



High-Level Conference on:

Water for Agriculture and Energy in Africa: the Challenges of Climate Change

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National Investment Brief

TANZANIA, UNITED REPUBLIC

SUMMARY:

The country's overall poverty levels remain at around 40% in the rural area areas where most households depend on agriculture, as compared with urban areas where poverty levels have fallen in recent years from 28% to 18%. At this rate of change Tanzania is highly unlikely to achieve the millennium targets of reducing food insecurity and halving poverty by 2015. Food security is highly dependent on climatic conditions from one year to another. In a good year the country tends to be food secure in overall terms, although there are regional shortfalls; but recent improvements to the transportation and marketing sectors nowadays mean that - again in a good year - local shortfalls can be made good by surpluses transported from elsewhere in the country.

The agricultural sector remains dominated by rainfed production, with only a little over 0.2 of its 5.1 million ha being irrigated. Nonetheless, studies have shown that the total irrigation potential of the country exceeds the total area currently planted. The irrigation sector is largely characterised by small-holders, mainly in traditional irrigation schemes and in developed smallholder irrigation schemes using water supplied by publicly funded developed schemes ranging from a few ha to a few hundred ha. The most frequently irrigated crop is rice, but maize, vegetables, other annual crops, sugar cane and citrus are also produced. The sector is also beginning to feature emerging and commercial farmers largely growing high value horticulture, industrial and beverage crops for export. Climate change is expected to be variable. Although the country is expected to warm overall, some areas will become drier particularly the centre, while the Lake Victoria basin, the North East and South East are expected to become wetter.

There are five major drainage basins in the country, and these can be subdivided into nine river basins. Much of the water remains unallocated, but two of the countries main rivers, namely the Rufiji and Pangani are recorded with more water use conflicts due to high competition, not least between the irrigation and hydropower sectors. This situation can be expected to intensify, and is exacerbated by the fact that much of the irrigation development has taken place, or is expected to take place upstream of the dams, thereby precluding the possibility of win-win solutions as a result of operating rule innovations. To curb this situation the Government has already established Basin Water Offices in all its nine basins with a mandate to control and manage water allocation to all sectors, with a sustainability consideration.

The country's development agenda is predicated very much on poverty alleviation and the wise use of natural resources. Enhanced and increased agricultural production, especially irrigated, is expected to be central to the development agenda and is targeted not only at direct food security, but also added value and export (Tanzania is already a net exporter of agricultural outputs) with increased private sector participation both as producer and service provider, with the possibilities of public private partnerships already provided for in the emerging policy framework and strategy. As far as this brief is concerned the main policy instruments would be the National Strategy for Growth and Reduction of Poverty, the Agricultural Sector Development Programme, the National Irrigation Policy and Strategy (including the National Irrigation Master Plan) and the National Water Policy.

An indicative investment envelope consists of US\$800 million for the short term, of which US\$363 million is allocated for small scale water control/smallholder scheme rehabilitation and US\$437 for large scale hydraulic projects. For the medium term, the total is US\$1447million (US\$947 million for small-scale and rehabilitation and US\$500 million for large scale water control). And for the long term the total is US\$2000 million.

1. CONTEXT

1.1 AGRICULTURE AND FOOD SECURITY

Agriculture

Tanzania's GDP in 2007 was \$21 billion (Economic Survey - URT 2007). Agriculture typically contributes around 25.8% of GDP and comprises up to 40% of its export earnings (Government of Tanzania, 2007), accordingly the sector continues to drive economic growth - in spite of the recent emergence of the new high-growth sectors of mining and tourism, and furthermore the sector continues to have the highest impact on the levels of overall economic growth. About 80% of the poor live in rural areas where agriculture accounts for 75% of rural household incomes.

Agricultural holdings are dominated by small scale, subsistence farmers cultivating plots typically ranging from 0.9 ha to 3 ha each (Tanzania National Website). These are almost entirely rainfed and production is predominantly targeted at food production. In fact some 85% of the total 5.1 million ha cultivated is planted to food crops. Emerging farmers are nonetheless appearing in the agricultural sector, and produce high value horticulture/floriculture, often for export; while large scale enterprises produce beverage and/or industrial crops such as tea, coffee and sisal. Finally, urban and peri-urban agriculture has also emerged, either as a household food security measure or to cultivate produce for the immediate local market in the form of other households, schools, hotels, hospitals restaurants and bars etc.

Irrigation and water control

Tanzania's National Irrigation Master Plan (2002) identifies a total irrigation development potential in Tanzania of 29.4 million ha. Of this total area, 2.3 million ha are classified as high potential, 4.8 million ha as medium potential and 22.3 million ha as low potential. However, only 289,245 hectares are under improved irrigated agriculture as of June 2008. As with agriculture as a whole, the irrigation practice is also dominated by small scale irrigation, mainly in traditional irrigation schemes and in developed smallholder irrigation schemes using water supplied by publicly funded schemes classified as i) Small scale irrigation: 0-500 ha; (ii) Medium scale irrigation: 500-2000 ha and (iii) Large scale irrigation: >2000 ha, (Government of Tanzania 2004). Nonetheless, emerging and commercial farmers are turning to irrigation and in fact are encouraged to do so by existence of the National Irrigation Master Plan and the emerging policy framework, as will be seen below. Tanzania's current irrigation typology (Government of Tanzania 2007) is based on the nature of infrastructure rather than irrigator as indicated below:

1. **Gravity-fed Irrigation Schemes:** which are schemes where farmers have diverted water from a surface water source it be a perennial, intermittent or ephemeral stream; a small, medium or large dam or any other source of surface water and conveyed it to the irrigated area by gravity via a system of canals or closed conduits.
2. **Pumped Irrigation Schemes:** these are schemes whereby water is pumped from a source which may include a river stream, a well, a borehole, a water reservoir and conveyed to the command area under pressure. The method of irrigation at the scheme could be surface, drip or sprinkler system.
3. **Rain Water Harvesting Schemes:** these are schemes whereby farmers construct water retaining bunds, harvest rain water and store the water at the foot of mainly paddy crop. Despite their simple technology, such schemes are significant in Tanzania's rice production.
4. **Micro Irrigation Schemes:** these are schemes whereby farmers draw water from a source by hand and use it mainly for the irrigation of vegetable crops. They include cases where water is harvested from roof tops and stored in tanks and where farmers pond the water diverted from a stream and convey it to their fields through a piped network where it is applied to the crops through drip emitters or low pressure sprinklers (sometimes called localized irrigation). These type of schemes include those developed using the bucket drip irrigation kits or the treadle pumps.

The state of smallholder irrigation schemes varies from very well to poorly operated ones depending on the level of farmers involvement in the entire process of formulation, planning, implementation (development) and operation through the irrigators organisations. These are interestingly, good examples of farmer managed irrigation schemes.

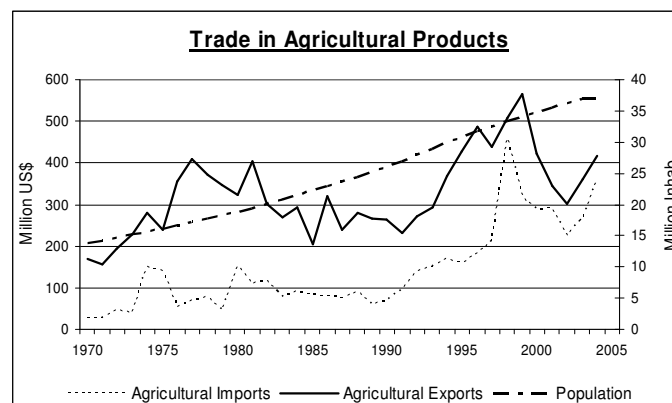
Food security

In 2003 FAO (FAO 2003a), described Tanzania as having a very high level of undernourishment, with 43% of the population being under nourished. The situation furthermore was worsening. In 1992 for instance the average food supply in kcal/person/day was 2080, whereas by 2001 it had fallen to 1770. Similarly, in percentage terms, the undernourished comprised 35% of the population in 1992 and 43% in 2001. These figures compare poorly with both the East Africa Region and Sub-Saharan Africa as a whole (39% and 33% respectively).

However, at the time of writing, the country is described as generally food secure with the exception of some Northern locations which can be classified as moderately food insecure (USAID June 2008). This is largely due to good results from the most recent harvest. However, climate variability means that this favourable situation is guaranteed year after year. It should be noted however, that ongoing, country wide to road infrastructure and telecommunications by the Government and the private sector, have facilitated the movement of food crops and livestock from surplus to deficit areas. In addition, traders are able to share market information more quickly and more cheaply than in past years.

Food and agriculture trade and import balance

As can be seen from the figure, Tanzania is a net exporter of agricultural goods. However, the recent high prices of agricultural commodities internationally has cause the government of reissue a historic cereal export ban while offering traders the opportunity to import 300,000 MT of maize, duty free. However, these initiatives have had only limited success due to high import prices, porous borders and below average harvests in Kenya.



1.2 WATER RESOURCES AND HYDROPOWER

The country is divided into five major drainage systems:

- Indian Ocean Drainage System;
- Internal Drainage of Lakes Eyasi, Natron and Bubu Depression Complex;
- Internal Drainage of Lake Rukwa;
- Atlantic Ocean Drainage; and the
- Mediterranean Sea Drainage system.

These systems have further been divided into nine river and lake basins for effectiveness of water resources management:

- | | | |
|-------------------|--|-------------------------|
| • Pangani River | • Ruvuma River | • Lake Rukwa Basin |
| • Rufiji River | • Lake Nyasa Basin | • Lake Victoria Basin |
| • Wami/Ruvu River | • Internal Drainage Basin (Lake Eyasi, Manyara, Natron and Bubu Complex) | • Lake Tanganyika Basin |

Water is becoming increasingly scarce in Tanzania, especially in the Pangani and Rufiji Basins both of which have important hydropower installations. Competition between the hydropower and agricultural sectors is intense, with much of the total irrigation abstraction taking place upstream of the hydropower reservoirs.

Total renewable water resources for the country have been estimated at 93 km³/yr (AQUASTAT), of which 84 km³/yr arise internally while the balance, 9 km³/yr, comprises flows along the Tanzania/Mozambique border.

Annual withdrawals in 2002 were estimated to total 5.142 million m³. The agricultural sector dominates water use with some 86% of withdrawals being used for mainland irrigation.

1.3 CLIMATE CHANGE

Tanzania is predicted to warm by 2 - 4 C° by 2100 (Paavola, year unknown), somewhat less than north-western Africa and South Africa. Inner parts of the country are likely to experience higher temperature increases than coastal areas and cold and dry seasons will warm more than warm and wet seasons. Rainfall is predicted to decrease by 0 - 20% in the inner parts of the country. In contrast, rainfall may increase by 25-50 percent in the northeast, southeast and the Lake Victoria basin. Changes in the mean temperature, rainfall patterns and rainfall variability are likely to prolong dry seasons and to increase the severity of periodic droughts. This will be pronounced in the interior part of the country which will experience higher temperature increases and reduced rainfall. The northeast, southeast and the Lake Victoria basin will be less exposed to droughts but they are likely to experience more frequent and severe flooding (Paavola *ibid*).

These trend expectations are largely confirmed by Government's own forecasts (Government of Tanzania 2003a) which predicts, based on global climate change scenarios, that the mean daily temperatures will rise on average between 3° and 5° C, throughout the country, with rainfall increases in areas characterised by bimodal rainfall of between 5% and 45%, and decreases of between 5% and 15% in areas of unimodal rainfall.

The same source states that – inter-alia – both the water resources and agricultural sectors (including livestock) will become vulnerable. In particular:

- In rivers Pangani and Ruvu, runoff would decrease by 6% to 10% while in the Rufiji River runoff will increase by 5% to 11%. These changes would adversely affect water supply and socio-economic activities.
- With respect to agriculture in areas with increased rainfall, the leaching of nutrients, topsoil erosion and water logging will all affect plant development and yield.
- Climate change favours the occurrence of disease and pests due to the higher temperatures and increased rainfall.
- Coffee will most likely be grown successfully where rainfall would increase. Cotton growing areas would be reduced. Maize yield could be reduced by about 33% over the entire country.
- Where rainfall is expected to fall, irrigation will be required to substitute for moisture losses due to increased evapotranspiration. Although under such conditions irrigation will most likely tend to be expensive because of reduced river runoff and the vulnerability of shallow wells necessitating the development of deep wells instead. Drought resistant crop varieties will also be required.

2. NATIONAL STRATEGIES FOR WATER, AGRICULTURE AND ENERGY

2.1 POLICY CONTEXT

Tanzania's national targets are aligned with and targeted at the Millennium Development Goals (MDGs) which the government acknowledges to be appropriate, internationally agreed targets for reducing poverty, hunger, diseases, illiteracy, environmental degradation and discrimination against women by 2015. As a result, agriculture and irrigation development are both firmly anchored in recently developed national level macro policies which include the *Tanzania Development Vision 2025* (TDV 2025) and the *National Strategy for Growth and Reduction of Poverty* (NSGRP¹).

The *Agricultural Sector Development Programme* (ASDP) is implementing the objectives of the *Agricultural Sector Development Strategy* (ASDS). It is a comprehensive response to Cluster One of the NSGRP i.e. the Growth Cluster. Intermediate outcomes under this cluster include an overall

¹ or MKUKUTA in Kiswahili,

increase in irrigation assets by means of a process articulated in the NSGRP as 'demand driven irrigation prioritization. Equally, His Excellency, The President i) declared irrigation to be a high priority component of the Tanzanian National Strategy for Growth and Reduction of Poverty (NSGRP) and ii) stressed the sector's importance as an essential element of the agriculture sector's overall development strategy.

Even before this Presidential declaration, the *National Irrigation Master Plan* mentioned above was already in place. It was conceived in the late 1990's and comprehensively prepared in the years that followed prior to its launch in 2002. However, as a master plan, it was referred to when developing the irrigation sub-component of the ASDP taking in account somewhat difficult to reconcile with the district level, demand driven modality. The highly detailed and comprehensive analysis that went into its preparation nonetheless imbues it with immense value as a framework to guide and regulate demand driven development. As such it is also used in the context of the National Irrigation Development Policy and Strategy currently under finalisation. This policy will not only call for demand driven district level, participatory smallholder schemes, but in accordance with the ASDP will also call for the development of national level bulk service infrastructure for the sector.

Future irrigation development will be both enabled and regulated by an innovative new water policy, which was promulgated in 2000 and establishes - *inter-alia* - integrated water resources management on a river basin basis; water use permits; enabling legislation for a wide range of water user institutions (including households); the economic pricing of water and will eventually lead to the establishment of water markets which are specifically called for in the Policy. All future irrigation development will also be subject to stringent environmental and social impact assessments. This has begun with the planned Strategic Environmental and Social Assessment (SESA) to be done for eight months from January 2009. It must be understood however, that irrigation is Tanzania's major water using sector and as such represents major potential conflict with the energy sector, a principle development principle for which is that energy should be developed on a least cost basis. Although the energy policy lacks specificity with respect to hydropower (Government of Tanzania 2003b), it is almost certain that it will be expected to play a major role in securing cheap, reliable energy for the country. Past experience suggests that there will be increasing competition with the irrigation sector over water supplies, a situation that will not be helped by the fact that much of the existing and potential irrigation areas are upstream of the dam, therefore precluding somewhat the possibilities for win-win scenarios resulting from flexible operating rules at the dams.

Tanzania's strategy for climate change adaptation in the water resources sector is predicated on both supply and demand management. Supply management entails more capital investment in reservoirs and additional infrastructure as follows:

- development of ground water;
- provision for inter-basin water transfers; and
- expanded rainwater harvesting.

Demand management will involve:

- investment in new water-saving technologies and changed user practices. Already some industries are applying cleaner production techniques;
- water conservation measures at the level of catchment area and end use (protection of the catchment area and the re-use and re-cycling of waste waters respectively).

For agriculture, government has proposed the following adaptation measures:

- changes in farming systems, including varietal changes and shifts of economic crops such as cotton and coffee to new areas;
- increased irrigation service coverage, including supplementary irrigation;
- upgradation of existing irrigation assets;
- reduced tillage, cover cropping, mulching and green manure;
- current traditional irrigation schemes will require substantial improvement to reduce water loss by evaporation and infiltration;
- social safety nets in the form of food programmes and other social security programmes.

2.2 INVESTMENT ENVELOPE

An investment envelope for the short, medium and long term is presented in the Table below and expressed in million US\$. It is based on the MTEF calculations prepared during the appraisal of the Agricultural Sector Development Programme in 2006. It should be noted that the ASDP budgets do not differentiate between newly built and rehabilitation.

Time scale	Type of investment (million US\$)			Total
	Small scale water control	Rehabilitation of irrigation	Large scale hydraulic projects	
Short-term	363		437	800
Medium-term	947		500	1447
Long-term	1000		1000	2000
Total	2310		1937	4247

2.3 PROJECT PORTFOLIO

Section 3 presents recently achieved, active and pipeline projects related to the above investment envelope.

3. PROJECT PROFILES (ON-GOING AND PROJECTED)

Project title	Funding Partners	Lifeline	Total Budget	Description
I. PROJECTS RECENTLY IMPLEMENTED				
River Basin Management and Smallholder Irrigation Improvement Project	URT, World Bank	1996-2004	US \$33 million	Demand driven participatory rehabilitation and upgradation of smallholder schemes in the Rufiji and Pangani Basins
Participatory Irrigation Development Program	URT, IFAD, WFP and Irish Aid	2000-2006		Capacity building and smallholder irrigation development targeted at increased reliability of irrigation service delivery, farmer strengthening for o&m etc
Special Programme for Food Security	URT, FAO	1995-2002	2,270,175 US\$	Dealt with irrigation water management interventions in selected irrigation schemes including complementary small scale income generating activities at household level such as goat and chicken rising.
District Irrigation and Water Harvesting Support in most affected drought areas	FAO- NEPAD/ Govt of Japan	2005-2007	US\$34.05 million	Use of water saving technologies through irrigation practice of using water pumps and drip systems for irrigation of high value crops.. Capacity Building in installation and management of the systems. .
II. ON-GOING PROJECTS				
Agricultural Sector Development Programme (ASDP)	URT - World Bank, AfDB, Irish Aid, IFAD and FAO through , ASDP basket fund	2006-2013	US\$2.0 billion (provisional)	The project is expected to have the following components: (i) Local-level support.; (ii) National-level support. This component is designed to support : (i) agricultural services, primarily research and extension; (ii) irrigation development; (iii) market and private-sector development; (iv) food security; and (v) coordination, monitoring and evaluation
District Irrigation Development Fund	Component of a Multi-partner Basket fund of ASDP	2006-2013	Depends on level of contribution to the fund	Supplements financial requirement gaps by the Local Government Authorities (Districts) in implanting irrigation investment under the District Agricultural Development Plans (DADPs).
National Irrigation Development Fund	ditto	2006-2013	ditto	Caters for irrigation interventions requiring funding levels which are above the Local Government (Districts) budget levels (more than US\$500,000); irrigation interventions with complex designs and implementation requirements, large scale bulk service infrastructure to attract the private sector; where schemes span over district boundaries and irrigation interventions with cross-cutting issues and with special interest/benefit to the nation.
Agriculture Sector Development Programme (covering Food Security)	URT - World Bank, AfDB, Irish Aid, IFAD and FAO through , ASDP basket fund	2006-2013	US\$ 615 million	The objective of the ASDP is to improve national food security and reduce poverty on an economically and environmentally sustainable basis. The programme components are: Development of food security information and crop monitoring system; District training on preparation of food security activities in the context of ASDP and District Development Plans; Capacity building for Department of Food Security.

Zanzibar Programme on Food Security	URT	2006-2010	US\$ 8,99 million	The programme has as immediate objectives: To reduce the number of people below the food poverty line before 2010; To improve food security policy development and management. Outcomes should be; increased food availability, increased food production, increased and improved food consumption, use and utilisation - all within food insecure groups.
TZ-GEF Energy Dvpt and Access Expansion	WB	2007-2012	59.6 million US\$	Major sectors: (i) Energy and mining (renewable energy: minihydro facilities/solar) (57%) ; (ii) Public Administration, Law, and Justice (31%); Energy and mining (Power) (12%)
III. PIPELINE PROJECTS				
Agricultural Sector Development Programme (ASDP)		Up to 2013		Since the launch of ASDP there is no stand alone projects interventions, all agricultural interventions are implementing the District Agricultural development Plans (DADPS) as they come up through the participatory demand-driven formulation by the beneficiaries (farmers).
District Irrigation and Water Harvesting Support (Mainland)	FAO-NEPAD	6 years	US\$34.05 million	Components: A. Development and Rehabilitation of Irrigation and Water Harvesting Infrastructure; B. Provision of Agricultural Services; C. Capacity Building in Irrigation Management; D. Improved Linkages between Irrigation Schemes and Market Infrastructure; E. Environmental Assessment and Catchment Management; F. Social Services
Land Management and Development of Irrigation Schemes (Zanzibar)	FAO-NEPAD	5 years	US\$11.6 million	Components: 1: Water Resources Management and Infrastructure; 1.1: Rehabilitation/installation of irrigation infrastructure; 1.2: Strengthening irrigation management capacity; Component 2: Promoting Soil Fertility Improvement and Catchments Management Approach; 3: Strengthening Management/Financial Capacity of Farmers' Organizations; Component 4: Strengthening Research and Extension Services

ANNEX 1: MAP OF WATER CONTROL IN TANZANIA



ANNEX 2: COUNTRY STATISTICS

Country and population								
Area of the country	2005	94730	1000 ha					
Cultivated area as % of the total area of the country	2005	10.9	%					
Total population	2005	38329	1000 inhab					
• of which rural	2005	63	%					
Population economically active in agriculture	2005	15802	1000 inhab					
• as % of total economically active population	2005	78	%					
• female	2005	54	%					
• male	2005	46	%					
Economy and Development								
Gross Domestic Product (GDP) (current US\$)	2007	21000	million US\$/yr					
• value added in agriculture (% of GDP)	2007	25.8	%					
• GDP per capita	2005	901	US\$/yr					
Access to improved drinking water sources								
Total population	2006	55	%					
Urban population	2006	81	%					
Rural population	2006	46	%					
Water Resources and management								
Average precipitation	2007	1012.2	10 ⁹ m ³ /yr					
Total actual renewable water resources	2007	96.27	10 ⁹ m ³ /yr					
Dependency ratio (transboundary rivers)		12.7	%					
Total actual renewable water resources per inhabitant	2007	2512	m ³ /yr					
Total dam capacity	2002	4.196	10 ⁹ m ³					
Total water withdrawal	2002	5.184	10 ⁹ m ³ /yr					
• as % of total actual renewable water resources	2002	5.38	%					
IRRIGATION AND DRAINAGE								
Irrigation potential	2006	29400	1000 ha					
Water Management								
Area equipped for irrigation: full control - total	2002	184.33	1000 ha					
Equipped lowlands	2002	0.00	1000 ha					
Total area equipped for irrigation	2002	184.33	1000 ha					
• Area equipped for irrigation as % of cultivated area	2002	1.8	%					
• Annual increase rate		2.3	%					
• Power irrigated area as % of area equipped for irrigation	2002	0.8	%					
• Area actually irrigated as % of area equipped for irrigation		-	%					
Non-equipped cultivated lowlands and flood recession	2002	0.00	1000 ha					
Total agricultural water managed area	2002	184.33	1000 ha					
• Agricultural water managed area: as % of cultivated area	2002	3.6	%					
• Drained cultivated area as % of total cultivated area		-	%					
Typology of irrigation schemes								
Small-scale schemes (< 500 ha)	2002	5.53	1000 ha					
Medium-scale schemes (500 – 2000 ha)	2002	71.212	1000 ha					
Large-scale schemes (> 500 ha)	2002	107.243	1000 ha					
Irrigated crops								
Rice	2002	89	1000 ha					
Maize	2002	57	1000 ha					
Sugar cane	1998	13	1000 ha					
Vegetables	1998	38	1000 ha					
Citrus	1998	7	1000 ha					
Other annual crops	2002	81	1000 ha					
ENERGY INDICATORS								
Energy Production	2005	19.10	Mtoe					
Net Imports	2005	1.33	Mtoe					
TPES	2005	20.40	Mtoe					
- TPES/Pop	2005	0.53	toe/capita					
- TPES/GDP	2005	1.61	toe/thousand 2000 US\$					
- TPES/GDO (PPP)	2005	0.80	toe/thousand 2000 US\$ PPP					
Electricity Consumption	2005	2.36	TWh					
- EC/Pop	2005	61	kWh/capita					
ENERGY SUPPLY AND CONSUMPTION								
	Coal	Gas	Crude oil	Petroleum products	Hydro	Other Renewable & Waste	Others	TOTAL
Production	46	114	0	0	153	18786	0	19099
Imports	0	0	0	1315	0	0	12	1327
Exports	0	0	0	0	0	0	0	0
International Marine Bunkers	0	0	0	-22	0	0	0	-22
Stock Changes	0	0	0	0	0	0	0	0
Total Primary Energy Supply (TPFS)	46	114	0	1293	153	18786	12	20404

* in thousand tonnes of oil equivalent (ktoe) on a net calorific value basis.

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