

Liquid Biofuels EECCA

Conference on Cleaner Fuels and Vehicles for Eastern Europe,
Caucasus and Central Asia (EECCA)

Georgia, Tbilisi - 24-25 January 2008

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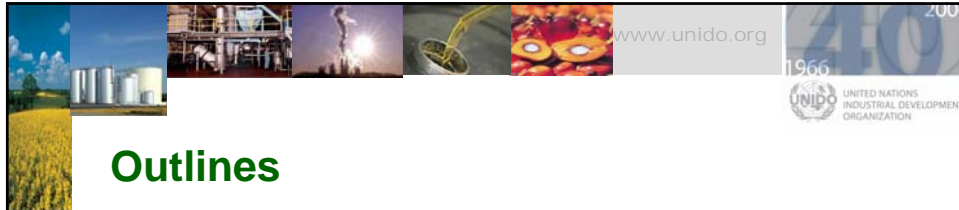
Urban Air Pollution

- ❑ The PCFV aims to reduce air pollution resulting from motor vehicle
- ❑ In EU countries efforts done resulted in controlling the level of several pollutants, except CO₂
- ❑ Transport sector is responsible for ~25% of CO₂ emissions
- ❑ Biofuels have the potential to contribute to reducing CO₂ from transport

Year	CO	Benzene	NOx	Diesel particle	VOC	CO ₂
1995	100	100	100	100	100	100
2000	50	60	80	70	65	100
2005	30	40	55	50	45	100
2010	25	35	45	40	35	100
2015	22	32	42	38	32	100
2020	20	30	40	35	30	100

Source: Emissions from road transport in EU25
Source: Auto II Programme- European Commission

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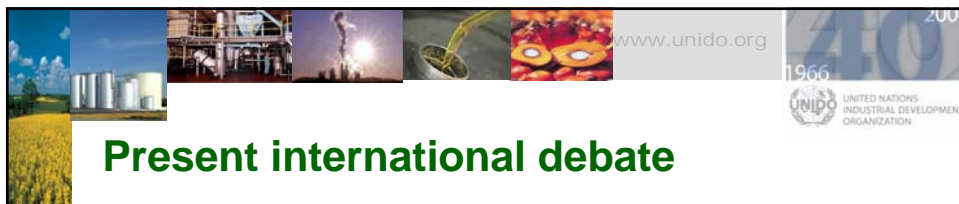
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Outlines

- Present intern. drivers to the use of biofuels
- What is biofuels?
- Which potential benefits?
- What are the concerns?
- Key factors to sustainable production and use of Biofuels in EECCA

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Present international debate

...consider Biofuels as potential solution to

- Increase **security of energy supply** that is being undermined with various **geopolitical conflicts**
- Revitalise **rural** and agriculture sector
- Reduce **CO2** and other emissions from transport sector
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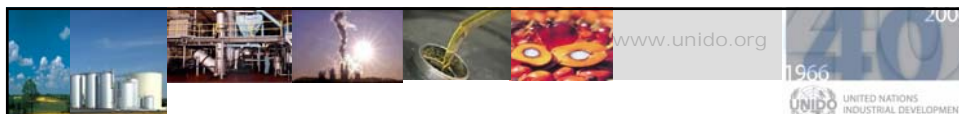
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Present situation on global level

- **Legislations** put in place by EU, USA and other regional institutions, to promote biofuels production and use of biofuels, ⇒ **market demand** is created ⇒ biofuels became now an international **trade commodity**
- This **market** is seen by many countries, having arable land, labours and appropriate climate conditions, as a **developmental opportunity** and by others as investment opportunity
- As a result, concerns and **uncertainties** as to the **sustainability** of the biofuels and potential **negative impacts** on food security, water, land use, biodiversity, social and ethical issues, etc.

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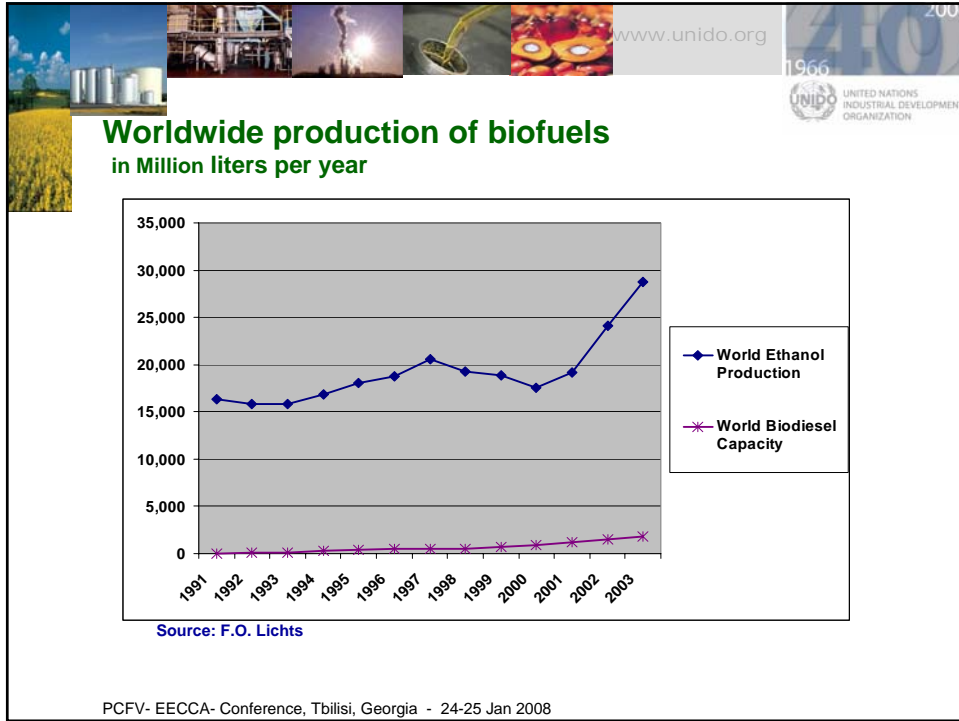
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What is Biofuels?

- Mainly **Bioethanol & biodiesel** is biomass-based transport fuel (also for stationary application-internal comb. Engines)
- It can substitute fossil fuels in vehicles either as **100%** or partially as a **blend**

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Present Situation- Biodiesel

2007 Biodiesel Production Capacity, '000 tons

EU Countries	2007	EECCA	2007
Austria	326	Armenia	n.a.
Belgium	335	Azerbaijan	n.a.
Denmark	90	Belarus	n.a.
Finland*	0	Bulgaria	65
France	780	Cyprus	6
Germany	4,361	Czech Republic	203
Greece	440	Estonia	35
Ireland	6	Georgia	n.a.
Italy	1,366	Hungary	21
Luxemburg	0	Kazakhstan	n.a.
The Netherlands	115	Kyrgyzstan	n.a.
Portugal	246	Latvia	20
Spain	508	Lithuania	42
Sweden	212	Malta	8
UK	657	Moldova	n.a.
		Poland	250
		Romania	81
		Russian Federation	n.a.
		Slovakia	99
		Slovenia	17
		Tajikistan	n.a.
		Turkmenistan	n.a.
		Ukraine	n.a.
		Uzbekistan	n.a.

Source: EBB

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What is Biofuels? - Technologies

- 1st generation biofuels/technologies
 - Biodiesel through **transesterification** of oil seed (rapeseed, soya, sunflower) or used oils and greases
 - Bioethanol through **fermentation** of sugars (beet, s.cane) grains (wheat, corn)

Transesterification

```

    graph TD
      A[Jatropha oil] --> B[Ester interchange  
(Transesterification)  
(+ Catalyst)]
      C[Methanol (approx. 10%)] --> B
      B --> D[Separation]
      D --> E[Clarification]
      D --> F[Clarification]
      E --> G[BIO DIESEL]
      F --> H[Glycerine (approx. 10%)]
      
```

```

    graph TD
      A["Starch/cellulose  
H(C6H10O5)nOH  
162 kg"] -- "+ Enzymes" --> B["Glucose  
n C6H12O6  
180 kg"]
      B --> C["Ethanol  
2n C2H5OH  
92 kg"]
      B --> D["Carbon dioxide  
2n CO2  
88 kg"]
      
```

Source: EUBIA

Mature technologies but the feedstock cost/land available is the problem

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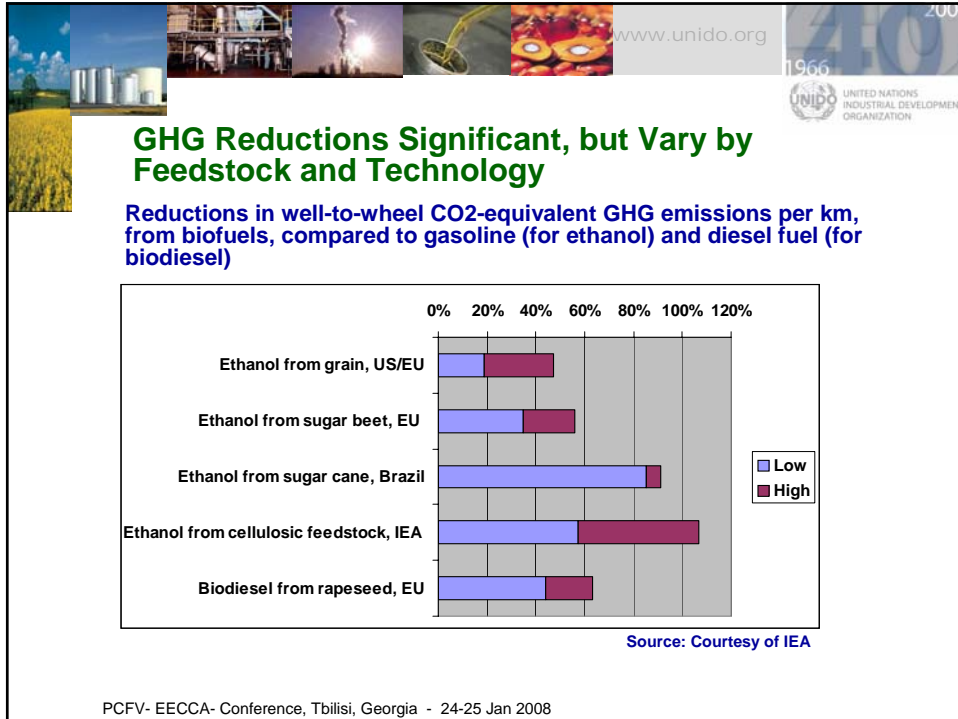
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What is Biofuels? - Technologies

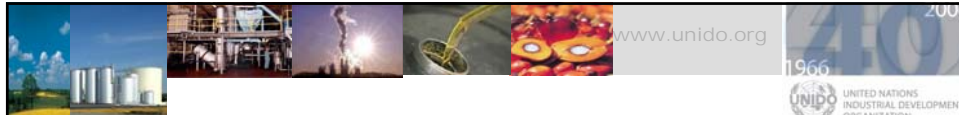
- 2nd generation technologies
 - Synthetic diesel through biomass **gasification** F-t, hydrothermal upgrading, depolymerisation, etc.
 - Bioethanol through **fermentation of cellulosic** materials (wood, grass, agri. Waste)
- 2nd generation are expected to have many advantages over the present ones
 - Using a wider range of feedstock that are more available and less expensive leading to cost competitive biofuels, and lowering the **pressure on land**
 - Lowering the well-to wheels **GHG emissions**

Not yet commercially available

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- Some of Benefits seen in Biofuels:**
- ❑ Employment creation, in agri. & industrial sectors
 - ❑ Conservation of foreign exchange by reducing import quotas and improving country's balance of payments
 - ❑ Biodiesel optimized viscosity and thus, could be used as lubricant, eg, in sulfur free diesel
 - ❑ ...
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Some of Benefits seen in Biofuels:

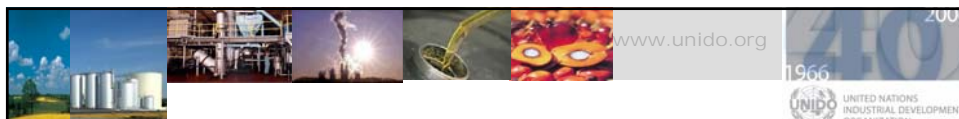
Cleaner air cities

Air pollution in cities: could be reduced significantly, biodiesel results in substantial reductions of:


- unburned hydrocarbons (67%)
- carbon monoxide (47%)
- particulate matter (47%)



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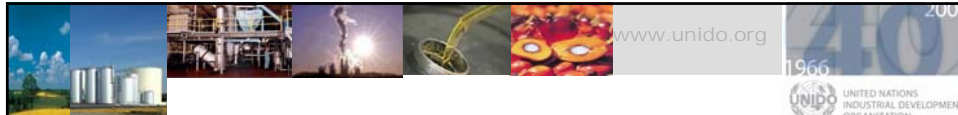
Air pollution:



Graphic source: © University of Hohenheim

- Emissions of NO_x are slightly reduced or increased (10%) depending on the engine and testing methods used.
- However, biodiesel's lack of **sulphur** allows the use of **NO_x control technologies** that cannot be used with conventional diesel (containing sulphur); Therefore, effectively managing NO_x emissions form biodiesel

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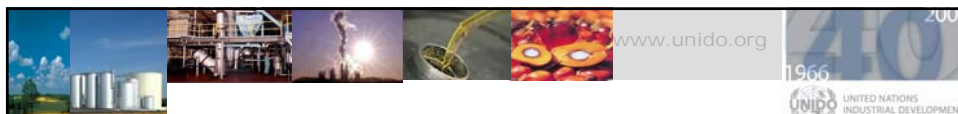
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However...
Risks and uncertainties are voiced regarding

- Competition on **land use**, for food or fuels, and the impact on **food security** and prices
- Competition for **water** resources which is already a in short supply
- Negative impact on **GHG** resulting from changes in uses of reserves zones, such as rain forests
- **Soil erosion** and water **pollution**
- Negative **socio economic** impacts on vulnerable communities
- ...

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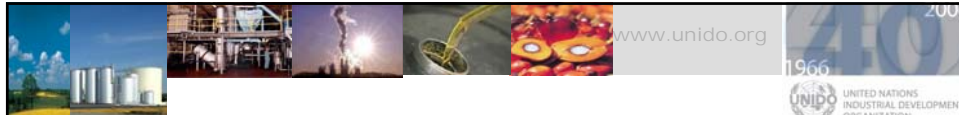
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Risks and uncertainties...

- However, there are also concern about the **economic sustainability** of biofuels production
- E.g., cost of biodiesel from rapeseeds is ~0.52 to 0.65 Euro/l (**before taxes**) depending on plant capacity
- Thus, to compete, it depends on
 - price of fossil fuels,
 - market incentive measures,
 - intern. trade, B99
 - ..

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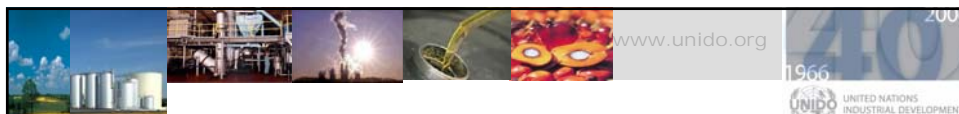
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Risks and uncertainties

- To assure economic viability, obviously, some **int.trade agreements, financial measures and incentive** have to be in place to enable market penetration of biofuels
- In addition, **dissemination of experience** and lessons learned in order to **reduce the production cost** are also needed

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Key factors for a Sustainable Biofuels Production and Use in EECCA

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Ensuring involvement of all stakeholders

From the start, all stakeholders relevant for the production and marketing chain should be involved, have common understanding on their respective complementary roles:

- Ministries in charge of Agric, Environment, Energy, Finance...
- Refineries and fuels distributors
- Fuel quality control
- Farmers' Unions
- Private entrepreneurs & banks
-

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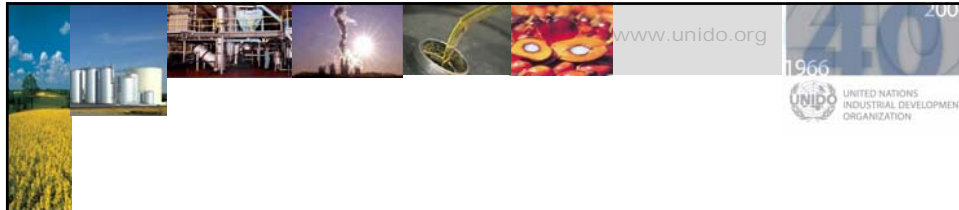
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Policy Framework & Incentive Mechanisms

Needed to be put in place (based on national driver to biofuels):

- In order to identify & set targets
- Enabling market creation by, if needed, tax exemption to be competitive with regular fuels
- De-taxation should be designed to direct the market to the segment decided
- Ensure the financial attractiveness of crop plantations to farmers
- Promote private sector participation
- ...

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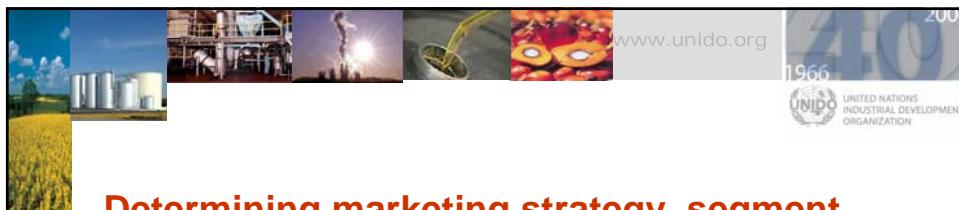
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Feedstock availability, price...

- ❑ Devising a **strategy to ensure availability** & avoid price fluctuations, longer term storage, promoting use of multi-feedstock technology...
- ❑ Breeders, agric, **researchers, extensions** workers, farmers & unions are important stakeholders to ensure **best practice** leading to selection of best varieties & higher yield
- ❑ Encouraging Private enterprises to participate

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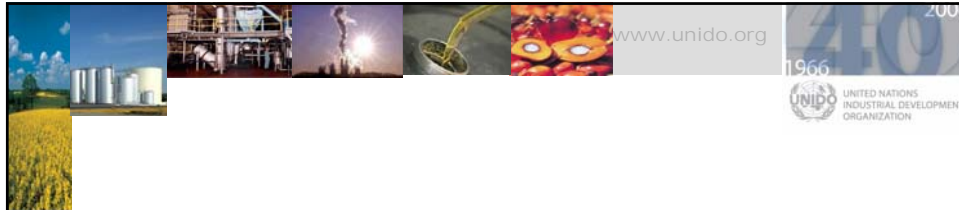
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Determining marketing strategy, segment

- ❑ Determining options:
 - Pure 100% for certain market segment (agr. machinery's or city bus fleet)
 - Blend, eg, 5% of biodiesel, can be used in e in all vehicles without modifications, does not need separated distribution system
- ❑ Which segment?
 - City transport to improve air quality and lessen harmful emissions
 - Lakes & Rivers protection due to fast biodegradability

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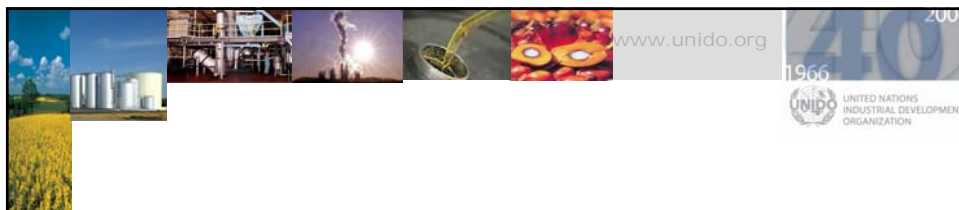
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Process technology & quality control

Select Process with highest & guaranteed quality to the standard

- ❑ Ability to process multi-feedstock to accommodate fluctuation of feedstock price by selecting the least expensive
- ❑ Highest efficiency, eg, 100% conversion of oil (the most expensive input) to biodiesel
- ❑ ...

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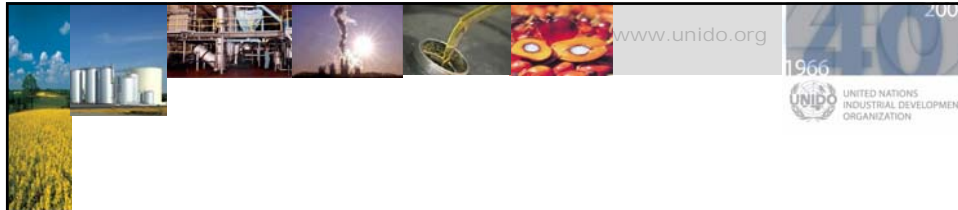
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Plant site selection

- ❑ To lower transportation costs of feedstock & products
-e.g. near water transport facilities for large scale, in vicinity of oil mills, etc.
- ❑ Access to services
- ❑ Local investments laws, taxes, labor market regulations?
- ❑

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Optimum maximum capacity of production within the constraints

Unless small scale for own use

- ❑ The larger the capacity the less the production cost /unit, thus more profitability or less need for incentives
- ❑ The larger the capacity the less the cost associated with quality control
- ❑ From 10-15,000 t/y it is feasible to invest for installation to purify glycerin up to pharmaceutical level, thus extra income, (*however?*)
- ❑ ...

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Possible technical assistance activities that could be provided by UNIDO...

A country-wide biofuels feasibility study profiling the present situation, identifying barriers and providing recommendations based on benchmarking with successful references.

Main components of the study could be:

- **Feedstock:** Supply Analysis to define **available and potential** feedstock volumes from a secure supply, estimate final **size, process technology & location** of the biofuels plant; agricultural **Best practice**, policies and **financial** measures to increase **oilseeds** production/availability and to ensure the biodiversity and socio economic impacts
- Present **Diesel and petrol** fuel market and **Scenarios** for Future Consumption & Potential Biofuels Market Share



Possible technical assistance activities that could be provided by UNIDO...

Main components of the study could be:

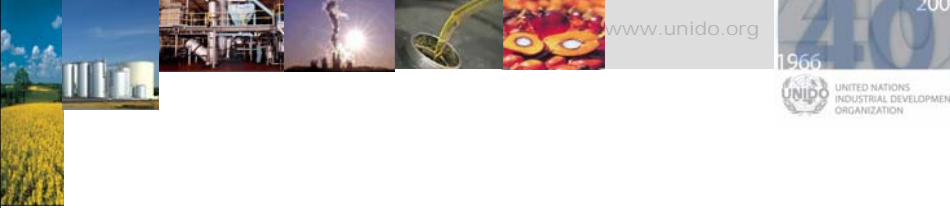
- **Market promotion mechanisms:** based on a **macro economic input-output analysis**, advising on **incentive mechanisms** to allow marketing into well-defined segments
- Reviewing **agricultural** and **energy** sectors present regulation and incentives, if needed, proposing recommendations promoting the development of sustainable **value chain**
- Accordingly, determining the capacity of production, potential stakeholders



Possible technical assistance activities that could be provided by UNIDO...

Main components of the study could be:

- **Advice on Process technology:** multi-feedstock, high yield, quality
- **Markets:** defining the **target markets** and segments; e.g., whether to go for **100% biodiesel** or **5% blend**, potential **distribution partners** and competitors to allow a successful start up of **market penetration**.
- **Linking up** with **Corporate Social Responsibility** matters.



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Thank you for your attention!

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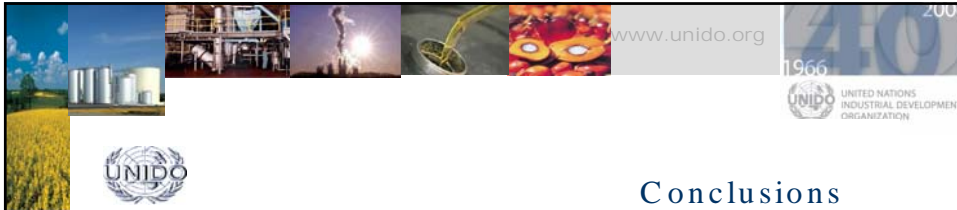
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Among areas of focus considered by UNIDO, on global level, are:

- Identify and streamline appropriate **sustainability standards** and **certification** schemes
- Accelerate **technological advancement** to reduce land/ feedstock needed per unit biofuels produced
- There is certainly a room for improving **agricultural land productivity**
- Share knowledge on **best practice** of industrial optimisation to **reduce production costs** and business vulnerability
- Put in place **appropriate int. trade policies** and **incentive mechanisms** promoting the production and use, with reduced impact on state tax revenue

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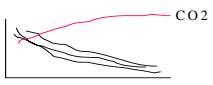
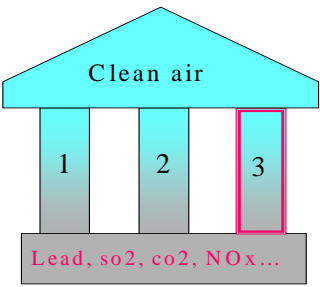
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Conclusions

Three complementary ways to reach the goal of *clean air*:

- 1- Using cleaner fuels & Increasing fuel efficiency
- 2- Technological innovations, less fuel/km; more efficient engine; vehicles with cleaning technologies
- 3- Using fuels with less WtW CO₂ emissions: Biofuels are presently a mature & commercially available option

Clean Fuel and Vehicles in Central & Eastern Europe & Turkey-Szentendre-27-28 October 2005

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