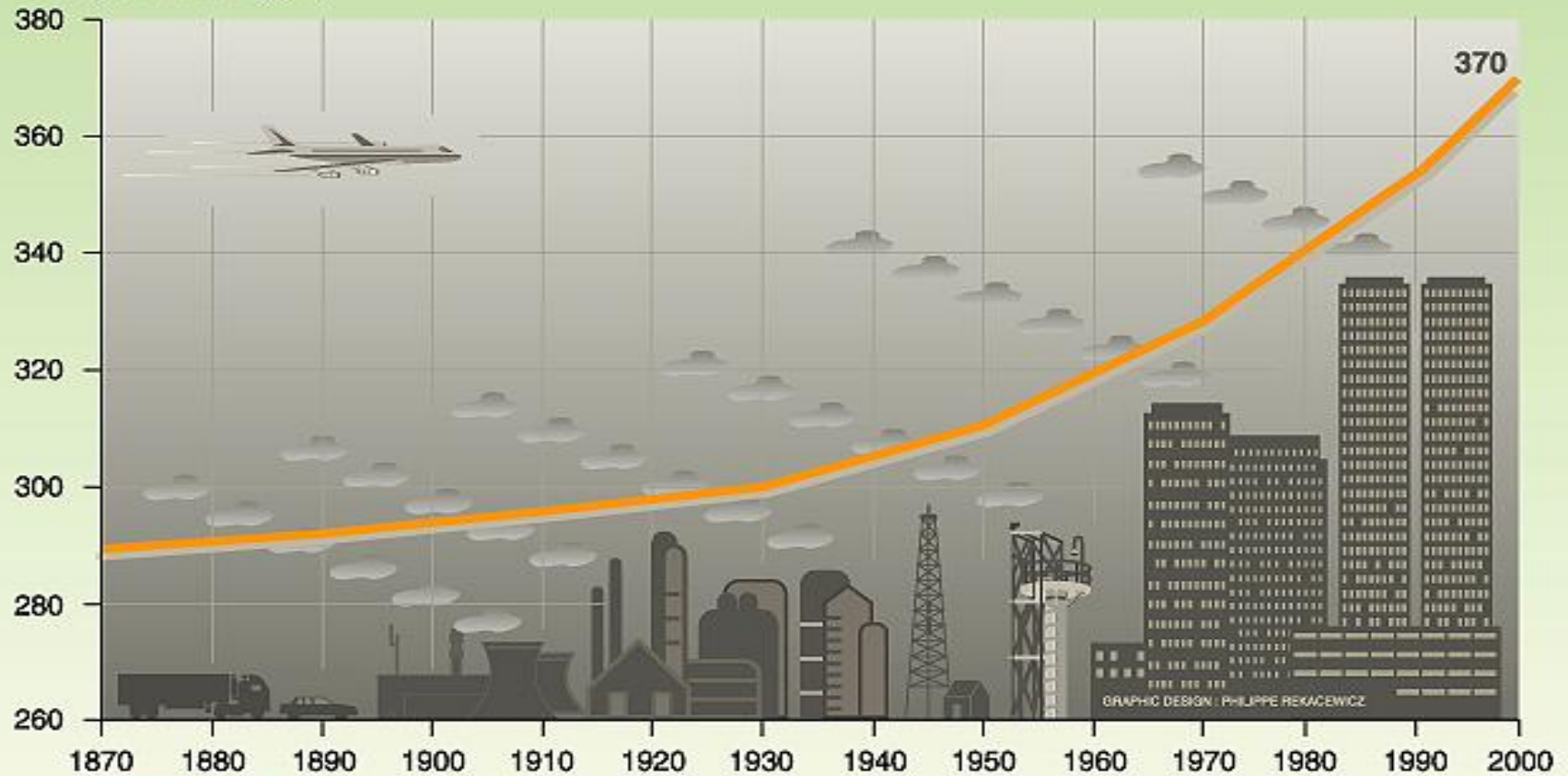
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Global Climate Challenge and Evolution of Response



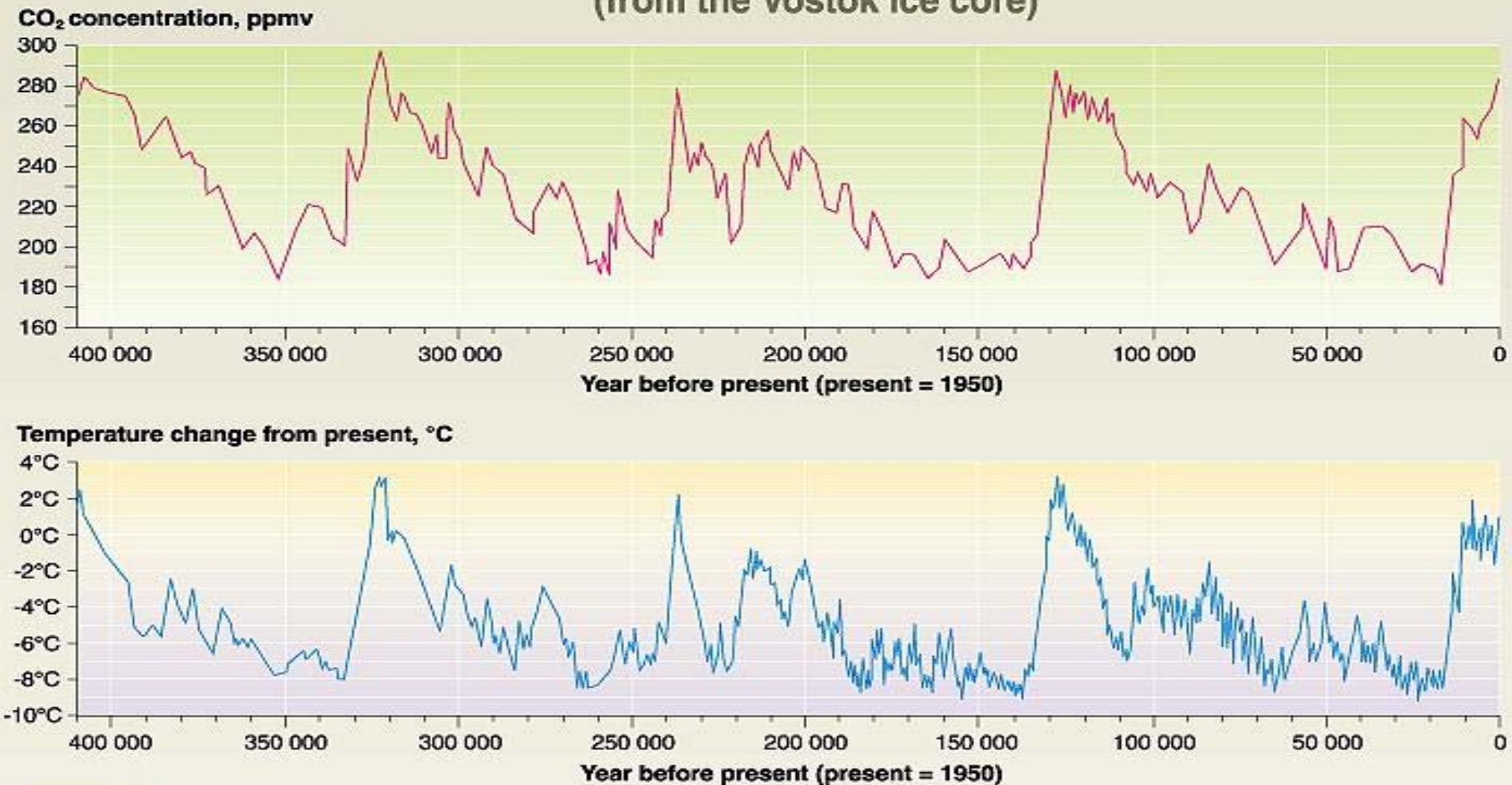
Global atmospheric concentration of CO₂

Parts per million (ppm)



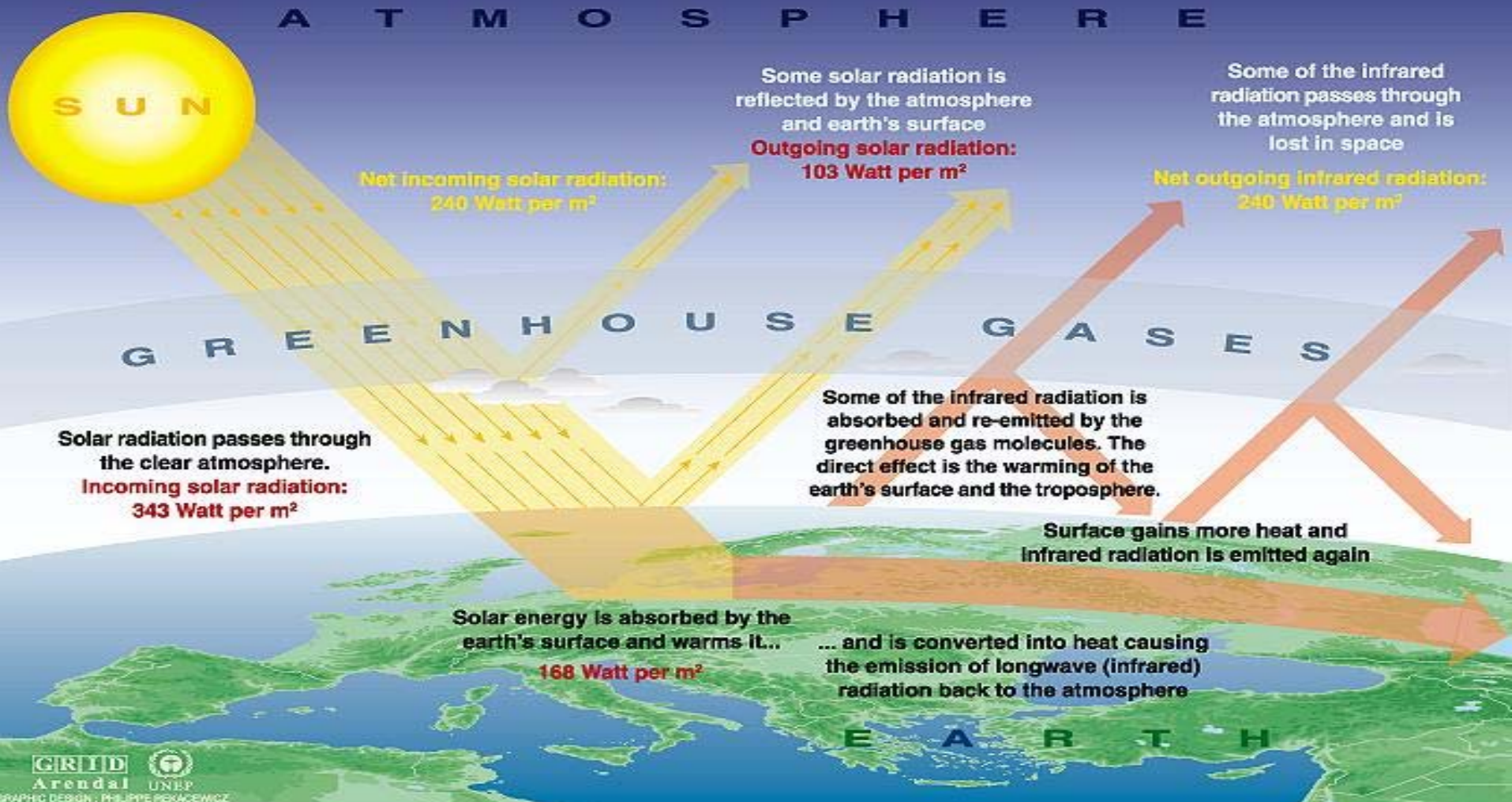


Temperature and CO₂ concentration in the atmosphere over the past 400 000 years (from the Vostok ice core)





The Greenhouse effect





our world and climate change

Climate Change

Since about 1750, atmospheric concentrations of carbon dioxide have increased by 30%, methane by 145% and nitrous oxide by 15%. During the last 100 years the average temperature of the earth's surface has increased by between 0.3 and 0.6 °C. Many scientists believe that carbon dioxide from the burning of fossil fuels for things such as power generation and transportation may be partially responsible for these increases.

Electricity generation

The amount of energy used to generate electricity has doubled since 1970 and electricity demand continues to grow rapidly. Fossil fuels are used to generate most of this electricity. As a result, the electricity sector accounts for about 30% of global carbon dioxide emissions from fossil fuel use.

Transportation

Vehicles account for around 20% of global carbon dioxide emissions from fossil fuel use. Cars are the biggest contributors to these carbon dioxide emissions. Actions to reduce greenhouse gas emissions from the transport sector can simultaneously alleviate other problems such as local air pollution.

Industry

When industrial uses of electricity are included industry is responsible for 47% of global carbon dioxide emissions. Countries differ in their existing and predicted industrial energy use. Developed countries' industrial emissions are expected to remain relatively constant, while in developing countries emissions will rise as their economies grow. The treatment of rubbish and other waste also results in emissions.

Buildings

Buildings use electricity and fuel for heat, light and power. Measures to improve building design such as insulation and efficient lighting and appliances could significantly improve the energy efficiency of buildings. Disposal and treatment of domestic waste also produce methane and carbon dioxide emissions.

Agriculture

Agriculture is responsible for about 20% of human-related greenhouse gas emissions, emitting about 50% of our methane and 70% of our nitrous oxide. Across the world, rice paddies and ruminant animals emit large quantities of methane. Fertiliser use increases nitrous oxide emissions.

Forests

Forests and plants take up carbon dioxide from the atmosphere and use it to grow. They also release carbon dioxide through respiration and decomposition. The extent of emissions resulting from deforestation is uncertain, but it is estimated that between 600 million and 2.6 billion tonnes of carbon are released every year. As much as 60-90 billion tonnes of carbon could be absorbed and stored over the next 50 years, if measures were taken to conserve and plant forests.

Oceans

Oceans influence global climate: they affect weather patterns and also naturally emit and absorb carbon dioxide on a large scale. The average sea level may have risen by 10 to 25 centimetres over the past 100 years. This is due to incoming freshwater from melting glaciers and ice and because water expands as it warms up.





Global Challenge of Climate Change

- The challenge is not just to understand climate change: it is to find a response to address both **adaptation** and **mitigation** of climate change, and:
- To find a viable solution for the so-called called “industrialization dilemma.”



Global Response

- The international response to climate change began in 1992 with the adoption of the UNFCCC;
- In 1997, the Kyoto Protocol marked the first steps towards concerted global action on climate change (Annex I Parties agreed to reduce their overall emissions of GHGs by 5.2 % during 2008-2012).



The main greenhouse gases

Greenhouse gases	Chemical formula	Pre-Industrial concentration	Concentration in 1994	Atmospheric lifetime (years)***	Anthropogenic sources	Global warming potential (GWP)*
Carbon-dioxide	CO ₂	278 000 ppbv	358 000 ppbv	Variable	Fossil fuel combustion Land use conversion Cement production	1
Methane	CH ₄	700 ppbv	1721 ppbv	12,2 +/- 3	Fossil fuels Rice paddies Waste dumps Livestock	21 **
Nitrous oxide	N ₂ O	275 ppbv	311 ppbv	120	Fertilizer industrial processes combustion	310
CFC-12	CCl ₂ F ₂	0	0,503 ppbv	102	Liquid coolants. Foams	6200-7100 ****
HCFC-22	CHClF ₂	0	0,105 ppbv	12,1	Liquid coolants	1300-1400 ****
Perfluoromethane	CF ₄	0	0,070 ppbv	50 000	Production of aluminium	6 500
Sulphur hexa-fluoride	SF ₆	0	0,032 ppbv	3 200	Dielectric fluid	23 900

Note : pptv= 1 part per trillion by volume; ppbv= 1 part per billion by volume, ppm v= 1 part per million by volume

* GWP for 100 year time horizon. ** Includes indirect effects of tropospheric ozone production and stratospheric water vapour production. *** On page 15 of the IPCC SAR. No single lifetime for CO₂ can be defined because of the different rates of uptake by different sink processes. **** Net global warming potential (i.e., including the indirect effect due to ozone depletion).



International Climate Process From Rio to Marrakechsh...and finally..Montreal!

- The international political response to CC began with the adoption of the UNFCCC in 1992;
- In 1995 – ad hoc group was established to renegotiate “inadequate commitments”, the so called “*Berlin Mandate*”;
- Following that, as a result of intense negotiations at COP3 the Kyoto Protocol is agreed upon in 1997;
- COP 4 1998– “*Buenos Aires Plan of Action*” – setting deadline for the establishing rules of the Mechanisms;
- COP 6 2000 – in The Hague – no agreement; COP6 part II –2001 “*Bonn Agreement*”
- COP7 2001– “*Marrakech Accords*” (rules on CDM were adopted);
- COP8 2002 – “Delhi Declaration on CC and SD” emphasis on poverty;
- COP9 2003– Milan – agreement on A/R projects for the first commitment period 2008-2012
- COP10 2004 – Buenos Aires;
- Ratification of Kyoto Protocol – February 2005
- COP11/MOP1 2005 – Montreal



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The Flexibility Mechanisms of the Kyoto Protocol



Flexibility Mechanisms

To meet emission reductions commitments, in the most cost-effective manner the Protocol contains provisions allowing Annex I countries some *flexibility* to meet their obligations through emission reductions which occur elsewhere.

Article 17. Emissions Trading.

Article 6. Joint Implementation (JI).

Article 12. The Clean Development Mechanism (CDM)



Project-based mechanisms: CDM and JI

- The CDM and JI are the two so-called **project – based “flexibility mechanisms”** of the KP designed to allow its parties flexibility in achieving quantified emission reduction commitments. Under this mechanisms projects that reduce emissions or remove CO₂ from the atmosphere generate emission certificates: *Certified Emission Reductions (CERs)* in the case of CDM and *Emission Reduction Units (ERUs)* in the case of JI;
- The main idea of CDM and JI - *reduce* GHG emissions in one country to permit an *equivalent* quantity of GHG emissions in another country, taking advantage of the difference in MC of mitigation



Dual Purpose of CDM/JI

- To assist host countries with **sustainable development** through the **transfer of cleaner technology** and **financial resources** for specific projects, *while at the same time* contributing to the objectives of the Climate Convention by lowering emissions of greenhouse gases.

Top- three rating for host countries (CDM and JI)(Source: PointCarbon):

CDM host country rating

1. India
2. China
3. Brazil

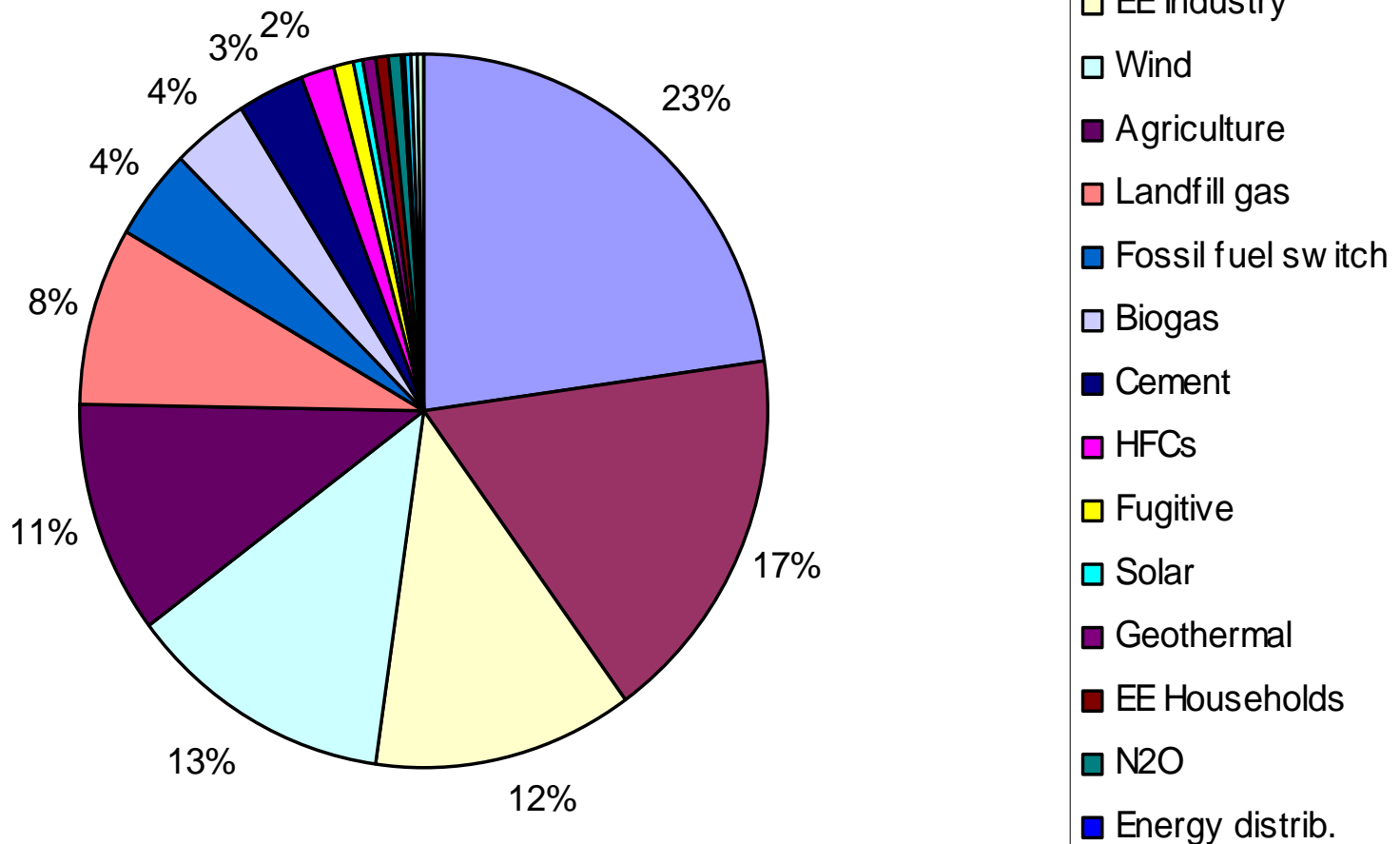
JI host country rating

1. Romania
2. Bulgaria
3. Poland



Sectoral distribution of CDM projects (Source: UNEP)

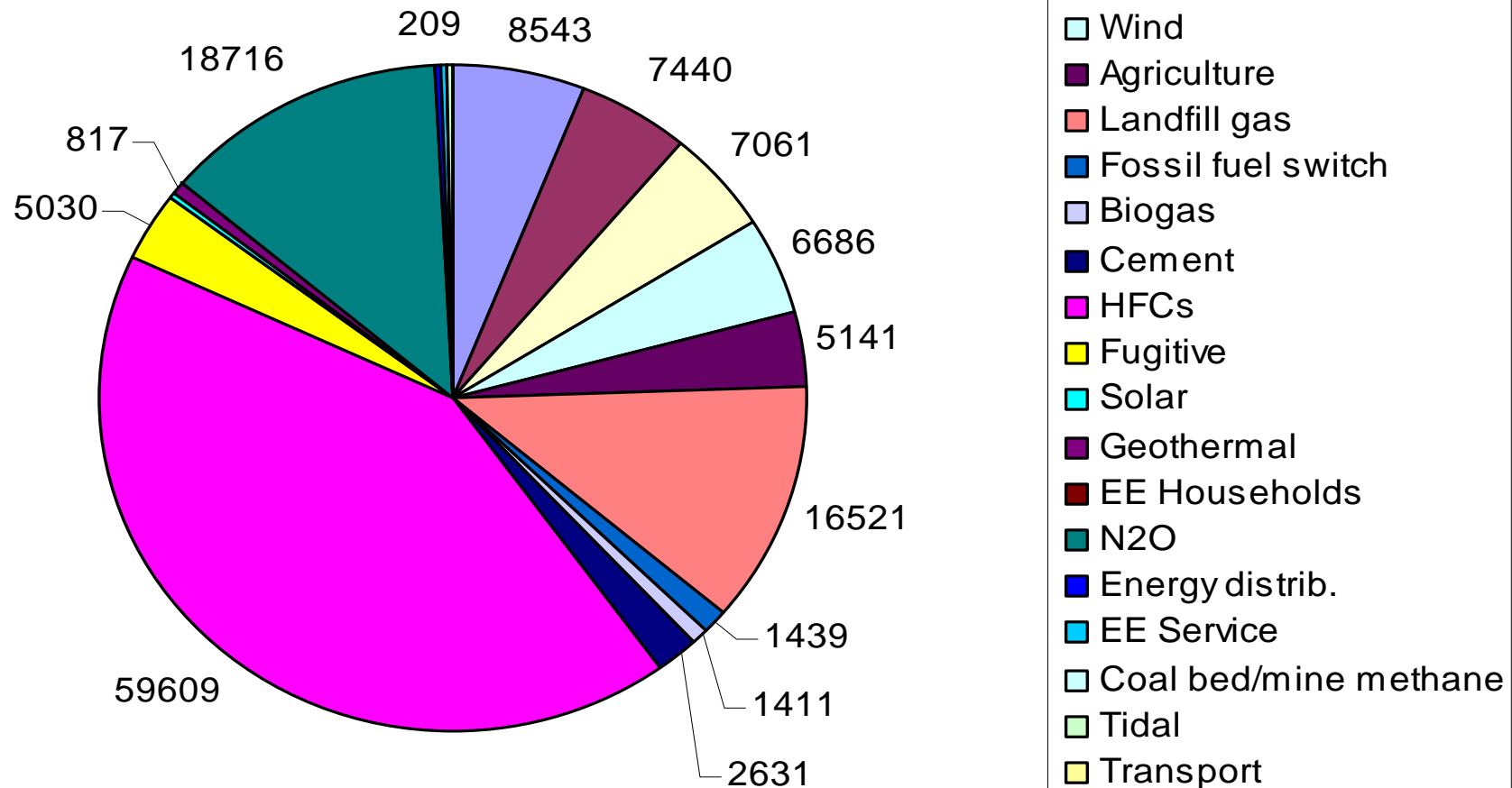
Number (%) of CDM projects in each sector





CERs by sector

Annual CERs from CDM projects in each sector





JI/CDM Financing Models

Three Options:

- Bilateral: Arrangements made directly between investors and hosts.
- Multilateral: Investments flow through a centrally managed fund (World Bank PCF, IFC carbon facility).
- Unilateral: Project development, financing and implementation by host country



Emissions Trading (ET)

- ❑ Emissions Trading is the third flexibility mechanism of the KP. Under the Protocol, ET will involve the development of an international trading system where each country with commitment to reduce GHG emissions will be allocated **AAUs** based on the total amount of emissions allowed under the Protocol. **EU ETS** has become operational on 1 January, 2005, covering 12, 000 installations in 6 major industrial sectors. Article 11 of the trading directive establishes a link between CDM and JI on one side and the EU Allowances trading on the other (**the Linking Directive**).



EU Emissions Trading Scheme

- EU member state governments must set an emissions cap for emission sources (12,000) covered by the Scheme;
- Each emission source then allocated allowances;
- Amount of tradable allowances allocated to each installation set down in a National Allocation Plan (submitted to EC in March 2004).
- To be linked to JI/CDM (could reduce compliance costs 20%)



Credits, Allowances, Reductions

Under a regulatory environment (e.g. cap-and-trade) where a country emissions have been “capped” an *allowance* (e.g. *EU Allowances*) is a unit of emissions which has been assigned to an emitter by a regulatory authority;

Assigned Amount Units (AAU) is a KP term for total emissions of CO₂e which each country with commitment to reduce GHG emissions can emit over a commitment period.



Credits, Allowances, Reductions (Cont'd)

Certified Emissions Reduction (CER) is a reduction produced by CDM project that has been certified by the CDM Executive Committee. CERs are subject to 2 per cent levy for the cost of *adaptation*.

Emission Reduction Unit (ERU) is an emission reduction produced by a JI project and carries with it certification;

Verified Emissions Reductions (VERs) this is usually used to indicate a reduction which is a non-compliance instrument, but carries with in a certification;



Credits, Allowances, Reductions (Cont'd)

The units of the these instruments usually in one of three forms: Metric tons of CO₂ (tCO₂), Metric tons of CO₂ equivalent (tCO₂e) and Metric tons of Carbon (MtC).

To covert CO₂ emissions to tons of carbon, use the molecular-weight ration of carbon C to CO₂, which is (12C/44CO₂).



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Carbon Market



Carbon Market Characteristics

Segmented market:

Mandatory Emissions Trading: EU ETS, UK ETS, NSW/Australia

Kyoto Markets – CDM, JI, AAU

Voluntary emissions trading: CCX/USA (private and voluntary market for trades between firms)

Retail Schemes – product differentiation

Carbon market is a policy-driven market



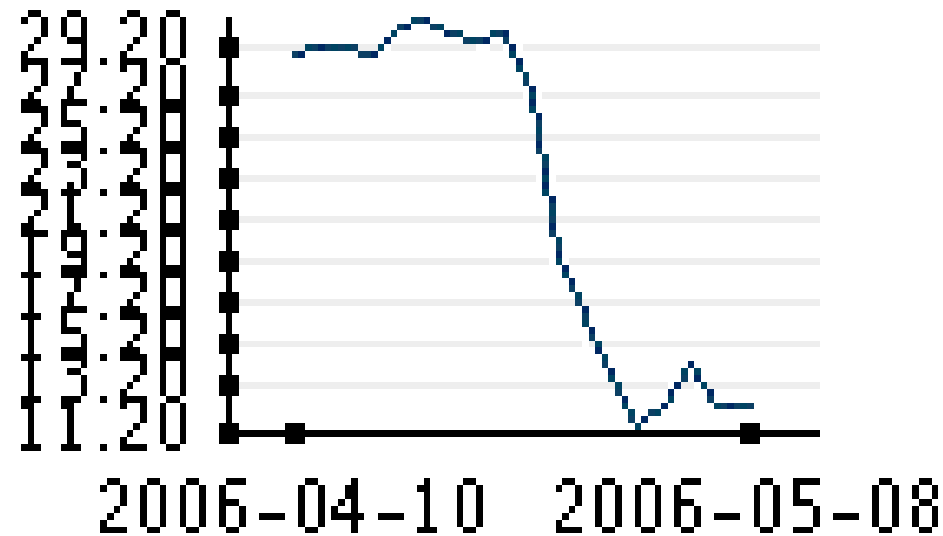
CDM/JI price trends and drivers

Prices differ a lot from contract to contract, mainly based on the distribution of risk between buyer and seller

Price category	Price range (Euro/t Co2e)	Description
1	3-6	Non-firm volume: Buyer buys what seller delivers even if emission reductions turn out not to quality as CERs
2	5-10	Non-firm volume: Contract contains preconditions, e.g. that the underlying project qualifies for the CDM
3	9-14	Firm volume. Contract contains preconditions, usually strong <i>force majeure</i> clauses and high credit rating requirements
3	12-14	Firm volume. No preconditions. Forward spot trades will in future fit this category. Currently only JSE's Carbon Credit Notes fit under this category



EUA price last 30 days





Carbon Funds

Multilateral and bilateral institutions

World Bank's Prototype Carbon Fund:

US\$145 million, increased to US\$180m

Dutch ERUPT and CERPT \$250 mil (Senter and Rabo Bank)

EBRD/Fondelec US\$70 million

Austrian Carbon Fund: €288 million over 10 years (2003-2012)

Japan Carbon Fund

Canada: 10 million tonnes minimum per year

Danish: US\$10 million

Finland: Pilot phase, small scale CDM, 1 to 1.4 million tonnes, prices €2.5 – 6.00

KfW Bankengruppe: €10 million

Community Development Carbon Fund (CDCF), Italy \$7.7m, Canada \$2.5.

Small scale CDM, least developed countries and poorest communities



Austria Government - Example of a GHG Buyer

Direct purchase of ERUs/CERS from JI/CDM projects

Budget: EURO 288 Mil.

Strategy: Direct purchase + Investment in Carbon Funds and Facilities

Funding for development costs: 50 per cent or Euro 40,000

Pipeline: 110 projects, ERPA finalized – 15 projects



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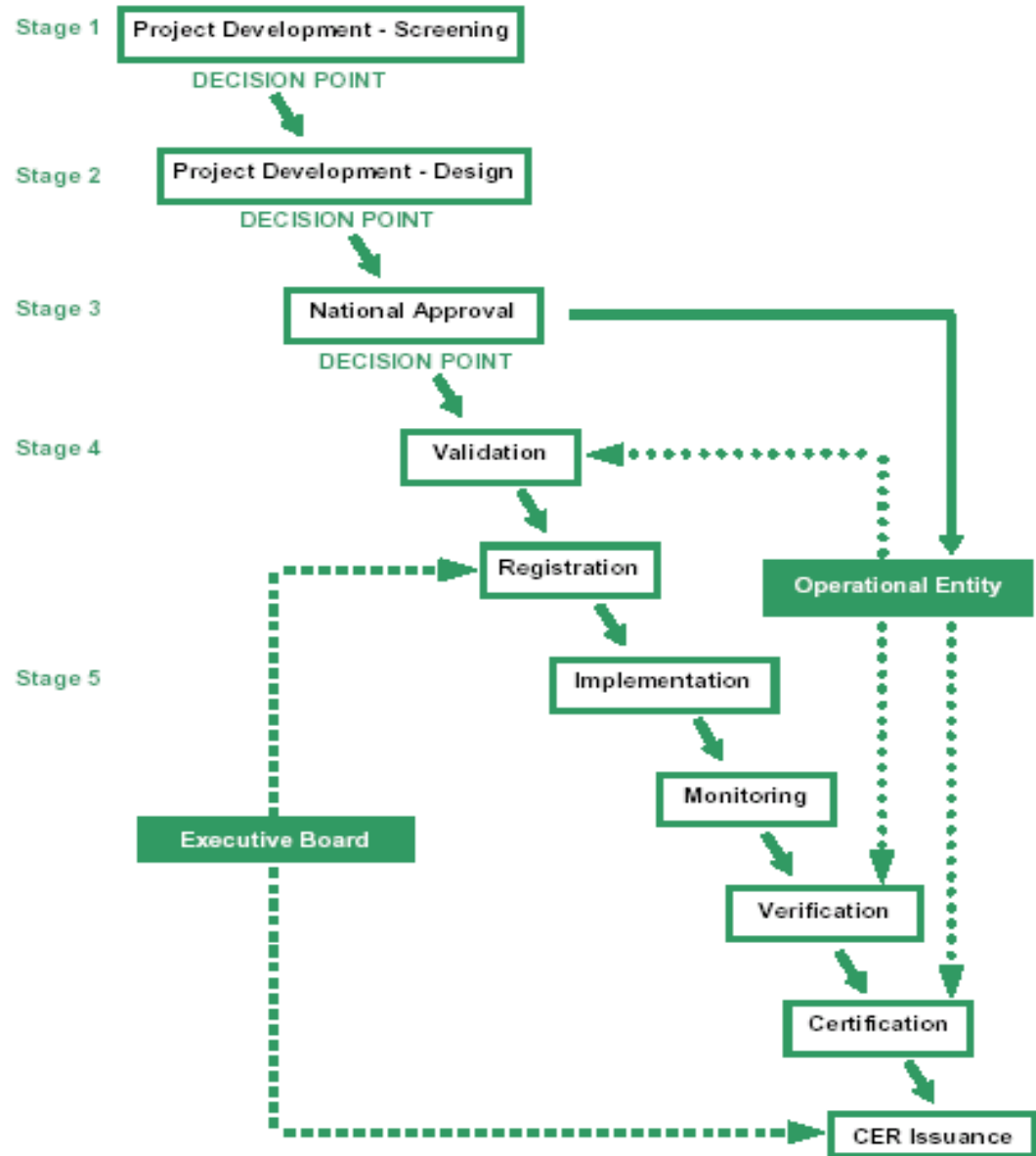


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Project Cycle Transaction Costs of Project Development



Step-by Step: *The CDM Project Cycle*





What are the Criteria for CDM Projects?

Sustainable development

Host country criteria

Environmental Impact Assessment

Stakeholder consultations

Emission reductions

Real, measurable, long-term...(Kyoto Criteria)

Project viability

Technologically proven

Financially sound

Host country approval

Project validation and registration

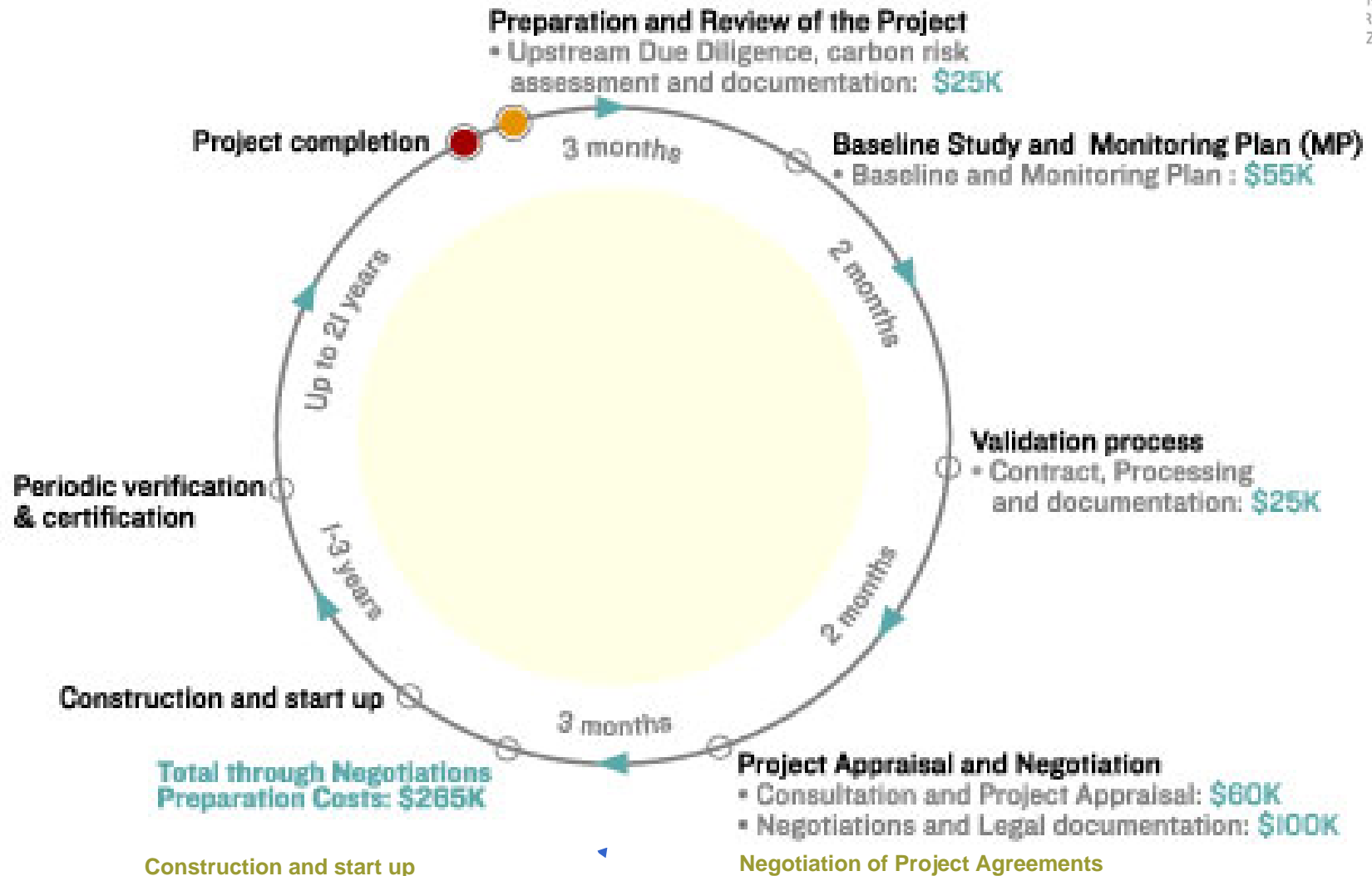


Carbon Asset Generation

Source: Prototype Carbon Fund (IBRD)

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EB project registration fee

Average tonnes of CO2 equivalent reductions per year over the crediting period (estimated/approved)	US\$ (*)
$\leq 15,000$	5,000
$> 15,000$ and $\leq 50,000$	10,000
$> 50,000$ and $\leq 100,000$	15,000
$> 100,000$ and $\leq 200,000$	20,000
$> 200,000$	30,000



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CDM/JI: Key Terms and Concepts



CDM Key terms: Baseline

A projected level of future emissions against which reductions by project activities could be determined. The baseline shows greenhouse gas emissions or sink enhancement that would have occurred in the absence of the project activity.

Determination of emission reduction benefit:

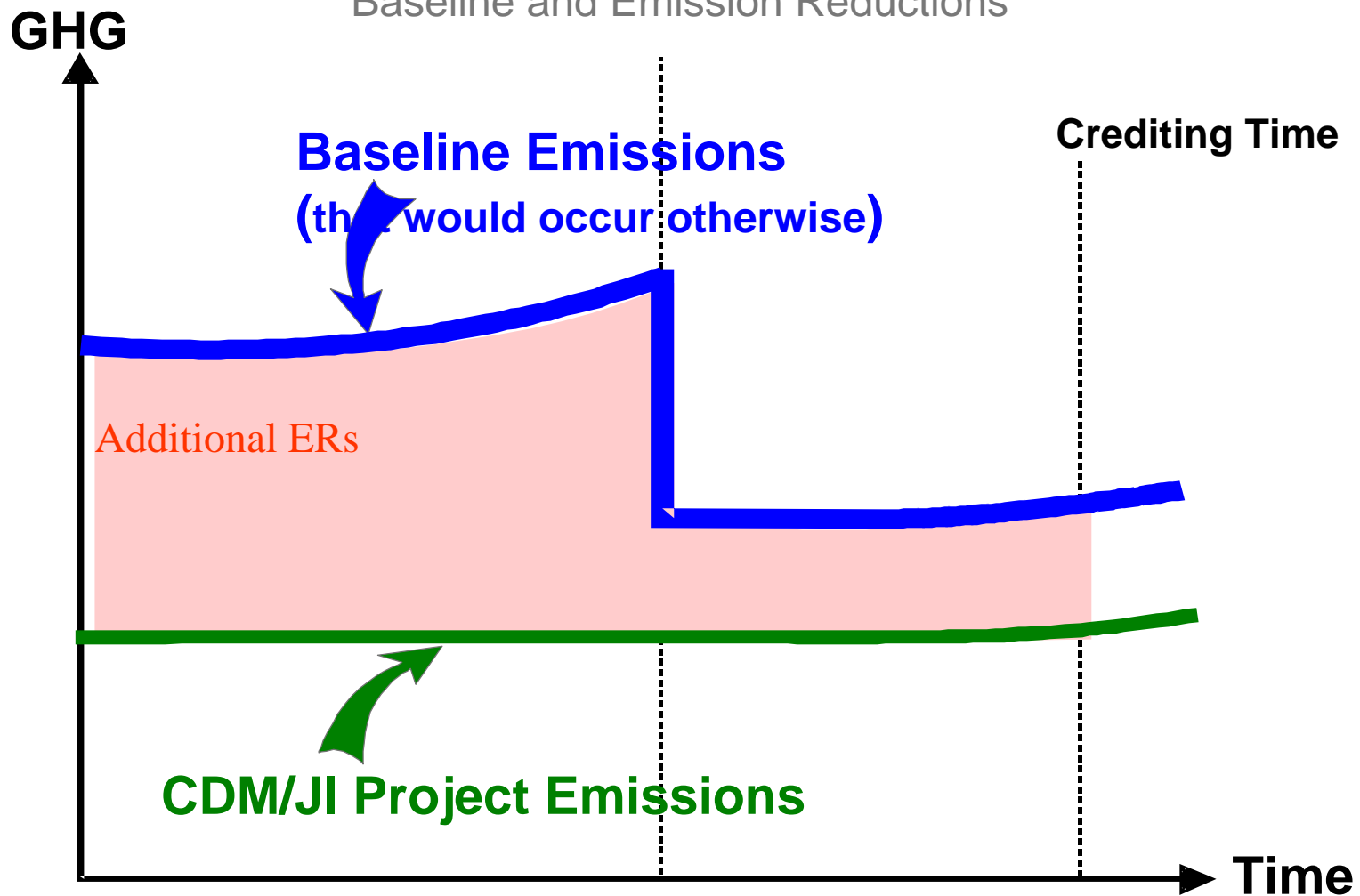
Baseline emissions (counterfactual) - Project emissions (measurable)

= Emission reductions (to be verified)





The Concepts of Baseline and Emission Reductions





Key term: **Additionality**

Additionality is set out in the KP as a project condition for both CDM and JI, stating that projects should result in “reduction in emissions that are additional to any that would otherwise occur”.



- Delivers possible baseline scenarios (including the proposed project)
- Comparison of options (incl. the proposed project) to determine the additionality of a proposed project against all alternative scenarios



Steps of selection of project baseline: Executive Board (EB) Additionality Tool

The tool uses several sequential tests:

- Legal requirements;
- Investment analysis,
- Barrier test;
- Common practices test, and:
- CDM impact test



Joint Implementation (JI)

- **JI** allows for the transfer and acquisition of emission reductions units (ERUs) resulting from activities that reduce anthropogenic GHG at source or enhance their sink removal.
- **JI** promotes investment by Annex I (industrial countries) in other Annex I countries.
- The investor country or a private entity is then able to use **ERs** from projects towards their own commitments under the KP



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UNIDO work in CDM/JI



UNIDO's Competitive Advantage

- Unique mix of programme areas, experience & capacity
- Industry is a key mitigation sector
- Technical agency
 - 40 years providing technical assistance to industry relevant for CC mitigation
 - The sectors for CC: energy; industry & solvents; transport; agriculture; waste
 - Networks and tools: NCPC, ITPOs, COMFAR
 - Projects & global forum



An Approach for UNIDO?

Partnerships w. business & industry

- ✓ One or more host countries
- ✓ A donor / buyer country

Capacity built in CDM project formulation

- ✓ Identifying specific needs
- ✓ Developing training / CB package
- ✓ Delivering LBD programme

Portfolio development

- ✓ Determine needs / requirements of host DNA
- ✓ Find out country priorities for CDM
- ✓ Develop relevant / acceptable portfolio
- ✓ Matchmaking



UNIDO strategy

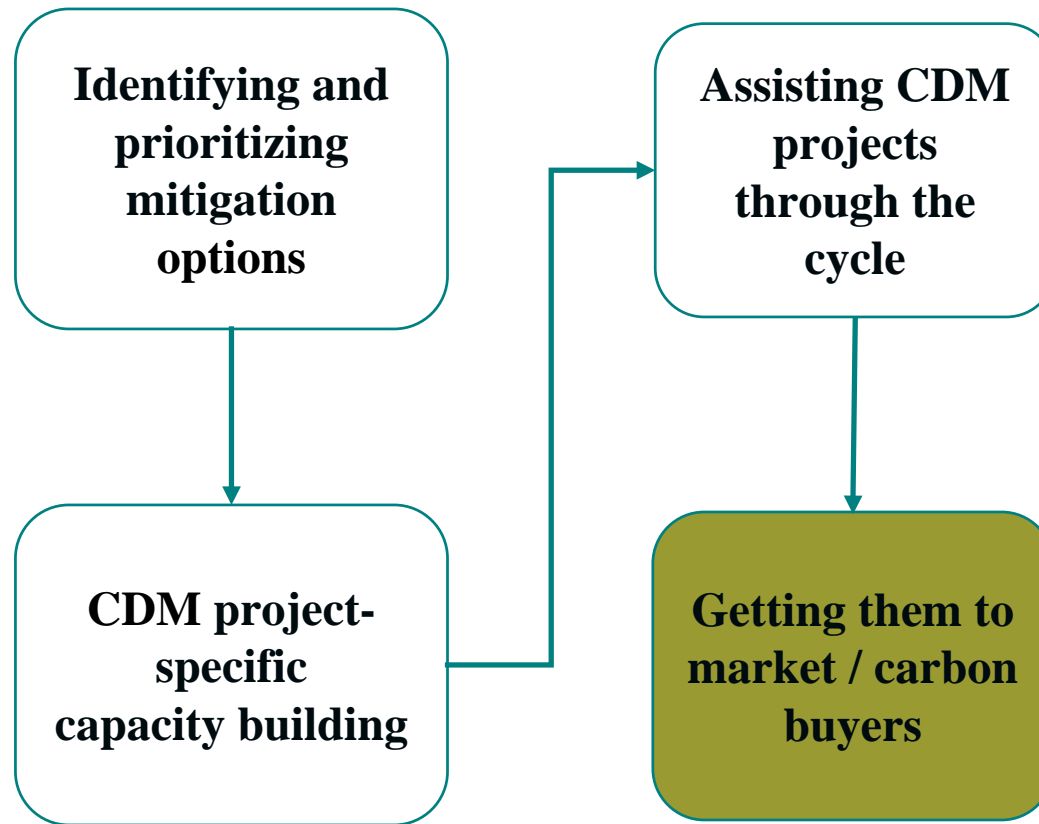
Working with buyers: project identification and development. Control of transaction costs associated with host government approval;

Working with sellers: (developing countries and economies in transition), capacity building through learning by doing; needs assessment, development of national project portfolios;

Development of *business models* to enable projects in industry to capture additional revenues from the sale of credits into carbon market.



The concept of UNIDO TA project in Climate Change/KP





Common groups of needs

Awareness raising

- Information

Capacity building

- Legislation / regulations & investment framework

- Identification of CDM opportunities / audits

- Contract negotiations/Carbon market knowledge

- Tools

CDM portfolio work

- Partnership building with potential buyer

- Baseline analysis

- Technology selection

- CDM project cycle



EEC Unit

CDM assessments/portfolio-building

- 8 African countries (1998-2002) & 9 PINs
- PINs portfolio of South Africa (23 projects) and Brazil (53 projects) (2002-2003)
- 5 ASEAN countries (2002)
- 11 Francophone Africa countries (2006) – 19 PINs;
- PINs/PDDs development for Vietnam, South Africa and Mexico (in progress)

Global Forum

EGMs & workshops on CDM, EE, technology transfer, EU ETS

(for details on on-going projects and global forum activities see **Annex** to this presentation <http://www.unido.org/doc/18258>)



However!

- ❖ Not much ODA/donor financing available for general CDM capacity building & no Kyoto or CDM fund so...
 - Follow the money & the trail leads to the carbon market (Euro 9.4 billion !)
- In a few (but increasing number of) cases some CB and/or advance funds can be obtained related to CDM project development
 - Example: the Austria-UNIDO pilot project



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