



Southern African Biofuels Association

Bioenergies

Workshop IBSA 2. and 3. of Decemeber 2010



Energy mix

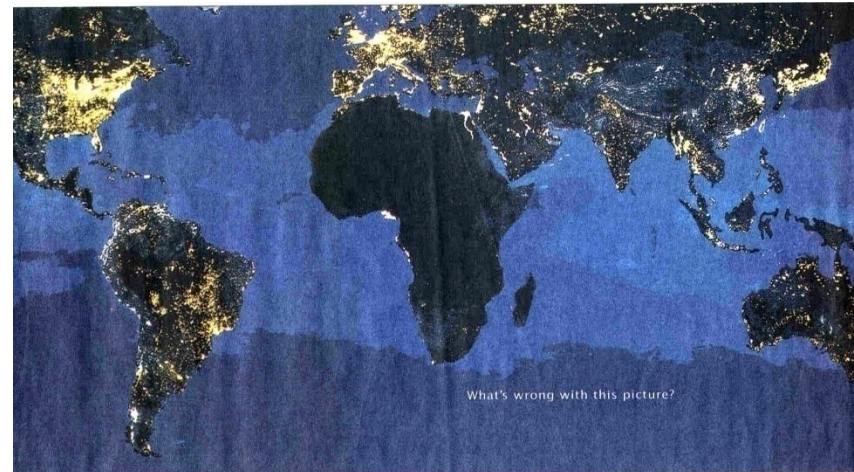
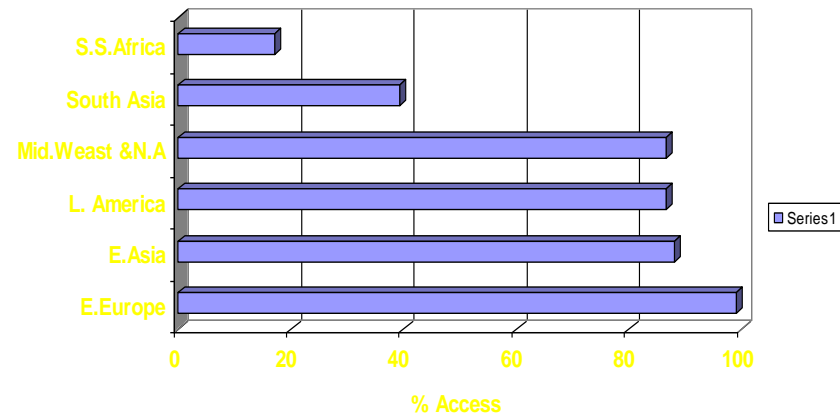
1. Energy mix is the best precondition for:
 - Energy supply security
 - Energy price stability
2. Energy market is a regulated market
 - nothing is possible without political support
 - and new valuation of resources



Electricity Situation of Southern Africa

- ❖ Southern Africa needs 563 billion US\$ during next 25 years investment
- ❖ Electricity access in Africa is the least among developing regions, under 20%
- ❖ 40% of electricity is used each by North & South, while the remaining 46 countries uses 20%
- ❖ Electricity access to rural areas is less than 10%
- ❖ The average price is 0.13 US\$, one of most expensive energies in the world

Population with Access to Electricity in Developing Regions, 2000

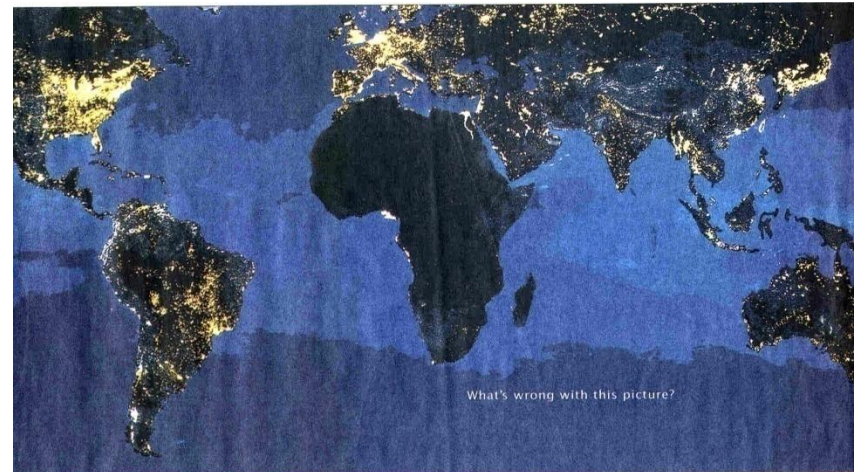
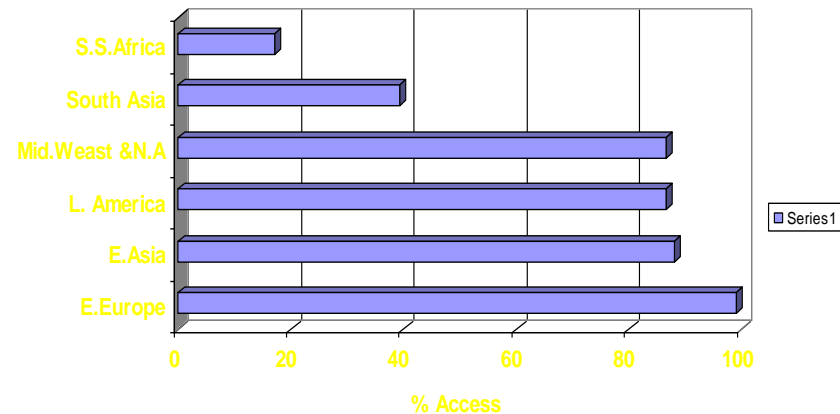




Transport Situation of Southern Africa

- ❖ SA: 19th largest user per capita in the world on crude oil bases
- ❖ 450 – 500 bn Rand consumed for land transport
- ❖ approx. 270 bn for personal transport
- ❖ Approx 14% of GDP is used for transport
- ❖ The situation is undermining **economic growth**: -transport is essential for economic growth -transport is **limiting economic growth**

Population with Access to Electricity in Developing Regions, 2000





Energy mix in Transport

- ❖ The upward trend in crude oil prices and the expected long term crude oil price adjustment as a commodity with limited availability allowing alternative fuels as a feasible option:
- ❖ conventional fuels, electricity, bio fuels, hydrogen, (gas and liquids)
- ❖ hybrid systems, flexible fuels engines, fuel cells

In future:

we have to live with a variety of fuels and propulsion systems, with a mix of public transport and individual transport



South Africa and GHG emissions

- ❖ 70 % of energy consumption is for transport
- ❖ Transport sector as end user is the largest emitter of GHG emission
- ❖ Kyoto – protocol 1997 commits signatories to reduce GHG emissions by 2012 by 5%
- ❖ SA – is the 5 largest GHG emitter per capita but rated as a developing country (list 2)



South Africa and GHG emissions

❖ Green house gases can be

❖ captured and stored

❖ and or used as fuel for photosynthesis and others

storage :- geological storage in soil, water and geological formations

- off shore, on shore in national and international areas

usage: - photosynthesis in : forestry / agriculture /nature conservation

- biotechnologies: algae- technologies, bacterial techn.

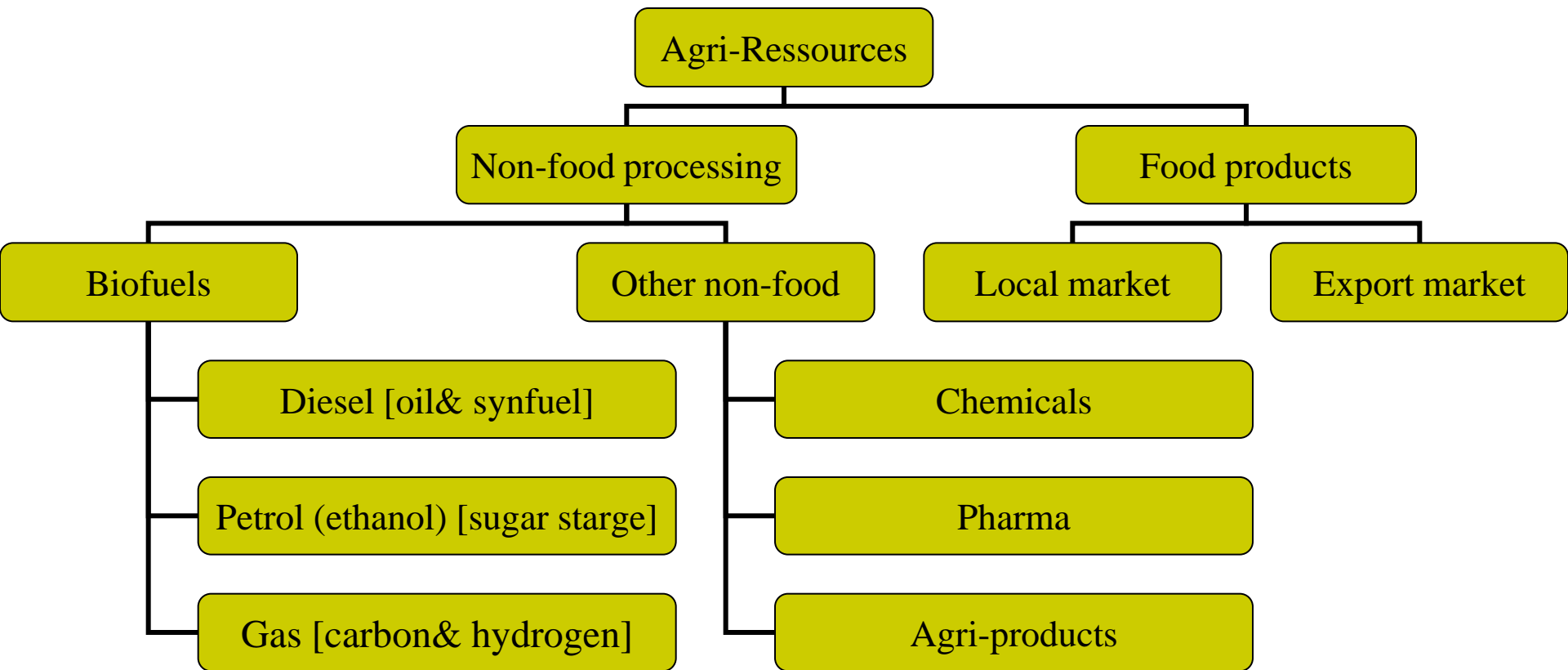


SA Agriculture and Agro –processing sector

- ❖ is the second largest employer in SA (11%)
- ❖ had a huge structural and technological development in the past 15 years
- ❖ 500 000 jobs lost
- ❖ cost developments: 22,7 fertilizer, 18,2 fuel, 12% wages and salaries
- ❖ Is a business, which requires a return on investment and coverage of cost
- ❖ food prices not determined by SA – agriculture but generating huge fluctuations
- ❖ bio energy offers the largest stable market for agriculture .
- ❖ Available agricultural land underutilized,
- ❖ Positive energy balance in biofuels if sustainable technologies and policies used
- ❖ There is no conflict between food and non-food production in Southern Africa



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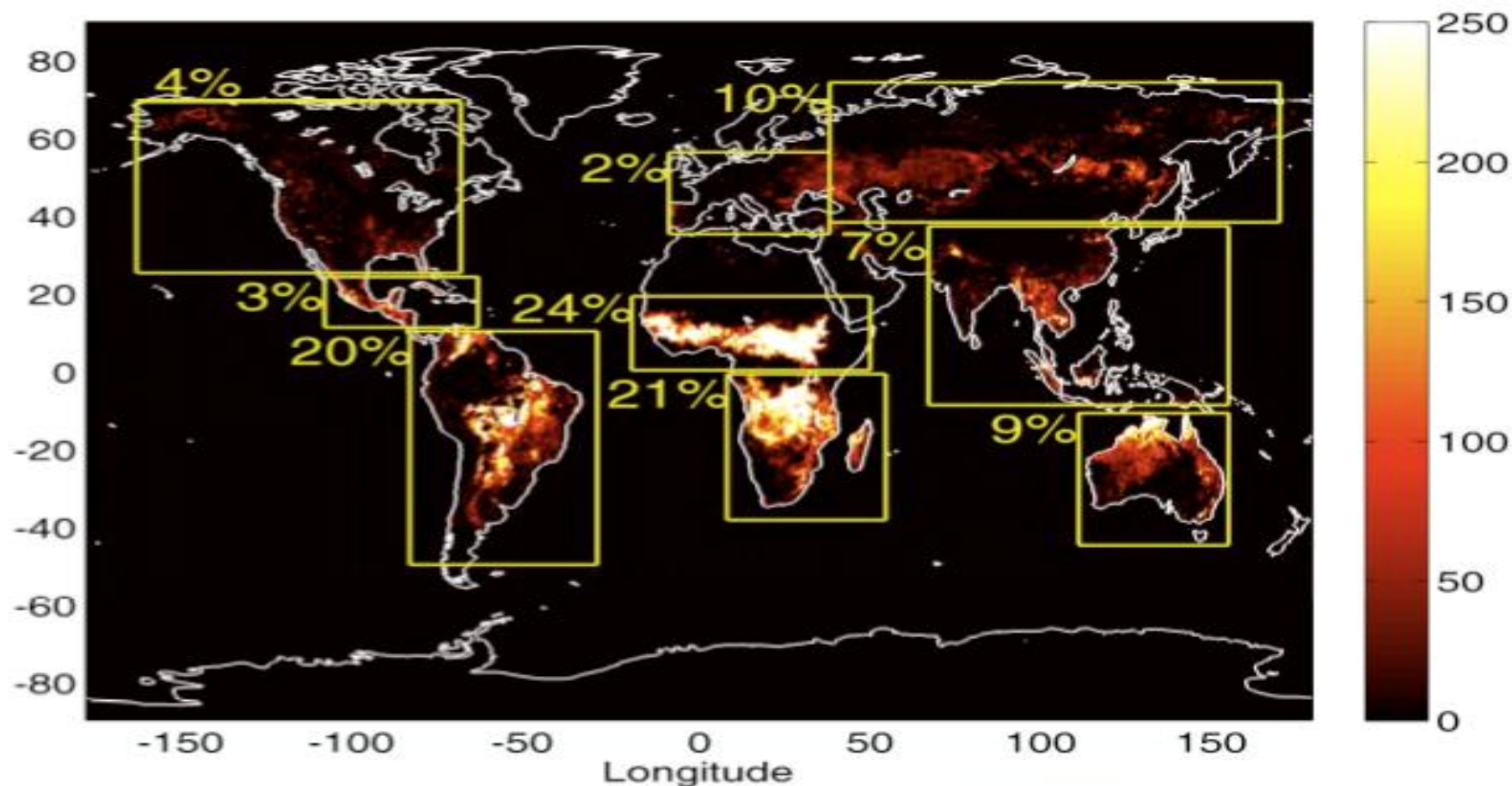
SA Forestry and Wood processing Sector

- ❖ SA has the largest in Southern Africa
- ❖ Provides 1.4 % of GDP and employees more than 170 000 people in SA
- ❖ 1.33 mio Ha in used with huge effect on climate protection
- ❖ Approx. 35% in timber saw milling is waste and only a fraction is used for bio energy
- ❖ Southern Africa is suffering alien plant invasion
- ❖ Cellulose is one of the most important future raw materials for biofuels
- ❖ Has widely underutilized potential



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Total annual fire counts

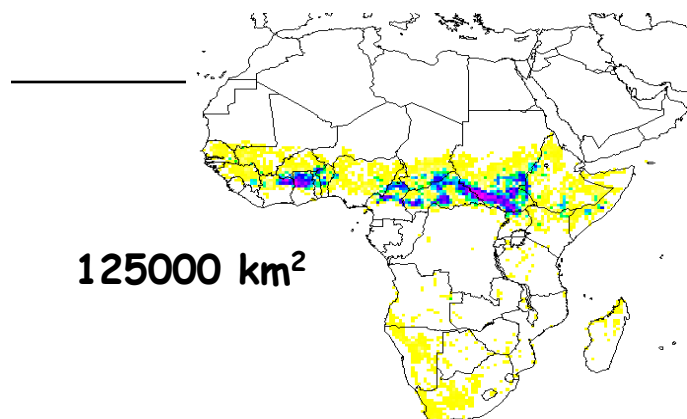


data source: NASA MODIS satellite (<http://modis-fire.umd.edu>)

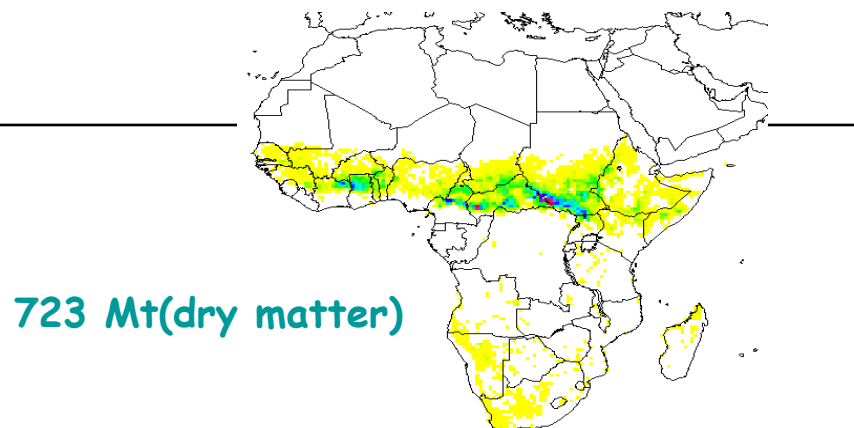


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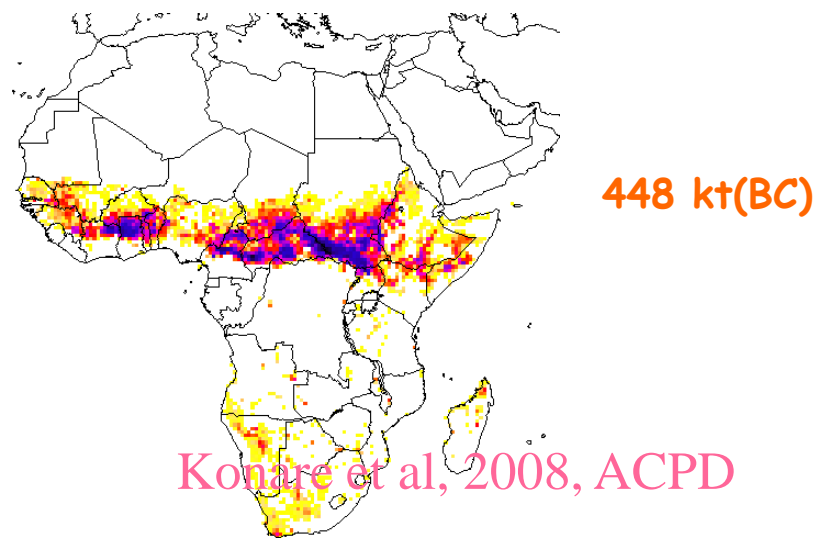
Burned Areas



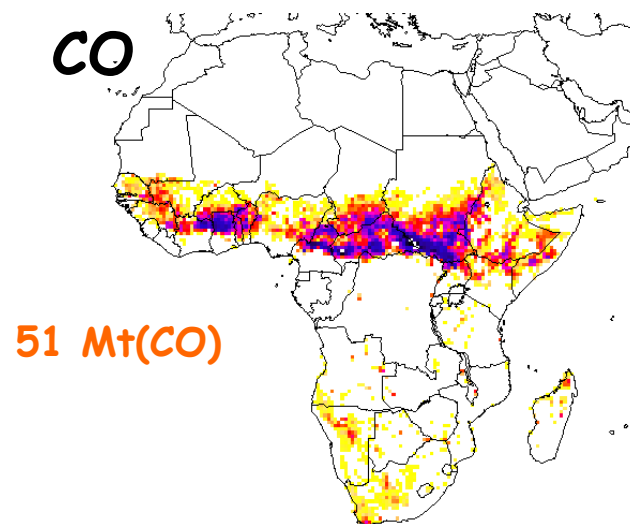
Burned Biomass



BC



CO



Konare et al, 2008, ACPD

December 2006



Generations of bio fuel technologies

- ❖ Raw materials: organic waste and agric. production
- ❖ 1. generation : extraction, separation, fermentation ,digestion , combustion 30 % fuel, 70 % for human consumption, ethanol and diesel,, solid biomass
- ❖ 2. generation : pyrolise, gasification, production of a crude oil, which is than a raw material for processing
- ❖ 3. generation biotechnologies : algae's
- ❖ 50 % crude oil, 50 % biomass for processing
- ❖ 4.generation: integrated bio energy systems, electrical energy, liquid fuels , chemicals, heat : we call it **biorefinery**



Land availability

- ❖ Not managed land is exposed to erosion and degradation by the elements we have already fire, flood and dust hazards and are exposed to climate change effects
- ❖ The use of land is part and parcel of national resources and the national economy, the regulations to own and use and the control mechanism influences the business environment
- ❖ There is sufficient land available for bioenergy
- ❖ Land without infrastructure and people using it has no value
- ❖ The management and use of land is an obligation not a right
- ❖ Land has to be used on sustainable manner – land use has to be regulated and controlled is a public and private issue



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Size of African Continent Compared to Other Land masses

Land Masses	Square miles	Square kilometres
Brazil	3,300,161	8,547,378
Japan	377,727	978,308
Australia	2,966,189	7,682,394
Europe	1,905,731	4,935,820
U.S.A (Continental)	3,120,066	8,080,934
Total	11,669,874	30,224,835
Africa (including Madagascar)	11,715,721	30,343,578





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Production status of the 7 suggested energy crops (yields
in 000mt; based on FAO, 2004 figures)

Crop							
Country	Palm oil	Sun flower	Soya bean	Maize	Sorghum	Sugar cane	Cassava
Angola	280	11		510		360	5,600
Botswana		7		10	32		
DRC	1,150		14.6	1,155	54	1,787	14,951
Lesotho				150	46		
Madagascar	21		0.05	349.7	1	2,460	2,191
Malawi		3,7		1,733	45	2,100	2,559
Mauritius				0.19		5,200	0.13
Mozambique		6.3		1,248	314	400	6,150



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Production status of the 7 suggested energy crops (yields in 000mt;
based on FAO, 2004 figures(continued)

Crop							
Country	Palm oil	Sun flower	Soya bean	Maize	Sorghum	Sugar cane	Cassava
Namibia		0.05		33	6		
South Africa		675.5	220	9,737	449	19,095	
Swaziland				70	0.6	4,500	
Tanzania	65	28	2.1	2,800	650	1,800	6,890
Zambia		10	15	1,161	19	1,800	950
Zimbabwe		8	84	1,000	80	4,100	190
TOTAL	1,516	749.6	335.8	19,957	1,697	43,602	39,441



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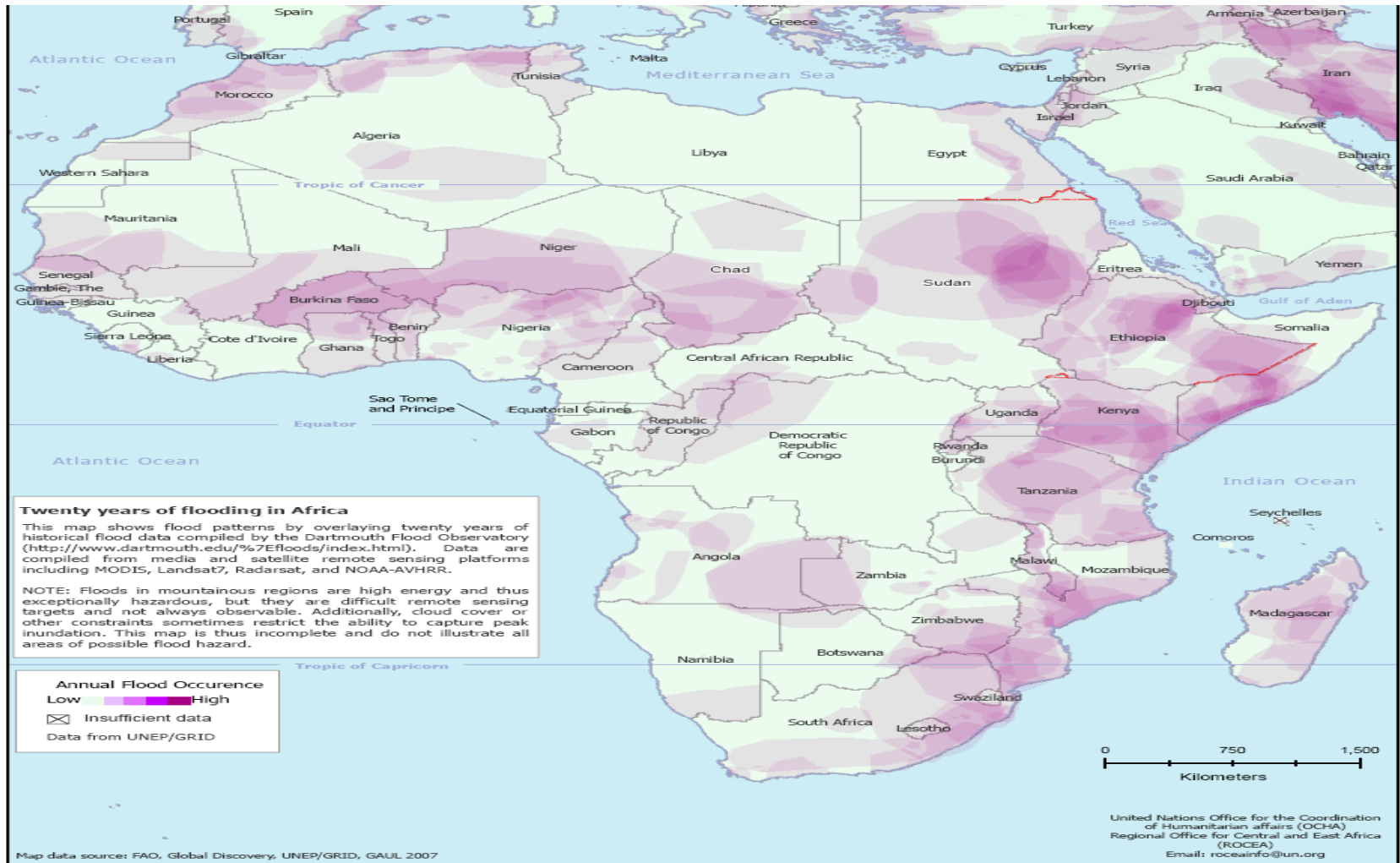
Arable land potential for five selected SADC countries (in mil ha)

Country	Land area	Suitable cropland (~ 20 %)	Area under crops today	Area required for domestic energy supply
DRC	227	45	8	0.2
Angola	125	25	4	0.6
Tanzania	88	18	5	0.3
Zambia	74	15	5	0.2
Mozambique	78	16	3	0.2

Source: FAO-IISA and calculations by Takavarasha, Uppal, Hongo



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The names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations



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Waste Generation in South Africa

Estimated Municipal Solid Waste Tonnage per Municipality			
Recommended order in which Municipalities should be approached (pre-feasibility conducted by C&EO in Feb 2006)			
1 Municipality			
2 Eden District Municipality	200,000.00	Pilot	
3 Buffalo City (East London)	300,000.00		
4 Durban Metropolitan Municipality	800,000.00		
5 Nelson Mandela Metropolitan Municipality	500,000.00		
6 Ekurhuleni Metropolitan Municipality (East Rand, Ga	1,000,000.00		
7 Tshwana Metropolitan Municipality (Pretoria)	1,000,000.00		
8 City of Cape Town	2,100,000.00		
9 City of Johannesburg	1,800,000.00		
10 Others	2,300,000.00		
TOTAL	10,000,000.00		
(The National Director of Waste (Ms Dee Fischer) will be notified immediately and project will seek endorsement)			



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Table 1: Recycling Statistics for South Africa (DEAT, 2000a & 2004b)

Waste	Percentage Recycled					
	1990	1992	1994	1996	1998	2004
Paper	29	28.4	38	38	38	52
Cans	21	26.3	29.9	51	67	85
Plastics	11	14.8	17	17	12	14
Glass	14	22.4	19.4	17.6	20.8	22



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Table 2: Waste received at landfill sites in South Africa (DWAF, 2001

Province	Waste Received at Land
	t/annum
Eastern Cape	571,000
Free State	782,000
Gauteng	4,297,000
KwaZulu Natal	1,811,000
Mpumulanga	481,000
Northern Cape	262,000
Northern Province (Limpopo)	153,000
North West	354,000
Western Cape	1,487,000
TOTAL	10,198,000



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The South African fuel market (Source: SAPIA)

Product volumes in million of liters	2004	2005	Change in %
Petrol	10 985	11 165	+ 1.6
Diesel	7679	8115	+ 5.7
Jet fuel	2076	2180	+ 5.0
Illum Paraffin	797	761	- 4.6
Fuel Oil	569	489	- 14.1
Bitumen	277	305	+ 10.3
LPG	563	550	- 2.3



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Import/Export South Africa (II)

Year	Share of total imports	Imports SA in million R	Exports SA in million R	Trade Balance in million R	Exchange Rate R/US-\$
2000	13.02%	186,281	209,492	23,211	6.87
2001	12.34%	214,331	249,338	35,007	8.38
2002	10.75%	272,681	311,677	38,995	10.66
2003	11.00%	256,837	276,800	19,963	7.58
2004	12.75%	304,773	295,192	-9,581	6.48



The fuel market in the SADC - region

- ❖ will be a free trade zone
- ❖ will have homogenized standards
- ❖ SADC consumption in 2006: 724000 bbls/day
- ❖ petrol consumption approx.: 633100 ltr / day
- ❖ diesel consumption approx.: 5180800 ltr / day
- ❖ 50 refineries in Africa, 39 in operation
- ❖ SADC – 4 in SA, 1 in Angola, 1 in Zambia
- ❖ Expected: 2 % blend in diesel, 8 % in petrol plus special fleet solutions
- ❖ **Means we need also a commune market for biofuels**



Limitations & opportunities of

Fossil fuels

- ❖ Availability
- ❖ Cost exploration
- ❖ Climate change
- ❖ Cost of processing and distribution
- ❖ Fiscal issues
- ❖ Import / export balance

Biofuels

- ❖ Availability
- ❖ Land requirements/regional
- ❖ Social requirements
- ❖ Technological requirements
- ❖ Costs of production, distribution and implementation
- ❖ Fiscal issues
- ❖ No sulphur emissions
- ❖ Quality enhancement
- ❖ CO 2 Certificates



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Bio fuels are an possible partner to fossil fuels:

as an quality agent : lubrication in diesel

ETBE replacing MTBE

blending: in Petrol and Diesel (from 5% to)

pure fuel application:

without technical alterations to engines:

biodiesel, bio ethanol , hydrous ethanol

with technical alterations to engines:

pure plant oil in diesel type engines



Present situation

SA Bio fuels strategy : 2% blending ratio on total fuel consumption by volume with tax and price regulations

SABS: biodiesel in force,
biodiesel quality management standards in prep.,
bio ethanol standards will follow,

SADC countries developing own strategies and overtaking South Africa

Municipalities: will formulize the climate change policies: BRT – systems, traffic management systems, intermodal public transport systems



Combined systems

- ❖ gas/diesel
- ❖ ethanol/petrol
- ❖ biodiesel/diesel
- ❖ fuel / electrical batteries with generator
- ❖ hydrogen/fuel cell
- ❖ Ethanol / gel to ethanol gel
- ❖ Biogas (methane) – compressed natural gas CNG