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ADJUSTING TO RECENT CHANGES IN THE ENERGY SECTOR: CHALLENGES AND OPPORTUNITIES

Background note by the UNCTAD secretariat*

Executive summary

In recent years, dramatic changes have taken place in world energy markets. Oil prices have increased sharply, as has concern about the security of energy supplies, with the possibility that both these effects will remain an integral part of the macro-environment for some time to come. The implications of these changes for economic growth and development are potentially serious. However, the new situation also offers opportunities for developing countries in terms of accessing new markets and reducing poverty. This note focuses on two aspects that are particularly important for developing countries: the adjustment to higher and more volatile oil prices, and the opportunities offered by biofuels production and exports.

Adjusting to the recent changes in the energy sector will be difficult for many developing countries. Oil exporters may have to address pressure on the real exchange rate that could also lead to "Dutch Disease", as well as decide how to invest windfall revenues. The more deleterious impact, however, will hit oil-importing countries, in which rising import bills can trigger knock-on effects that touch every sector of the economy — from falls in household income at the micro-level, to fuel shortages and cost increases that hamper business operations and undermine export competitiveness, to macro-level increases in inflation, unemployment and external debt. A range of measures exist for alleviating the impact of oil price rises, from strategies for smoothing the impact over the longer term to mechanisms such as hedging and compensatory finance.

A further option is to expand the availability and use of oil substitute products. Indeed, the increase in oil prices has had the effect of improving the commercial viability of such alternatives. One solution is the use of biofuels, whether through the conversion into ethanol of traditional crops such as sugar cane or maize, through the industrial production of cellulosic ethanol or through biodiesel production. Biofuel offers a potentially low-risk diversification strategy for developing country farmers, boosting employment and wages in the agricultural sector. Developing countries in particular can benefit from this opportunity because of their lower production costs and the incentives for biofuel production embedded in the Kyoto Protocol's Clean Development Mechanism. However, a significant risk to the realization of development gains from biofuels lies in the international trade environment where high tariffs, technical barriers to trade and domestic subsidies are pervasive. Challenges faced by developing countries include ensuring that small farmers do not face undue barriers to participation in the sector and gaining access to relevant bio-energy technology.

* This document was submitted on the above-mentioned date as a result of processing delays.

Contents

1. INTRODUCTION

1. The Expert Meeting takes place at a time of concern about energy prices and security of energy supplies, and about the growth and development implications of changes in energy markets. The necessary adjustment will be difficult for many developing countries, but the new situation also offers opportunities for those countries in terms of accessing new markets and reducing poverty. The present paper focuses on two aspects that are particularly important for developing countries: the adjustment to higher and more volatile oil prices, and the opportunities offered by biofuels production and exports. Chapter 2 provides background information, describing some of the basic characteristics of the new situation. Chapter 3 deals with the adjustment of LDCs and African countries to higher oil prices and chapter 4 describes the possibilities offered by biofuels production. Chapter 5 poses questions for discussion.

2. GENERAL IMPLICATIONS OF HIGHER AND MORE VOLATILE ENERGY PRICES

2. In recent years, the dynamism of trade in energy products has manifested itself in high growth rates. As table 1 shows, the value of world exports of all energy products taken together increased at an annual rate of 12.65 per cent from 2001 to 2004. This increase is not limited to traditional energy products. Export values of biofuels, whose traded volumes are the smallest among the energy products listed, increased at an annual average rate of over 25 per cent, thus significantly outpacing export value growth for all other energy products. The export dynamism of the energy sector extends also to equipment for renewable energy production.

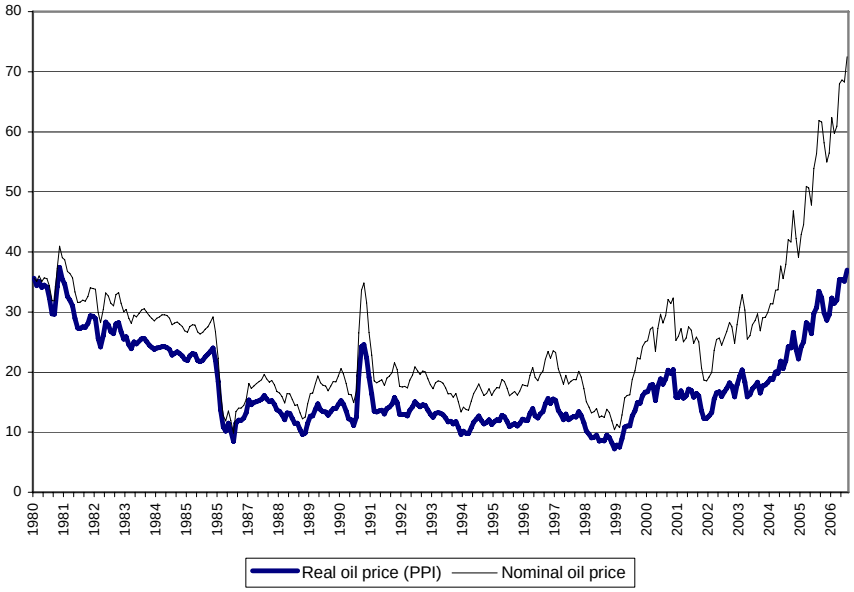
Table 1. Export dynamism of the energy sector

Energy products	Growth rate 2004/2001 (%)	Average annual growth rate 2004/2001 (%)
Coal products	73.49	18.37
Petroleum oils	52.23	13.06
Other petroleum gases	56.69	14.17
Electrical energy	50.21	12.55
Biofuels	100.21	25.05
All energy products	**50.61**	**12.65**
Energy equipment		
Hydraulic turbines & water wheels of a power > 1000 kW but <= 10,000 kW	105.05	26.26
Biomass (mech. stokers, mech. grates, mech. ash, etc.)	69.15	17.29
Solar water heaters	57.89	14.47
Photovoltaic generators DC of an output > 37.5W but <= 75kVA	59.81	14.95
All renewable energy equipment	**63.38**	**15.84**
Total world exports	**46.71**	**11.68**

Source: UNCTAD estimates based on COMTRADE.

3. A substantial part of this dynamism can be explained by rising prices of energy products. Prices of crude oil and refined products, for example, have increased rapidly during the first years of the new millennium and have reached levels in real terms that have not been seen since the early 1980s (figure 1).

Figure 1. Crude oil price 1980 – mid-2006, $/barrel



Source: IMF primary commodity prices.

4. The present oil price boom may resemble the oil price shocks of 1973/1974 and 1979, but there are differences. Most obviously, the price increase cannot be directly attributed to a particular supply-side shock and the rise in prices has been gradual rather than sudden. The price increases are the result of accelerating demand growth, with supply not being able to keep up owing to a number of different factors, none of which alone would have been sufficient to trigger large price increases. It should be noted that the acceleration in oil demand was modest, since annual increases in global oil consumption were still relatively small in both 2004 and 2005. The supply-side factors (reduced oil exports from Iraq, hurricane damage to oil wells and refineries in the United States) were also relatively modest compared with total oil production. Taken together, however, the changes in supply and demand were sufficient to initiate and sustain a steady rise in prices from 2003. Once the price rise had gathered momentum, speculative buying, both by those who wanted to protect their security of supply and by those who saw an opportunity for profit, was sufficient to increase prices to record levels. The fact that refining capacity was close to fully utilized led to a rise in refining margins (see table 2) and a rise in product prices that exceeded the rise in the price of crude oil and reinforced the impression of a crisis.

Table 2. Refining margins in selected regions, $ per barrel

Refining	Margins	1998	1999	2000	2001	2002	2003	2004	2005
NW Europe									
Brent	(Cracking)	1.58	0.70	3.37	2.05	0.75	2.34	3.77	4.67
Mediterranean									
EsSider	(Cracking)	1.46	0.82	3.67	2.28	0.92	2.53	4.76	5.79
United States Gulf Coast									
Brent	(Cracking)	0.33	-0.70	0.57	0.43	-0.35	0.75	0.60	2.50
United States West Coast									
ANS	(Cracking)	2.19	3.30	4.65	4.78	1.56	2.80	5.30	5.38
China									
Dubai	(Hydrocracking)	0.28	-0.37	0.71	-0.25	-0.53	0.59	3.26	3.33

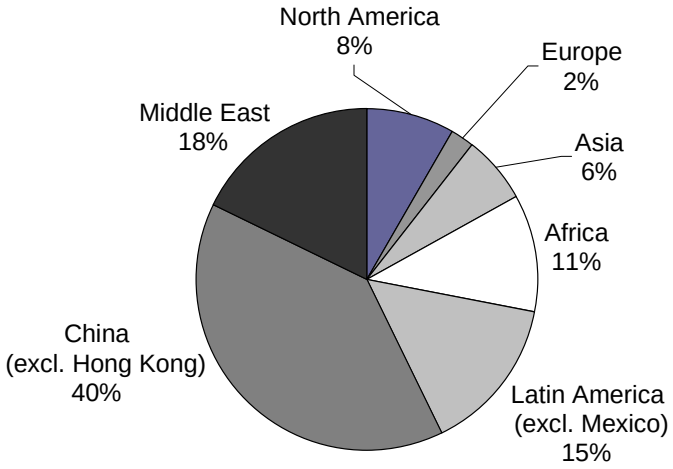
Source: International Energy Agency (http://omrpublic.iea.org/currentissues/sup.pdf).

5. Given the tight balance between supply and demand, prospects for continued rapid growth in oil demand in Asia and reports of shrinking reserves, it is natural that the question is raised as to whether this oil price increase is more permanent than the previous ones, and it is not surprising that the spectre of physical exhaustion of oil reserves appears again, as it did in earlier boom periods.

6. It is not the intention here to assess the evidence for and against a possible exhaustion of oil reserves, nor to make long-term forecasts for oil prices. However, the main points of the arguments deserve to be briefly summarized in order to sketch the main contours of the "new energy economy" as at least a strong possibility.

7. On the demand side, it should first be noted that the rapidly growing Asian economies account for an increasing share of demand growth — China alone represented 40 per cent of total growth in 2004 (see figure 2). This figure needs to be seen in perspective. Although China's oil consumption grew by 16 per cent in 2004, its share of total oil consumption was less than 8 per cent. Developed countries still account for the major part of world oil consumption, although their demand is growing slowly (see figures 3 and 4). Nevertheless, if oil demand in China and other Asian countries continues to grow at high rates it could offset the slowing down of demand growth in developed countries. Thus, in spite of the price increases that have occurred, it would be prudent to assume at least clearly positive rates of growth in world oil demand.

Figure 2. Shares of world increase in oil demand 2004 (regions as defined by IEA)



Source: International Energy Agency (http://omrpublic.iea.org/currentissues/sup.pdf).

Figure 3. Oil demand in OECD countries, million barrels/day

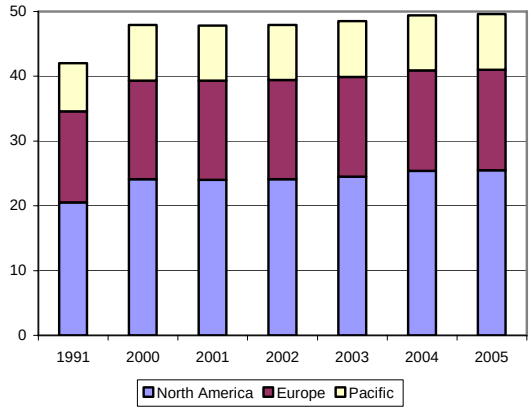
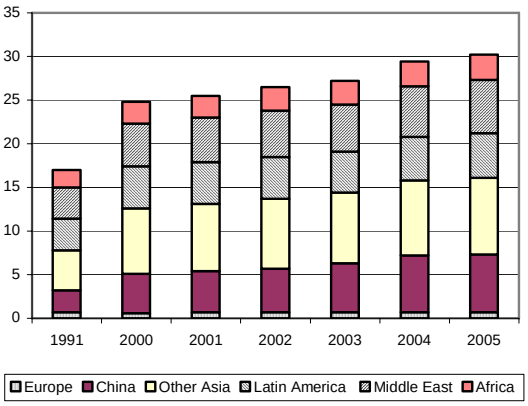


Figure 4. Oil demand in non-OECD countries, million barrels/day



Source: International Energy Agency (http://omrpublic.iea.org/currentissues/sup.pdf).

8. On the supply side, the crucial issue is the cost of marginal production. While oil from conventional sources can be produced at a cost of less than $30 per barrel, oil from deep sea wells and from wells in the Arctic may cost $40–60 per barrel to extract (International Energy Agency, *Resources to Reserves: Oil & Gas Technologies for the Energy Markets of the Future*, 2005). Heavy oil bitumen from deposits in Venezuela may have production costs of up to $40 per barrel, and oil shales may have costs of up to $70. While conventional sources of oil would undoubtedly meet demand for a very long time, even if used exclusively, it is not likely that they will be the only sources exploited. It is unlikely that producers of conventional oil will expand capacities to keep prices low and alternative sources off the market. A price that allows development and entry into production of unconventional sources of oil would suit all producers and, therefore, the cost of production from unconventional sources would be expected to set a floor for the price. A price significantly above that floor would probably not be sustainable, since it would lead to excess supplies.

9. Accordingly, for the purposes of the present paper it is assumed that oil prices will remain substantially above the past long-term trend for a considerable time. Also, it appears prudent to assume that the pattern of large price fluctuations that seems to have become established over the past few years will remain a feature of the market.

10. On these assumptions developing countries will face considerable adjustment problems. The success with which countries adapt to a situation with higher energy prices will depend on their natural resource endowments, physical geography and level of development. The challenges and opportunities of the adjustment process are reviewed below. The review is structured to look at two types of energy bearers that are important for developing countries, namely oil and gas, which dominate developing countries' energy use, and biofuels, which offer perhaps the best opportunity for diversification of the energy use of those countries. With respect to oil, the discussion distinguishes between the very different problems of net oil-exporting and net oil-importing countries.[1]

3. IMPACT OF HIGHER OIL PRICES AND OIL PRICE FLUCTUATIONS ON DEVELOPING COUNTRIES, WITH SPECIAL REFERENCE TO LDCS AND AFRICA[2]

11. Higher oil prices affect developing country economies at both macro- and micro-levels. A large part of the effects are transmitted through changes in terms of trade.[3] According to UNCTAD estimates, the terms of trade of countries with exports dominated by fuels increased by 30 per cent during 2002–2004. On the other hand, all fuel-importing developing countries with exports dominated by manufacturing experienced a deterioration in their terms of trade during this period. The terms-of-trade losses for East and South Asian economies with predominantly manufacturing exports in 2003 and 2004 ranged from 8 per cent for Taiwan Province of China to over 14 per cent for India. For some economies, including Colombia, Costa Rica, Viet Nam and South Africa, whose export baskets have significant shares of both manufactures and primary commodities, the effects were less pronounced. In the case of Malaysia and Mexico, where fuels account for one tenth of exports, the positive contribution of higher fuel prices largely offset the negative impact of trade in manufactures on their terms of trade during the same period.

[1] Other sources of energy such as nuclear, wind, solar and hydropower will not be discussed in this note.
[2] For a more detailed discussion of oil in Africa and LDCs, see UNCTAD (2006d).
[3] For a more detailed discussion of terms of trade and related effects, see UNCTAD (2005).

3.1. Macro-level effects

12. At the macroeconomic level, the impact of high oil prices differs dramatically between oil- importing and oil-exporting countries. Table 3 shows that differences between African oil importers and exporters have been significant, although several oil-importing countries have shown impressive growth rates in recent years, mostly thanks to price increases for non-fuel commodities. Net exporters, of course, benefit from windfalls, but even in those countries higher oil export earnings are partly offset by higher production and transport costs in other parts of the economy.

13. While oil use has declined in developed countries since the first oil shock in 1973, developing countries have significantly increased their use as commercial fuels have replaced traditional fuels and industrialization has picked up. According to the IEA, Africa's oil intensity (oil consumption in relation to GDP) in 2002 was 2.34 times higher than that of the OECD.[4] The impact of high oil prices is therefore strongly felt when oil prices spike, particularly in net oil- importing countries with very low per capita income. On average, the impact is estimated to be a 1.5 per cent drop in GDP for a $10 per barrel price increase and a drop of up to 3 per cent for very poor countries.[5]

Table 3. Real GDP growth in selected African countries (percentage)

	1997–2001	2002	2003	2004	2005	2006
Oil-exporting countries	4.1	4.2	7.8	8.3	6.8	8.0
Oil-importing countries	2.7	3.3	3.0	4.9	4.9	4.5
Sub-Saharan Africa	3.0	3.5	4.1	5.6	5.3	5.3
HIPC Initiative (completion point countries)	4.9	3.3	4.5	6.8	6.7	5.7

Source: IMF, *Regional Economic Outlook: Sub-Saharan Africa*, May 2006.

14. During the first two oil shocks of the 1970s and 1980s, inflation and unemployment increased dramatically in Africa and in LDCs. During the present upturn in oil prices, the experience has to some extent been reversed by the application of prudent monetary and fiscal policies. However, there are signs of inflationary pressures beginning to take hold. Companies are struggling with lower demand and higher energy costs as well as with demand for higher wages. A number of countries, including Burundi, Seychelles and the Democratic Republic of the Congo, have already seen inflation climbing rapidly. The African Development Bank predicts that current high oil prices, if sustained, will translate into an average increase in inflation of 2.6 percentage points for oil-importing African countries in 2006.[6]

15. One effect of the oil price increase is higher oil import bills. A survey of African importers by the African Development Bank shows that oil accounts for more than 15 per cent of total imports in 12 countries and for 10 to 15 per cent in 16 countries (See table 4).

[4] International Energy Agency. *Analysis of the Impact of High Oil Prices on the Global Economy*. May 2004.
[5] International Energy Agency. *Analysis of the Impact of High Oil Prices on the Global Economy*. May 2004.
[6] African Development Bank. "High oil prices and the African economy". Concept paper prepared for the 2006 Annual Meetings, Ouagadougou, Burkina Faso.

Table 4. Oil imports as a percentage of total imports

Category (in %)	Number of countries (2006)
Less than 5	5
5–10	14
10–15	16
15–20	10
20–25	1
More than 25%	1

Source: African Development Bank.[7]

16. In the United Republic of Tanzania, the cost of oil imports has risen from roughly $190 million in 2002 to about $480 million in 2006 for approximately the same amount of oil.[8] Mali's cost of imports quadrupled in 2005 from $100 million spent on oil imports in 1998. According to the World Bank, the oil price impact on heavily indebted poor countries (HIPC) between December 2002 and April 2006 is 4.7 per cent of their GDPs.[9]

17. External borrowing by oil-importing countries has increased significantly. The expected increase in sub-Saharan African oil imports of $10.5 billion in 2005 was more than ten times the annual debt relief received by all 14 African countries included in the 2005 G-8 debt deal.[10] This increase in debt as a result of higher oil prices undermines projected debt sustainability and could lead to another cycle of indebtedness and the need for additional debt relief (see table 5).

Table 5. High oil price impact on selected HIPC

Country	Estimated cost of oil (2002) Million $	Projected cost of oil (2006) Million $	Increase in annual cost (2002–2006) Million $	Projected debt relief from IMF/WB in 2006 Million $
United Republic of Tanzania	189	480	291	140
Ethiopia	231	589	358	78
Malawi	47	119	72	40
Rwanda	51	131	80	38

Source: Jubilee USA Network, "High oil prices: Undermining debt cancellation and fuelling a new crisis", Jubilee USA Network policy brief, July 2006.

18. Oil-exporting countries experience a different set of problems. Oil revenue has risen to unprecedented levels, generating massive windfall gains. In 2004 and 2005, the windfall gains that accrued to the Governments of nine oil-exporting countries in Africa exceeded $15 billion (see table 6). Research by the Overseas Development Institute estimates the surpluses generated by the eight largest oil exporters in Africa to be as high as $22 billion in 2006, growing to $35 billion in 2015 at current prices.[11] In oil-exporting countries of Africa and LDCs, the revenue flow resulting from high oil prices has caused real exchange rates to appreciate. This may weaken the competitiveness of a country's other exports and cause its

[7] African Development Bank, op. cit.
[8] http://allafrica.com.
[9] World Bank. *Factors behind Developing Countries' Resilience to High Oil Prices.* May 2006.
[10] http://www.commondreams.org/news2006/0713-09.htm.
[11] M. Warner. "Sustained oil, gas and mineral windfalls mean that Africa could fund a substantial portion of its own MDG financing gap". Overseas Development Institute, September 2005.

traditional export sector to shrink. The effect has been described as "Dutch Disease".[12] Remedies for the disease have been defined. They are mainly intended to reduce excess liquidity by placing — overseas — revenues that are surplus to the absorptive capacity of the economy. However, Governments may find it difficult to resist political pressure to use the revenues for worthy social programmes and they may not be able to apply the correct doses of fiscal restraint at the right times.[13] The issue of how to invest the surplus is also receiving growing attention. While prudence would dictate that the excess funds should be invested conservatively so as to provide income for future generations, it could be argued that it would be possible to invest in development without straining the absorptive capacity of the surplus country, for instance by placing the surplus in a fund for regional development. Discussions about possible arrangements are under way in African institutions such as the African Development Bank.

Table 6. Estimated government revenues from oil exports, 2003–2004, million $

Source of government revenue	Country	2004	2003	Windfall
Taxes on production — profits	Algeria	9 933.1	8 208.0	1 725.1
Taxes on production — profits, transactions and concessions	Angola	5 694.4	3 814.7	1 879.7
Profits (CEMAC) — direct input	Cameroon	673.3	613.5	59.8
Profits (CEMAC) — direct input	Congo	904.0	798.0	106.0
	Egypt	360.1	229.5	430.6
Profits (CEMAC) — direct input	Gabon	1 059.2	1 079.3	-20.1
Export revenues of NOC	Libyan AJ	10 27.1	8 532.7	1 994.4
Taxes on production + profits and profits (Profits = gross revenues less cash calls)	Nigeria	18 965.2	11 025.6	7 939.6
Profits (CEMAC) — direct input	Equatorial Guinea	1 263.3	775.5	487.8
	Africa (without other producers)	**49 379.7**	**35 076.9**	

Source: UNCTAD calculations based on data from Algeria Ministry of Energy and Mining, Sonatrach, Central Bank of Libya, Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC), Central Bank of Egypt, Central Bank of Nigeria, IMF and Angolan Ministry of Finance.

3.2. Micro-level effects

19. Outside the oil sector itself, a rise in oil prices has similar implications at the micro-level in both oil-importing and oil-exporting countries. It reduces the real disposable income of households outside the oil sector, particularly urban households (firewood remains the most widely used fuel in rural areas, particularly among poor people). It also raises production costs in most sectors, including both industry and agriculture, and may damage competitiveness.

20. Oil accounts for virtually all the fuel used in the transportation sector in Africa and LDCs. The impact on these economies when prices rise is therefore understandably great. Without the shield of price controls, the increased transportation costs resulting from high oil prices have a direct impact on the movement of goods. For instance, Ethiopia has made progress in increasing the rate of economic growth, but current high oil prices have pushed up

[12] The term refers to the Netherlands' natural gas find in the 1970s, which caused the real exchange rate to appreciate, in the process destroying the local industry's competitiveness as the cost of domestic production factors became higher and imports became relatively cheaper.

[13] For a discussion of the policy choices facing oil-exporting countries, see "The exposure of African Governments to the volatility of international prices, and what to do about it", UNCTAD/DITC/COM/2005/11.

transportation costs, thus raising production costs. This affects the competitiveness of the country's major export, coffee. Furthermore, a shortage of truck fuel is hampering drought relief in the south of the country.[14]

21. As shown by the case of coffee, the impact on export-oriented agriculture can be particularly severe. Agriculture employs the majority of the population in most countries in Africa and is important for both food security and foreign exchange earnings. However, farmers are now faced with increasing costs for fuel to operate farm equipment and irrigation systems. Moreover, higher costs of energy-intensive supplies such as fertilizer lead to diminishing use of these supplies and lower productivity.

22. Through their effect on government finances, high oil prices may also affect poverty reduction programmes in oil-importing countries as funds are reallocated to cover rising costs of fuel. Many countries have attempted to alleviate the effect of energy prices on poverty with subsidies.[15] While subsidies may help to mitigate the immediate impact of oil price increases, they may not be the most appropriate instrument to deal with high oil prices in the longer term. The burden on the government budget that subsidies represent may be unsustainable for most countries. Moreover, subsidies may also delay necessary adjustments in consumer behaviour and demand structure. Indeed, in some countries there appears to be considerable scope for reducing energy costs through market liberalization. In Hyderabad, India, for example, only the richest 10 per cent of households used liquefied petroleum gas (LPG) in 1980. Middle-class households used kerosene because they could not obtain LPG, a more efficient fuel. There was no kerosene for the poor because the limited amounts available for public distribution were bought by middle-class households. As a result, the poor had to use wood, which was even more expensive than kerosene. When the Indian Government liberalized energy markets and relaxed restrictions on the production and import of LPG, more middle-class households switched to LPG. Supplies of kerosene were then more plentiful and more available to the poor. Now more than 60 per cent of households in the city use LPG.[16]

23. The removal of subsidies has caused public unrest in several developing countries. In 2005, a decision to increase fuel prices by 30 per cent in Indonesia was met with widespread protests. The subsidies became unsustainable as a result of oil price rises, with the Government spending $6 billion on subsidies in 2004.[17] In 2005, several cities in Nigeria were paralysed by strike protesting against fuel price increases under a policy of deregulating the downstream sector. It is interesting to note that in both these cases subsidies were abandoned in net oil- exporting countries (although Indonesia is in the process of becoming a net importer of oil).

24. One consequence of oil price increases is that the Governments of oil-importing countries have incentives to make their domestic oil markets more efficient. Since the 1980s many developing countries have opened their energy markets to competition. However, competition with imports is difficult to achieve owing to the limited size of markets and indivisibilities in infrastructure such as port facilities. Consequently, refining and distribution of oil products tend to be natural monopolies that have to be regulated. There appears to be

[14] "Poorer by the gallon oil dependency", *International Herald Tribune*, 9 June 2006.
[15] Senegal's direct oil subsidies have risen from 35 million euros in 2002 to 180 million euros in 2006.
[16] http://www.worldbank.org/fandd/english/0697/articles/020697.htm
[17] http://news.bbc.co.uk/2/hi/asia-pacific/4307433.stm

room for increased cooperation between developing countries when it comes to oil procurement, including on tendering procedures. Financing oil imports is another area where gains could be made, particularly by using structured financing techniques more intensively.

3.3. Strategies for alleviating effects of oil price increases

25. With regard to oil-importing countries, all strategies to deal with oil price increases entail some sacrifice. The strategies differ mainly in the timing of the sacrifice. Cutbacks in expenditure are one way of absorbing the consequences immediately. If the consequences can be postponed and spread over a longer period, however, their impact on development may be less pronounced. Governments can avoid the impact of oil price increases by hedging oil imports through the purchase of derivatives such as options, futures and swaps.[18] However, this of course has to be done in advance of the price increase. Governments may also use compensatory financial mechanisms provided by the international financial institutions, the use of which is typically subject to conditionalities. However, the existing multilateral schemes for compensatory financing do not fully meet the needs of developing countries because they are often not large enough in proportion to shocks and are usually late in being provided. In this area there may be scope for strengthening South–South cooperation. For example, Venezuela recently launched a scheme, the Petrocaribe initiative, in which participating countries from the Caribbean region benefit from low-cost long-term financing to buy their oil. Under the initiative, when the price per barrel is greater than $50 only 60 per cent cash upfront is needed, while the remaining 40 per cent can be paid through a 25-year financing period, including a two-year grace period, at an interest rate of 1 per cent per annum. As part of the agreement, a fund is established for social and economic programmes, with Venezuela making an initial contribution of $50 million and additional contributions coming from participating countries.

26. With regard to oil-exporting countries, strategies focus on ways to avoid expanding export revenues leading to excess liquidity that in turn could cause Dutch Disease.[19] The strategies generally have two elements. The first is a decision rule that attempts to put a brake on government spending. Usually this is done (either explicitly or implicitly) by estimating a rate of growth of potential output and avoiding expenditure increases that are not compatible with this estimate. The second element is a method of sterilizing revenues that are surplus to current requirements and ensuring that they revenues are eventually put to good use. The use may vary, but it is usually either to preserve intergenerational equity by reserving funds for a future date when, it is assumed, the oil will have run out, or to smooth out cyclical economic fluctuations by releasing funds when oil prices fall or when some other indicator says that the economy needs an infusion of funds.[20]

27. As already observed, the issue of where to park the funds until they are to be reinjected into the economy one way or the other has attracted increasing attention recently. At a meeting of finance ministers in Africa hosted by the African Development Bank in 2005, a proposal was made for the Bank to establish an oil fund with voluntary contributions

[18] Various instruments and their advantages and disadvantages are discussed in detail in UNCTAD documents: *The exposure of African governments to the volatility of international prices, and what to do about it*, UNCTAD/ DITC/COM/2005/11, and *A survey of commodity risk management instruments*, UNCTAD/COM/15/Rev.2, March 1998.

[19] For an overview of strategies that have been used by mineral exporters, see www.icmm.org.

[20] In Chile, for instance, a stabilization fund for tax revenues from copper mining has been successfully used to even out fluctuations in public expenditure (see UNCTAD, 2006b).

coming from part of the windfall gains of major oil companies from oil-producing countries.[21] This type of fund, according to the ministers, could be used to help African countries absorb the shock and support African development efforts.

4. BIOFUELS[22]

28. The increase in oil prices has had the effect of improving the commercial viability of alternatives to oil. One group of energy bearers that has benefited particularly and that is of major potential importance to developing countries is biofuels. Biomass was the world's primary source of energy until the late 1920s. Today about 10 per cent of the world's energy use still derives from biomass, and this figure is as much as 80 per cent in developing countries. While use of traditional biomass such as firewood and cow dung is associated with health hazards and environmental damage, modern biofuels offer the promise of considerable improvement in these areas. They also hold out the prospect of reduced energy import bills and improved energy security.

29. The production of energy from biomass involves a range of technologies, including solid combustion, gasification and fermentation. These technologies produce liquid and gas fuels from a diverse set of biological resources — traditional crops (sugar cane, maize, oilseeds), crop residues and waste (wheat straw, rice hulls, cotton waste), energy-dedicated crops (grasses and trees), dung and the organic component of urban waste. The results are products that provide multiple energy services: cooking fuel, heat, electricity and transportation fuels.

4.1. Development implications

30. So far, the preferred path for bioenergy use in the transportation sector has been the conversion of traditional crops such as sugar cane and maize into ethanol to be blended or directly used in internal combustion engines. Soyabeans, jatropha and other oilseed crops can be converted to biodiesel fuel and used to extend or replace ordinary diesel fuel. In the long term, cellulosic ethanol, which is based on industrial transformation of cellulose fibre into ethanol, may offer better production economies. It can utilize crop residues or dedicated energy crops.

31. A sizeable increase in global biofuel demand would spur higher feedstock prices and provide an incentive for allocating more land to production of biofuel feedstocks. Developing country farmers generally find it difficult to diversify into new crops because of lack of experience with the techniques and, above all, because such diversification carries with it major risks. Poor farmers cannot afford to take such risks since the consequences for their livelihoods if the new crop fails or they cannot sell it are potentially disastrous. Accordingly, they are locked into a poverty trap where they cannot advance beyond subsistence agriculture. Diversification into biofuel feedstocks, however, can be a low-risk strategy for such farmers, since the demand is likely to be more stable than for most other crops. Risks are also lower because biofuel crops such as sugar cane have "dual uses". If the biofuel market is slow, farmers can carry out arbitrage between that market and the traditional food product market. Moreover, the reallocation of land to energy crops would also result in higher

[21] Communiqué of African finance ministers, November 2005.
[22] For a more detailed discussion of the development and trade opportunities offered by biofuels, see UNCTAD (2006c).

prices of traditional agricultural products, both products with "dual use" because of increased overall demand and products with which biofuel production would compete for land. This would result in resource transfers to rural areas in developing countries and increased income.

32. It should be noted that higher prices of agricultural products, although immediately beneficial to the two and a half billion people in the world who make a living from agriculture, are not in the direct interest of some vulnerable groups, particularly the urban poor. However, as has been noted time and again in the debate on liberalization of international agricultural trade, the dynamic benefits resulting from higher international prices, particularly in the form of higher rural incomes and incentives to increased agricultural production, are likely to considerably outweigh the losses suffered by food-importing countries and urban populations. Moreover, although not all developing countries possess the climatic and other conditions suitable for biofuel production, many biofuel crops, such as jatropha, can be grown on marginal and unproductive land. In such cases, income from biofuel crops will be wholly additional without any cost in terms of forgone production of other crops.

33. Biofuels production can provide positive development impacts beyond the cultivation of feedstocks. It will lead to higher employment and wages in the agricultural sector, increasing the demand for non-agricultural goods and providing a base for rural economic diversification. In addition, the sugar and maize experience in Brazil and the United States indicates that the infrastructure for transformation of feedstock into biofuels is likely to be located in rural areas, close to where the feedstock is grown. In this case, construction and operation of those facilities will generate additional economic activity in rural areas. Transportation of the feedstock to the plant and distribution of the fuels could require additional infrastructure, the cost of which would be borne by biofuels production. The improvement of infrastructure would benefit rural areas and the marketing of other rural products.

34. The needs of processing infrastructures are different, depending on whether production is for local communities, national markets or exports. Biofuels can be vegetable oils which are used to run diesel power generators in remote communities. This is the case in some places in West Africa where a power generator is used to produce electricity for artisanal activities in the villages (e.g. blacksmiths, mechanics, carpenters) and also to power various tools, such as cereal mills, huskers, alternators, battery chargers, pumps, welding and carpentry equipment.[23] In such cases, the processing of feedstock into biofuels is simple and can build on existing infrastructure. For instance, oil from the nuts of jatropha trees that are used to fence fields can be used as biofuel. The nuts are not eaten because of their toxicity.

35. The potential exists for significant resources to move into agriculture and rural areas, creating a unique opportunity for development. Developing countries that can produce sizeable quantities of feedstock could benefit not only from an increase in agricultural production, but also from the establishment of a new energy sector with export potential.

36. Despite their potential for contributing to sustainable development, engaging in large-scale production of biofuels in developing countries also entails challenges, including the effect of production of energy crops on other land uses, the overall environmental impact

[23] The multifunctional platform; http://www.ptfm.net/old/mfpwhat.htm.

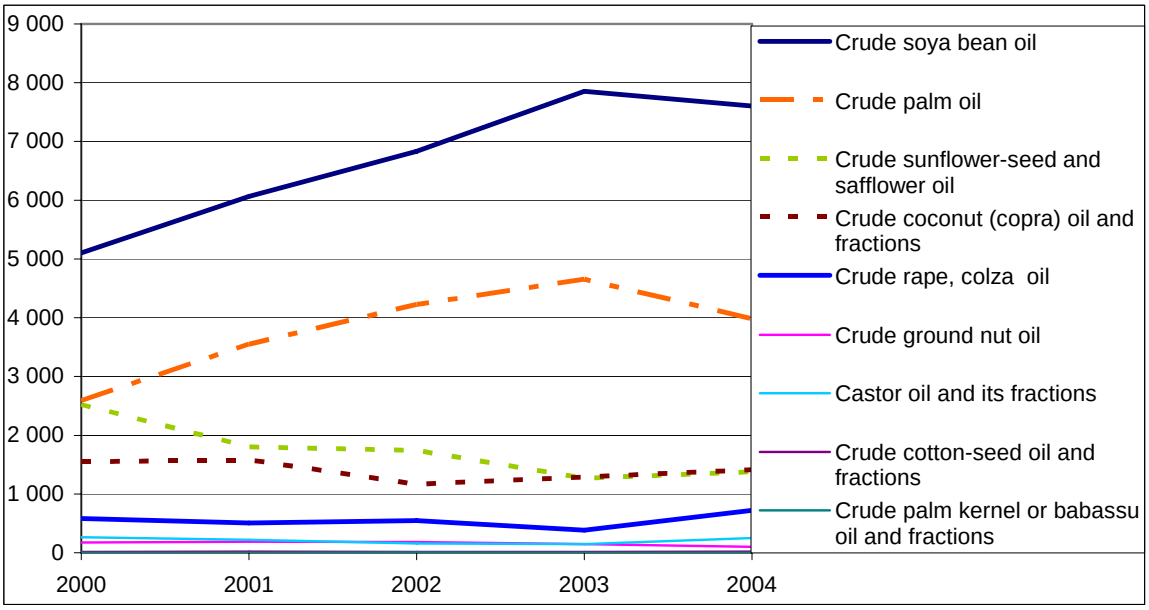
of biofuel production, the inclusion of small producers in this emerging market and developing countries' access to new bioenergy technology. Environmental concerns regarding feedstock production relate to the risk that increasing biofuel demand may lead to the cultivation of previously uncultivated land, which could include land with a high environmental value or a high level of stored carbon, or encourage monoculture with related adverse impacts on biodiversity. Environmental risks may also relate to the way in which feedstock is cultivated or processed. Furthermore, it is important that small producers be able to benefit from the new dynamism of the sector. To facilitate small farmers' involvement, organizational support should be provided to them. Finally, developing countries' involvement in R&D will require access to relevant technology.

4.2. Trade in biofuels

4.2.1. Evolution of biofuels trade

37. International trade in ethanol has increased rapidly during the past few years. Brazil is by far the largest exporter, and saw its exports increase from about 200,000 tons in 2000 to 1.8 million tons in 2004. Feedstock for ethanol is essentially composed of sugar cane and sugar beet. The international market for biodiesel is at a very early stage compared with that for ethanol. However, trade in vegetable oils that can be used to produce biodiesel has grown significantly, and this may be partly attributed to the production of biofuels.

Figure 5. World export of selected vegetable oil (thousand tons)



Source: UNCTAD secretariat calculations based on COMTRADE.

38. Figure 5 shows that trade in two types of oil, palm oil and soya bean oil, has increased. Palm oil exports almost doubled from 2000 to 2003, reaching almost 4 million tons in 2004. Soya-bean oil exports increased by 50 per cent from 2000 to 2003 to reach 7.6 million tons in 2004.

39. The increases in trade of some of the oils, such as soya bean oil, are mainly due to rapidly rising Chinese demand, driven by improving living standards and changes in the composition of food demand,[24] and less to biofuel demand.

40. The evolution of palm oil trade differs from that of soya bean trade. Palm oil is used in cooking in many developing countries but not in developed ones, except for food manufacturing. While it is hard to determine the final use of palm oil, developed countries, especially European ones, are the only ones to use palm oil as source of both food and energy.

41. European countries are the main biodiesel producers, and rapeseed oil is their primary feedstock. This oil is also used to feed animals and for human consumption. Between 2000 and 2004, world crude rapeseed oil exports increased by 25 per cent, while the share of EU exports fell from 36 to 9 per cent. The increase in biodiesel production in the EU from 715,000 tons in 2000 to 1.9 million tons in 2004,[25] while rapeseed oil production remained constant at about 3.6 million tons,[26] could partly explain the decrease in EU rapeseed oil exports over that period.

4.2.2. Competitiveness of developing country biofuel producers and barriers to trade

42. While the potential advantages of biofuel for developing countries from the point of view of energy diversification and rural development are evident, success in producing biofuels for export may be more difficult to achieve. For small and medium-sized developing countries in particular, the role of international trade in developing industrial-scale biofuel production is critical, since their domestic markets for biofuels are small. Accordingly, these countries will need to have access to foreign markets in order to develop biofuel production.

43. As shown by tables 7 and 8, production costs of biofuel are considerably lower in developing countries than in the developed world. Therefore, the most cost-effective way of reaching the objective of replacing fossil fuels and slowing down global warming would be for developed countries to import biofuels from developing countries. While it is unlikely that developed countries would be able to meet all their requirements this way, it is equally unlikely that they will be able to meet them if they rely wholly on domestic production.

Table 7. Production costs of ethanol

Feedstock used	Cost in euros (cents/litre)
Sugar cane, Brazil	20
Sugar beet, EU	50
Wheat, EU	45
Maize, USA	30

Source: *Biofuels for Transport: An International Perspective*, IEA, 2004, and São Paulo Sugarcane Agroindustry Union, 2005.

[24] See UNCTAD (2006a) for a discussion of the change in composition of Chinese food demand.
[25] Source: *Biofuels Barometer*, EurObserv'ER, May 2006.
[26] Source: FAOSTAT at http://faostat.fao.org.

Table 8. Production cost of vegetable oils

Feedstock	Production cost ($/ton)
Soya bean oil, Brazil	210
Soya bean oil, USA	420
Palm oil, Malaysia	220
Palm oil, Brazil	230

Source: "Liquid biofuels for transportation in Brazil", Fundação Brasileira para o Desenvolvimento Sustentável, funded by the German Government and coordinated by Agenor O.F. Mundim, November 2005.

44. The international community has agreed on measures to stimulate actions that will reduce emissions of greenhouse gases. Some of these measures have the effect of enhancing the competitiveness of biofuel production in developing countries. One measure included in the Kyoto Protocol is the Clean Development Mechanism (CDM). Annex I (developed) countries have committed themselves to reducing, by 2012, their greenhouse gas (GHG) emissions by at least 5 per cent compared with their 1990 emissions level. Each GHG-emitting company in Annex I countries has a quota of maximum emissions. The CDM allows companies in developed countries to assist developing countries in implementing projects identified as contributing to the effort to reduce GHG emissions and to count the resulting reductions as if they had been made by the companies themselves.

45. For the EU, the Kyoto Protocol represents an effort aimed at a 13 per cent CO_2 eq reduction in relation to 2005 emissions. The EU forecasts that it will need the CDM for at least 3 per cent of the total effort. CDM funds have been put in place to help private companies use the CDM. It is estimated that several hundred million euros will be invested by those funds.

46. Notwithstanding these efforts, there are several obstacles to the expansion of trade in biofuels. Tariffs on biofuels are significant, as shown in tables 9 and 10, and fuel quality standards may constitute obstacles to trade expansion. The Fuel Quality Directive of the EU sets requirements on fuels, including volatility (evaporation) criteria that bioethanol-based mixes (even at 5 per cent) cannot meet. Furthermore, imports into the EU are limited by stringent standards on ethanol quality, which set a very low authorized hydrocarbon content in ethanol. However, the tanks used to freight ethanol are the same as those used for petroleum products. Technically, it is almost impossible to completely remove petroleum traces in the tanks and, therefore, the ethanol will contain these traces. Moreover, this ethanol will also later be processed with hydrocarbon compounds. Exporters find it difficult to understand the problem of hydrocarbon traces in ethanol.

Table 9. Tariffs on ethanol imports in selected countries[27]

	Applied tariffs	Equivalent ad valorem
EU	19.2 € cts/l	34%
USA	54 $ cts/gal	20%
Japan	0%	0%
Brazil	20%	20%
Canada	4.92 $ cts/l	5.5%
Australia	5%	5%

Source: UNCTAD secretariat calculations based on TRAINS.

[27] Tariff equivalents in percentages have been calculated with an ethanol price of 0.7 US$/l. Exchange rate considered: 1.25 US$/EUR; 1.3 CA$/US$.

Table 10. Tariffs on vegetable oils in selected countries

MFN tariffs	Crude palm oil	Rapeseed oil	Soya bean oil
EU	1.9%	4.8%	4.8%
USA	0%	3.2%	19.1%
Japan	3.5%	10.9 yen/kg	10.9 yen/kg
Brazil	11.5%	11.5%	11.5%
Canada	6%	6%	4.5%
Australia	0%	5%	5%

Source: UNCTAD secretariat calculations based on TRAINS.

47. The Fuel Quality Directive also sets blending ratio limits for diesel and petrol, citing technical reasons. Diesel must not contain more than 5 per cent in volume of biodiesel (equivalent to 4.6 per cent in energy terms). This volume constraint limits the development of biodiesel, and is even in contradiction with the Biofuels Directive, which had set reference values of 5.75 per cent of market share for biofuels by 2010 (in terms of energy). The European Commission is currently preparing to modify this Directive.

48. In addition to being held back by high tariffs and technical barriers to trade, the development of international trade in biofuels is held back by the existence of domestic subsidies.[28] As the commercial viability of biofuels production has become more realistic, the calls for subsidies from farmers' organizations have become louder, which may also be motivated in part by the hope of recovering in biofuel subsidies what they may have to give up in agricultural subsidies in the context of the WTO negotiations on agriculture. Given the evident possibilities of arbitrage between production of feedstock for biofuels and food production, such attempts may not only choke off the development of an international market in biofuels, but also dilute the effect of an agreement on agricultural trade in the Doha Round. While incentives may be necessary for achieving the expansion in biofuel use that is desired for environmental reasons, they can easily be designed so as to be neutral between imported and domestically produced biofuels.

5. CONCLUSIONS AND ISSUES TO BE ADDRESSED BY EXPERTS

5.1. General issues

49. Developing countries, both exporters and importers of oil, are facing major challenges in trying to adjust to recent developments in the energy sector — higher prices, greater price fluctuations and increased uncertainty. Most countries will review their energy mix with a view to increasing the proportional contribution from sources of energy that (i) have lower and more stable prices, such as natural gas, that (ii) do not increase emissions of greenhouse gases, such as wind or solar power, and that (iii) enhance energy security and stimulate rural development, such as biofuels.

Questions to experts

- What policies can be used to move towards a balanced energy mix?
- How can the international community best assist developing countries in moving towards a better energy mix?

[28] For an overview of domestic support to biofuels production, see UNCTAD (2006c).

- What alternative forms of energy offer are particularly promising for developing countries?

5.2. Oil-exporting countries

50. With regard to oil-exporting countries, the most important challenge is to channel the additional revenue from higher oil prices into investment in human and physical capital while maintaining macroeconomic stability and promoting economic diversification. Increased transparency about taxes and other conditions relating to investment and trading arrangements is critical to the credibility of government policies in this regard. Alternatives to traditional placements of surplus oil revenues deserve to be analysed, particularly from the point of view of the potential role of oil revenues in supporting regional cooperation on concrete development projects such as improved infrastructure.

Questions to experts

- What lessons can be learned from experiences in managing revenues and risks with large energy-sector revenues? Can useful experiences be found in examples from countries that depend on other types of exports, such as hard minerals?
- How can the linkages between the oil industry and the rest of the economy be strengthened?
- How can surplus revenue be more effectively channelled to promote development, and what should be the regional dimension?
- How can the transparency of revenue flows in the oil industry be improved?
- What are the institutional arrangements and policies needed to promote regional energy cooperation?

5.3. Oil-importing countries

51. Oil-importing countries are under strong pressure to change their energy mix in the long term. In the medium term, they need to optimize their oil-refining and distribution systems, and they need the support of the international community to manage the shock to their balance of payments, to incomes and to development programmes. Since the impact of a given oil-price increase is relatively simple to estimate in advance, it should be possible to make financing under compensatory schemes more automatic and to attach fewer conditionalities to it.

Questions to experts

- How should oil-importing developing countries manage their exposure to price risks?
- What kinds of mechanisms would be effective in lessening the impact of oil price increases on oil-importing countries? How should they be funded?
- What is the role of regional cooperation in the management of oil-procurement, refining and distribution systems?

5.4 Biofuels

52. Biofuels production offers an attractive opportunity to meet several important development objectives at the same time: improved energy security, economic

diversification, rural development and improved integration into the international trading system. However, appropriate policies and regulatory frameworks have to be put in place for those opportunities to materialize.[29] The potential of biofuels is clearly recognized, but no progress has been made with respect to trade liberalization.

Questions to experts

- How can development gains from the production and domestic use of, and international trade in, biofuels be maximized?
- After the suspension of the Doha Round negotiations, how and where could the trade liberalization agenda for biofuels be implemented?
- How should the economic structure of a country, including its agricultural sector, its energy distribution networks and the size of the domestic market, be taken into account when policies affecting biofuels are being formulated?
- How can the transfer of new biofuel production technologies to developing countries be facilitated?
- How to enhance financing from the Clean Development Mechanism of the Kyoto Protocol to develop biofuels production?

[29]See UNCTAD (2006e).

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