The Gulf Crisis:
Implications for the Environment

Léonie Archer

Oxford Institute for Energy Studies

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The OIES Series of Papers on Gulf and World Oil Issues

The purpose of this series of eight papers is to analyse a number of oil issues - political, economic and industrial - which have always been important but which have acquired additional significance during the current Gulf crisis.

The analysis in each paper attempts to explain the nature of the problem at hand, the behaviour of economic agents in times of crisis and to draw policy implications for both governments and industry.

The series begins with a paper providing a political analysis of the Gulf crisis and of possible future developments. The other papers are concerned more specifically with oil and gas issues. The papers will appear weekly beginning on 3 October 1990 in a sequence in which problems with greater significance for the short term are dealt with first. The series then moves to issues with a long-term dimension (world economy, substitution of oil by gas, demand, environment).

The series extends significantly the work presented at a very early stage of the crisis (mid-August) in the Institute's study *The First Oil War.* Many new topics have been researched, and those addressed in *The First Oil War* developed in greater depth.

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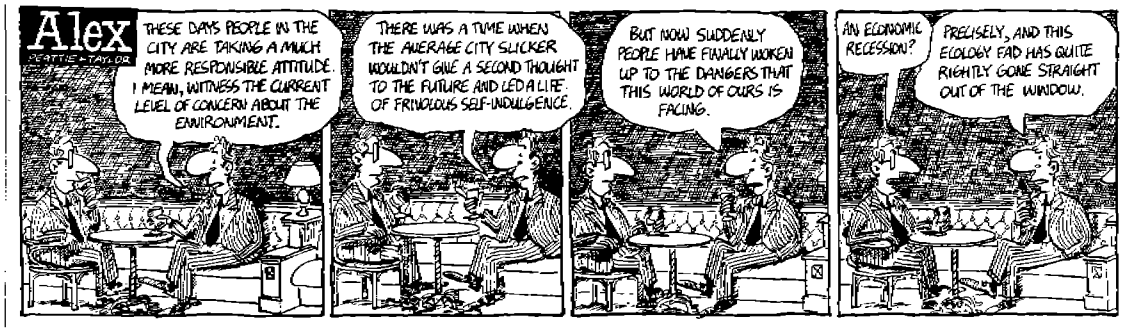

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1. Introduction: Conflict and the Testing of Commitment

The Gulf crisis has thrown into sharp relief matters of key concern to national, regional and global security. It has refocused political attention and jerked nations out of an earlier complacency regarding such varied but key issues as the Palestinian question, energy security and the development process. It occurs in a new global context of changed East-West relations, and historic developments in the Soviet Union and Eastern Europe. With political will, it could be the catalyst for accelerated action on another issue of global concern: the environment.

The immediate impact upon the global environment deriving from consumer behaviour, supply shortfalls, fuel substitution and the like following the imposition of sanctions on Iraq is relatively small. This will remain so even in the case of a "contained" military conflict in the Middle East (though war will doubtless have a very damaging impact upon the regional environment).

The fundamentals of environmentalism as perceived now in the 1990s - existing degradation to land, air and water quality and fear for future consequences of fossil fuel combustion - are ongoing and unchanged. The world is facing severe environmental degradation and the dangers of more to come: transboundary pollution, urban smog, acid precipitation, global warming. All of these pose serious hazards, which will be outlined in Section 2 of the paper, to human health and planetary well-being. All of them are substantially contributed to by the emissions from fossil fuel combustion[1]. World energy consumption, and hence also emissions, are on the increase. The developing nations of the world are rapidly expanding their slice of the commercial energy pie and the industrialized nations have since 1986 and the era of soft energy prices seen a return to

[1]Principally CO_x, SO_x, NO_x, and unburned hydrocarbons. CO_x is used throughout the paper as a collective term for CO and CO_2 (carbon monoxide and carbon dioxide); SO_x is used to refer to SO_2 and SO_3, with the former (sulphur dioxide) being the principal SO_x component of combustion emissions; NO_x (nitrogen oxides) is the umbrella term for NO (nitric oxide) and NO_2 (nitrogen dioxide), with NO_2 being the more toxic component.

more profligate energy consumption. Transport, the fastest growing energy sector and the only one in the OECD to see an increase in oil consumption during the post 1973 period of fuel substitution and conservation, is arguably the largest single source of global pollutants today.

This context is different to the previous oil crises of the 1970s. The mental map now incorporates the environment. Over the last twenty years there has been a closer meshing between economics and the environment, with energy being a significant link. In the 1970s global warming was not an issue in the public arena. Now it is on everyone's lips. Conservation, energy efficiency and fuel substitution in the wake of the first two price shocks were responses of a purely economic kind; now they are discussed in terms both of economic benefit and environmental protection. There is a new agenda, and whether people agree with its topics or not, they are obliged to consider them.

For energy and the environment the importance of the crisis in the Gulf and of analysis of events as they unfold, lies in what they tell us about how governments, industry and individuals are thinking. The significance lies in the use to which the current crisis might be put in support of perspectives, expectations and claims that now exist. On the one hand it has excited renewed calls by environmentalists for an urgent reassessment of our attitude toward current energy use and the planning of future energy policy; on the other, the opening of a new era of high oil prices has encouraged statements such as that by the American Petroleum Institute that there is "just the possibility that environmental extremism has peaked as people are worrying about their economic well-being" (*Platt's Oilgram News* 12 November). In other words, the crisis has encouraged both environmental bandwaggoning and equally vociferous calls for a return to policies of "sound energy and economics". The presentation is one of extremes: the procurement of supplies and energy security versus conservation and care for the environment. On the evidence from the crisis to date, price spikes and supply shortfalls would appear to result in calls for either increased exploration and production (E & P) or for savings of oil. Both views are understandable and rational; both have sprung from the same series of events. The question is whether after the initial panic has died down we will see a continuation of the economics/supply orientation or a shift in perspective and policy consequent upon the imperatives of the new environmental agenda.

The attitudes and expectations that are being evinced by consumers and producers, by the public, governments, oil industry and environmentalists provide the clues regarding possible future energy-environment pathways and as such must be closely scrutinized. This paper begins with a short survey of the environmental agenda as set for the 1990s. It then reviews in some detail the actions, reactions and statements of consumer countries worldwide during the first three months of the crisis. We note that the initial and predominant reaction was one of panic to secure supplies and make up for the loss of Kuwaiti and Iraqi oil rather than pursuance of demand restraint and conservation. However, shifts in orientation occurred in some countries once the initial panic had subsided and assessment of the squeeze could begin to be made. Within the review we consider the different regional reactions and impact consequent upon the crisis, both stranding them out to emphasize the differences (and paying particular attention to the developing countries which have largely been left out of the picture) and placing them in a global context as regional needs mesh and interact. Following the review we discuss

the implications for the environment, both immediate and for the future, of the energy responses to the crisis, for example the increased lignite burn in Eastern Europe or proposals to attain greater energy security by further investment in nuclear power, oil shale development and so on.

Energy is a necessity for development - for development in the countries of the "South" and Eastern Europe, and for furtherance of a lifestyle in the industrialized "North". Wealth, or at least a reasonably healthy balance of payments, is needed to address the very considerable environmental problems that we face. International co-operation is an absolute essential, as is reassessment of aid initiatives to the debt-strapped regions of the world. The Gulf crisis has drawn together nations for a cause, for pursuit of a common interim goal. In the light of the new agenda, could this be the basis for future endeavour toward longer-term goals that satisfy, as far as is possible, both energy needs and environmental imperatives? Will the crisis throw up new initiatives? Undoubtedly it will reinforce certain thinking, but in which direction?

In the psychology of human action, the notion of thresholds is very important. While the current crisis in the Gulf may be no more than a blip within the longer time framework of history and the broader contexts just outlined, it could be an important threshold.

2. Environmental Fundamentals: Changing Perspectives and the Development of an Agenda

In recent years there has been a phenomenal growth of concern for "green" issues - issues that were not in general circulation at the time of previous oil price shocks and supply crunches. There is a new public consciousness and a stated concern on political agendas for such energy related matters as acid precipitation, urban pollution and the greenhouse effect. We now know that acid precipitation, the result of action and reaction of SO_x, NO_x and unburned hydrocarbons (HCs), is destroying (and has destroyed) fresh water aquatic life and forests in Europe and North America; ground level ozone, formed by reaction between HCs and NO_x in the presence of sunlight, is the main component of photochemical smog and this is responsible for a range of respiratory problems in humans and damage to material infrastructure and plants. The general cocktail of emissions from vehicles in our urban centres - CO_x, NO_x, SO_x, HCs and other compounds - impacts adversely on human health, contributing in significant degree to such disorders as bronchitis, asthma, emphysema, general nausea and physical irritation. Some of the emissions are mutagenic, others possibly carcinogenic. The doubling of chest complaints in recent years in cities of the industrialized world has been attributed at least tentatively by medical authorities to photochemical smog and compared by them to the number of patients from the pea-soupers of the pre-war period - though with new complications. Smog in Athens is reckoned to claim as many as six lives a day; estimates for the USA of the impact of gasoline and diesel fuel use there run as high as 30,000 deaths a year, with the American Lung Association calculating that air pollution from vehicle, power plant and industrial fuel combustion costs the nation $40 billion annually in health care and lost productivity. For the urban centres of the developing world the story is worse: living on the streets of Mexico City is reckoned to entail the involuntary inhalation of the equivalent of smoking two packets of cigarettes a day. The extent of the environmental devastation to land, air and water from Eastern Europe's energy practices is just beginning to be fully appreciated.

The reality of global warming is also increasingly being agreed upon (though details of actual consequences have necessarily to remain a matter of speculation). In May this year scientists involved with the UN Intergovernmental Panel on Climate Change (IPCC), detailed to project the possible consequences of climate change, released their report: significant increase in human deaths from severe weather occurrences; coastal flooding and agricultural disruption/dislocation; mass migrations and displaced populations; epidemics and parasitic diseases relocated from the tropics to Europe; extensive soil erosion from drought even in the temperate zones, plus water shortages; greatly worsened air pollution, especially in the cities; and tremendous loss of species diversity as nature has too little time to adapt to changes.

We now appreciate that the principal greenhouse gas is CO_2, an inevitable by-product of fossil fuel combustion for which no feasible technical fix controlling mechanism exists. Current global output of carbon from burning fossil fuels is about six billion tonnes a year. We also know that world energy consumption is necessarily rising. As Stewart Boyle wrote just before the invasion of Kuwait:

> Under the "business-as-usual" scenario, developing countries will rapidly increase their energy demand over the next thirty-five years. Africa will increase commercial energy consumption by 124 per cent, Latin America by 145 per cent, India by 273 per cent and China by 158 per cent. Given that the OECD and Central Europe is also assumed to increase its consumption by between 45 and 90 per cent, global energy consumption, according to the IPCC, will rise from 370 exajoules to 774 exajoules. (*Oxford Energy Forum,* August 1990).

This scenario would have the effect of more than doubling emissions of carbon.

The consequence of this new awareness of such actual and threatened environmental degradation has been an explosion of discussion in both North and South by government, intergovernmental and non-governmental organizations, professional institutions, industry and business enterprises. We have already mentioned the work of the Intergovernmental Panel on Climate Change. As further example, in the declaration of the last Group 7 Summit Meeting in Paris no less than nineteen items of a total of fifty-six focused on the environment. In the same month (October 1989) EC environment ministers agreed to both individual and collective action to tackle the greenhouse effect. The study upon which the Commission based its energy policy declared that the challenge of the 1990s was to maintain economic growth while at the same time taking steps to stop or reduce global warming.

The invasion of Kuwait did not stop the discussion. In November the Second International Climate Conference took place in Geneva for discussion by governments of 130 countries on the issue of setting targets for stabilizing annual national emissions of greenhouse gases. In the same month the Clean Air Act was passed in the USA, a revision to the Clean Air Act of 1977 and a most far-reaching piece of environmental legislation. Amongst other things it mandated that only motor fuels cleaner than any on the market today be sold in the nine most polluted cities of the USA by 1995. In California the Air Resources Board adopted an even more rigorous clean air plan involving ultra-clean fuel and low emission vehicle regulations which will extend to the next century. A substantial number of cars will have to run on fuels other than gasoline - CNG, methanol, electricity.

Other smaller-scale initiatives also took place and may be seen as important indicators for possible pathways. For example, and staying with the USA, the Texas legislature resolved to seek the passage in 1991 of an Oil Spill Prevention and Response Act funded by a tax on crude and products (*Platt's Oilgram News* 31 August); California signed into law its own comprehensive oil spill legislation (effective from 22 September); and in Louisiana the Department of Environmental Quality refused to budge from its plans to ban the discharge of water from drilling operations, despite post-crisis urgings from the DOE. The oil industry too - again in response to mounting public awareness but also in anticipation of political development and to mend a tarnished image - took various environmentally responsible actions both large and small scale. These included the formation of an independent oil spill response organization - the Marine Spill Response Corporation, successor to the Petroleum Industry Response Organization set up after the Exxon Valdez spill (*Platt's Oilgram News* 7 September); work on reformulated gasoline and reduction in the sulphur content of diesel (Arco Products introduced its

second reformulated gasoline on September 6 and Texaco announced a new low-emission diesel fuel in late September (*Platt's Oilgram News* 7, 24 September); work on detailed environmental measures at drilling sites continued apace (*Oil & Gas Journal,* 17 September).

In our consideration of events in the first three months of the crisis and the possible longer- term directions that energy policies might take, this backdrop of environmental discussion and initiative must be taken on board. They were not abandoned in the face of the supply shortfall or higher prices. There was however an increasing gap between what was being said in international fora and what was being done. How would international and national response to the crisis feed into or divert from the imperatives of the environmental agenda? The context for absorption of, and reaction to, higher prices and supply shortfalls was different to previous crises, but would it make a difference when it came to the crunch?

3. Responses to and Impact of the Crisis

The weeks immediately following 2 August witnessed a flurry of activity and negotiation by consumer and producer countries to make up for some of the lost 4.3 million barrels per day (mb/d) formerly secured from the Iraqi and Kuwaiti oil fields. Panic surrounded the supply shortfall. Prices were volatile, to say the least. Regional imbalances and products shortfalls soon emerged. Demand in the industrialized nations went up some 3 per cent on the same quarter in 1989 (up 6 per cent in the Pacific OECD), with much of the increase attributable to secondary stockbuilding as the uncertainties of the Middle East situation took their toll on oil markets. The cash-strapped countries of Eastern Europe were particularly hit as they sought replacement supplies and new market sources following a decline in Soviet exports and the loss of Iraqi oil. The oil-importing nations of the developing world faced severe disruption, austerity programmes, and economic dislocation. Regarding the producer countries' ability to bridge the gap created by the embargo on Iraqi and Kuwaiti oil, fears regarding quantity were quickly associated with fears about quality: the replacement crude was expected to be heavy and high in sulphur. Refining capacity was strained. Some scheduled maintenance on plant and rig was postponed.

September saw a significant easing of the supply situation as OPEC made up about 80 per cent of the 4.3 mb/d lost after the embargo on Iraq. Increasing production in Saudi Arabia entailed an increase in gas flaring as fields without reinjection facilities were opened. Fears regarding the sulphur content of replacement crude eased as substitute supplies increasingly proved to be of slightly lower sulphur content than the lost supply, though of higher metals content. (The shift towards a heavier overall OPEC crude oil slate that accompanied the loss of Kuwaiti and Iraqi exports also started to reverse.) For the Far East, however, the move to boost distillate production by raising refinery throughput started a flooding of those markets with high sulphur fuel oil. Korea eased its earlier ban on products exports and relaxed its environmental regulations. As consumers worldwide continued to make up for the shortfall by supplies from different sources and producers upped their production and responded to consumer need for quick delivery, the pattern of worldwide tanker movement changed and the volume of oil at sea increased. Active product trade to the Far East and increased crude liftings from the Arab Gulf put more vessels on long haul voyages.

Despite the easing of the supply situation, fears within the industrialized nations for future energy security - fears which had been well and truly put back on the agenda following the invasion of Kuwait - encouraged calls for renewed E & P effort. So, for example, one month after the invasion Total chairman Serge Tcheruk announced that the company would have to "significantly step up investments in exploration and production" to make up for any possible long-term shortfalls in output caused by the Gulf crisis (*Platt's Oilgram News* 6 September); Greenland announced its belief that rising oil prices would restimulate interest in E & P in that area; and Elf, like Total, set its sights on various hot-spot acreages in West Africa, the Soviet Union and the Far East. More immediately, in the USA on late 3 August, Senator Murkowski successfully attached an energy security amendment to the Defence Department authorization bill. The amendment centred upon opening up the Arctic National Wildlife Refuge (ANWR) to drilling. While no action was taken in respect to the amendment, debate on the opening

of ANWR remains high on the agenda for the next Congress. The idled Point Arguello project offshore California was also spotlighted by both the oil industry and US administration as a way to up domestic production (production from the area had been prevented by dispute between Chevron and Santa Barbara County over how best to transport the oil in both an economical and environmentally sound way). Negotiation to combat the impasse while satisfying environmental requirements accelerated. According to Energy Secretary James Watkings, speaking in the second week of the crisis, the project could potentially bring 75,000 b/d to US production within six months to help fill the gap created by the embargo. Fears were expressed in California that oil companies might use the threat of war in the Middle East to increase offshore oil exploration and call for a reversal of the June initiative of a ten-year ban on offshore drilling. At the time of writing this paper no decision to reverse the moratoria had been announced. Much attention was also focused on increasing production from the Alaskan North slope.

In addition to consumers looking to crude and products supplies, they also turned to a limited extent to fuel substitution to meet their energy needs - limited because in the main analysts saw little opportunity for significant fuel substitution, unlike the case in the 1970s and early 1980s. A US DOE analysis one week after the invasion of Kuwait claimed that some 500,000 b/d of oil could be saved by industrial end-users and electrical utilities switching to natural gas (a replacement for just 3 per cent of US petroleum consumption). In the UK, however, the government turned to coal with electric utilities cutting purchases of heavy fuel oil from 228,000 b/d in July to a mere 31,000 b/d in September in favour of that cheaper resource. Lignite burn in Eastern Europe increased.

Although actual substitution in the industrialized countries was limited - and feared to be so for the future - calls for renewed effort in this area continued apace. As the weeks went by natural gas came increasingly on the agenda as the fuel choice for the longer term. Thus in September Belgium announced its intention to make greater use of gas from "more dependable sources" in various (unspecified) sectors in order "to combat rising oil prices and curb pollution" (*Platt's Oilgram News* 17 September); in the EC energy ministers were advised by their representatives in Brussels to authorize the scrapping of a sixteen-year-old EC decision aimed at discouraging member states from building gas-fired power stations, a decision made in response to fears of gas shortages that emerged after the 1973 oil shock; in Canada many homeowners used their annual pre-winter furnace maintenance checks to convert from oil to gas, the primary reason being, according to survey, their uncertainty over oil prices in the continuing Middle East crisis.

Again with a view to the longer-term satisfaction of energy needs, renewable sources and alternative fuels also got a look in with statements from the US industry about the need for a serious reassessment of the potential of solar, geothermal, tidal, wind and wave power. In Brazil President Fernando Collor de Mello called for a revitalization of the country's ten-year programme for substituting alcohol for gasoline. Attention was also given to financial incentives for greater development of oil shale projects for synthetic crude production, coal gasification and coal liquefaction, whilst at the end of August the IEA announced its intention "to take a further look at nuclear power" (*Platt's Oilgram News* 4 September). Its statements regarding enlarged nuclear programmes were echoed

from various quarters throughout September and October.

In the first few weeks of the crisis many industrialized nations sought to control the upward pressure on retail prices by exhortation or legislation: in the USA government officials demanded, with some effect, that oil companies restrain increases in gasoline prices; in Japan, MITI cautioned retailers against rising prices; other Far Eastern countries continued their tradition of government-controlled pump prices to maintain a stable retail price; and in Europe we saw Britain appealing to oil companies that "prices should not be higher than strictly necessary" (Prime Minister Margaret Thatcher, reported in *Weekly Petroleum Argus* 10 Sepember) whilst France, West Germany and Italy investigated price rises or imposed price freezes. As the weeks of the crisis went by, such attempts to control prices lessened. So, for example, Italy reversed its decision to impose a price freeze, while the IEA recommended to its member states a full price pass through to the market together with better information to the public on market developments "in order to enhance the transparency of the supply/demand situation" (IEA Press Release, 28 September). Throughout, retail prices overall rose on pre-crisis levels. Fears of inflation and recession loomed.

The impact of the crisis on retail prices and products supplies in the developing countries of Eastern Europe and the "South" was, of course, substantially different to industrialized nations, in terms of the relative increase, consequent hardship, economic dislocation, and government action. In Poland, for example, the government increased gasoline prices by 35 per cent as from 1 September. This meant that for a person to put just one gallon of gasoline in a car was to spend nearly 1.5 per cent of an average monthly salary. Throughout the developing regions, for the person in the street the impact of the crisis was felt (as an average) far more than for the counterpart consumer in the industrialized nations. India cut imports and civilian domestic distribution by a mandatory 15 per cent in October, with a cross the board 25 per cent increase in products prices. Pakistan faced severe shortages of kerosine, diesel and fuel oil. Zambia came close to complete economic standstill: Iraq had previously supplied nearly all its energy needs.

With regard to actual supplies of crude rather than increased costs matters did start to ease for some developing countries as producer countries began to give them priority attention. Thus, the UAE assured India that it would increase oil supplies to that country to help offset shortfalls: 500,000 tonnes of crude additional to the contracted 1 million tonnes (India in turn made moves toward providing allocation for all available gas by reducing flaring (about 17 million cu.m./day is flared in the western offshore and 1.5 million cu.m./day in Assam). Saudi Arabia announced that in the context of the disposal of additional production it was to prioritize those developing countries most affected by the Iran/Kuwait cut-off: Turkey, Brazil, the Philippines, India, Pakistan, Bangladesh, South Korea and Taiwan.

While preferential treatment was accorded for supplies, however, terms were on a purely commercial basis. Already strapped for cash and debt burdened, these less well able to cope regions of the world were forced to budget extra amounts for crude and products purchases. The problem was not so much the availability of supply but the cost of buying it. Various estimates, in billions of dollars, of the additional cost to developing countries on the assumption of a price stabilized at $25/barrel or $30/barrel were made by the

UN, the World Bank and others. Whatever the validity of their calculations - the bases of which are unclear and the totals speculative - it was evident that the crisis had put a significant additional burden on most developing countries. Paying more for oil and interests payments and earning less from trade, they faced financial devastation. For Eastern European countries too the cost of meeting the higher oil prices and paying for non-subsidized energy imports was huge and the period abounded with increasingly articulated fears about the macroeconomic cost to the region of the crisis.

With regard to the prohibitively increased cost to developing countries and the feared severe economic dislocation, various calls for aid from the West were made by a number of industrialized nations: France announced its intention to raise the matter at the next meeting of the general assembly of the IMF and World Bank; Norway supported a proposal at the 24 September UN General Assembly that oil exporters "transfer some of their recent profits to those oil importing countries that are suffering the most as a result of the conflict in the Gulf"; several IMF countries were said to be working out plans to channel emergency aid to Jordan, Turkey and Egypt[2].

In addition to such possible initiatives for international co-operation and aid to the developing world there were also calls for increased dialogue between consumer and producer countries. For example, at the Oil and Money Conference in London on 19 October, the Iranian Oil Minister Gholamreza Aghazadeh called for all parties in the oil industry together to discuss the future of oil markets supply and demand. He said that if contacts between producers and consumers had not been possible in the past, the Gulf crisis provided "an excellent opportunity when the two groups can cooperate to ensure security of energy supply in a manner that could benefit both sides". He also stated that "the question of oil is much wider [than the question of stocks and how to release them] and the consuming nations will simply have to talk to producing countries over matters like the long- term issue of price capacity, investment, the environment, and alternative sources of energy" (*MEES* 29 October).

* * *

Although response to the crisis was very much supply oriented, both in the first instance and as we have seen continuing as the months progressed, there was a slight shifting of perspective once the initial panic had died down. Measures to restrain demand and curb consumption began to be discussed in addition to the drive to secure supplies. September opened with the IEA Press Release already referred to which recommended a full price pass through to the market. In the context of demand restraint and curbing consumption, the same press release emphasized the need to intensify conservation and efficiency measures. Conservation in some countries did in fact receive new impetus in September and October and this was in sharp contrast to the start of the crisis when the overriding image to the industrialized world was that of President Bush conspicuously consuming gasoline in his politicized motor launch. Consumption of crude in the non-Pacific regions

[2]These latter so-called "front line states" (Jordan, Turkey, Egypt) were later designated as the primary recipients of a US-led Gulf Crisis Financial Co-ordination Group, targeted to receive $10.5 billion of a $13 billion aid initiative.

of the OECD saw a decline, and the IEA made a sharp downward revision to its earlier projections regarding OECD oil demand in the fourth quarter (700,000 b/d lower than the forecast published in July). France set a new target of a 20 per cent reduction in gasoline consumption through a package including new speed limits and called for a widespread campaign of conservation to help the country adapt to the oil squeeze created by the crisis. Italy started drafting a scheme to cut national energy use by 10 per cent by 1995 by passing cost increases to customers and by implementing a massive public information programme on energy efficiency and conservation methods. Within the EC generally the pre-crisis initiative SAVE (Specific Action Programme for Vigorous Energy Efficiency) which calls for a 12 per cent cut in community consumption by 1995 through a mix of fiscal incentives, consumer information and technical effort (transport, buildings, appliances) was given sharper profile. Japan, already the most energy efficient nation, had already announced its intention to further curb consumption in a far-reaching programme targeted on the year 2010. It additionally stated its aim to stabilize CO_2 emissions by the end of the century. The USA however, despite expressing increasingly vociferous concern for the country's energy security and rising import bill, showed no political inclination to map mandatory conservation measures into either its immediate short-term response to the crisis or any longer-term energy policy. Voluntary conservation measures instead were urged on the public.

All told, responses to the crisis in the first three months after the invasion of Kuwait were predominantly supply oriented, both in the first instance of panic reaction, and later in proposals to meet longer-term energy needs. New perspectives of demand restraint did gradually come into the picture, but these were additional to the basic drive to secure supplies through greater development of indigenous resources, fuel substitution, E & P, and alternatives. The impact of the higher prices and products shortfalls was felt most severely in the developing regions of the world. However, although the gap between them and the wealthy industrialized world widened in terms of impact as the weeks progressed, in other respects such as the moves to international co-operation and western aid initiatives, it narrowed. Throughout the three months there was the backdrop of environmental factors, even if such factors were in the main rejected or pushed down the agenda. We shall now examine the implications for the environment, both immediate and longer term, of these various responses.

4. Implications for the Environment

4.1 The Negative Side of the Balance

Some of the developments in the first three months of the crisis had actual and immediate, though limited, negative impact upon the environment and these should be noted at the outset before we turn to consideration of possible longer-term implications.

As noted in the review, the Far East had a particular flooding of high sulphur fuel oil: Korea lifted its restrictions on sulphur emissions, and whilst banning other products exports, allowed exports of its excess supplies of high sulphur fuel oil and high sulphur gasoil. Japan did not lift its own environmental restriction on the use of high sulphur fuel oil for power generation but MITI was increasingly forced to consider lifting the country's export ban, in which event additions to an already oversupplied market of a less than environmentally friendly commodity would be made. We have seen in our review of environmental fundamentals that SO_x are a primary contributor to acid precipitation. Similarly, switch by some utilities to coal burn rather than fuel oil or gas caused an immediate though limited (because actual substitution was minimal) increase of atmospheric CO_2 and SO_x. In terms of hazardous emissions, and particularly CO_2, the principal greenhouse gas, natural gas is the "greenest" of the commercial fuels. Coal sits at the bottom of the pile. Increased brown lignite burn in Eastern Europe impacted upon an already severely degraded environment. The atmospheric burden of hazardous emissions was also added to by the increased gas flaring in Saudi Arabia. Finally, the postponement of some scheduled refinery maintenance also had an immediate impact. Delaying maintenance such as decoking pushes up the immediate levels of toxic emissions from the refining process. (It also presumably increases the risk of accident which could have impact on land, air and/or water quality. Regarding the possibility of accident, attention should also be given to the fact noted in our review of the way in which patterns of tanker movement changed as the crisis developed. With more oil afloat, the greater the risk of oil spill and the longer such changed patterns persist, the more this risk increases).

Much more worrying than these actual impacts, however, are the longer-term environmental risks associated with the various proposals within the industrialized countries to further domestic energy security. To this category of potential environmental impact belong such matters as the renewed calls for investment in nuclear power and the Brazilian announcement about its national alcohol programme. Regarding the first, whilst nuclear may be the "greenest" commercial power resource in terms of its zero emissions of CO_x, SO_x, and NO_x, its potential for devastating environmental costs through accidents has been horrifically demonstrated. Any calls for renewed programmes of nuclear investment must weigh this frightful environmental cost in the balance. They must also consider the as yet unresolved problems of safe waste disposal, and clearly map in the much longer-term environmental dangers and very considerable economic costs of decommissioning. These as yet have not been fully taken on board or articulated in the public arena. Regarding the second, while running cars on alcohol from biomass clearly also cuts down on the CO_x, SO_x and NO_x emissions, it is not the environmental panacea it might at first appear. The pre-crisis Brazilian ethanol programme had already encountered significant problems and created new ones: in terms of the immediate

environment, distillery waste discharged to lakes and rivers had severely degraded water quality and the long-term effect of monoculture sugar cultivation on soil quality was open to serious speculation.

Also belonging to the category of potential impact are the possible implications of the worldwide glut in fuel oil which developed as the crisis unfolded. These implications need to be considered in the context of a highly significant recommendation by the IEA in September that there be a "temporary flexibility in the application of environmental measures" (IEA Press Release 28 September). If the price fits, the worldwide market saturation in fuel oil could lead to a more wholesale switching by utilities in non-dedicated power plants from gas or coal than was the case in the early weeks of the crisis. The relative ranking of coal, gas, and oil in terms of hazardous emissions has already been indicated. A move from gas would, environmentally, be a backward step; from coal a forward one.

The calls for a furthering of investment in synthetic crude production, coal gasification and liquefaction also did not augur well, both in terms of implications for the environment and for what such calls evinced of a possible throwback. Production of synthetic fuels has had a long and patchy history. Interest in them was particularly revitalized in the 1970s and early 1980s but then faded as the economics of such production became increasingly untenable in the new world order. Environmentally they were repeatedly shown to have serious drawbacks: oil shale pyrolisis generates significant volumes of air pollutants, and any fuel option employing coal as a feedstock necessarily poses the most severe threat compared to other feedstocks. Despite advanced technologies, coal gasification plants continue to have high levels of fugitive emissions to air and water of CO_2, NO_x, SO_x, non-biodegradable trace elements (arsenic, uranium etc) and carcinogenic compounds. Coal liquefaction generates the same general emissions but with more carcinogenic and mutagenic material than gasification. The resultant fuels and their use to some extent continue the problem. A return to increased synthetic fuel production would be an unwelcome revisiting of the past.

All of the consumer nations' considerations of fuel substitution, enlarged nuclear programmes, further development of synthetic crude production and the like show that the principal perspective within the industrialized countries was one of seeking solutions to their energy problems by various supply routes. For the environment, this was the most worrying dimension of the response in the first three months of the crisis. The reactions and actions were not heartening - particularly if they proved to persist to the longer term. The predominant orientation of securing supplies, the overriding concern initially to close the gap caused by international embargo on Iraqi and Kuwaiti oil and make up the numbers did not augur well - this especially in the industrialized countries.

In the first instance, and at the most general level, any environmentally sound policy must take as its starting point the perspective of end-use, not supply. Energy is of course only of use for the service it provides: dump a barrel of oil a day on a consumer's doorstep and say heat your house, run your business, drive your car and the reaction will be consternation, to say the least. To think therefore only in terms of X million barrels a day, to seek to claw a way back to pre-crisis supply level seemingly in abstract of other considerations and policy action and as if such levels were some kind of god-given

absolute, is a dangerous and short-sighted route to follow. Such action by governments also gives out the wrong signals to the consumer in the street. There is a danger that we become fixated on figures and forget that what in fact counts is the end product. If the same service can be attained using alternative energy sources or, more importantly, by using less energy, several needs are met: consumers', governments', the environment, and in the long run, producers'. We shall return to the economic and environmental benefits of energy efficiency and conservation for both industrialized and developing countries later in the paper. For the moment it is salutary to bear in mind that according to the US DOE estimates made in August, the simple energy efficiency expedient of drivers maintaining proper tyre pressure on their vehicles would save the USA around 100,000 b/d - 25,000 b/d more than the figure which the Department attached to possible production within six months from the Point Arguello project should it be opened.

In terms of giving consumers a proper signal, the efforts made by some industrialized countries to control retail prices was also a step in the wrong direction. Whilst such measures may in the short term hold down inflation, they put no restraint on consumption and could in the long term aggravate the (perceived) supply crisis that the governments sought to address. Consumption needs to be cut, by allowing prices to rise, in order to meet both energy and environmental needs[3]. This is, moreover, not just an imperative in the context of the present crisis, but also in the context of longer-term energy and environmental needs. World demand for oil has been steadily increasing in the last four years. Even without the Gulf crisis a supply crunch in the mid to late 1990s was widely expected. A crunch point was also to be reached in terms of global emissions of CO_2 and other hazardous emissions from fossil fuel combustion.

(As an extreme case, it could of course be argued that imposing domestic price controls now could in fact dampen demand in the longer term more dramatically than if no attempts were made to limit the pass through of oil price hikes resulting from the Gulf crisis: control in prices would distort the functioning of the market, lead to more product shortages and ultimately give rise to stronger upward pressures on prices, possibly taking us to the type of price levels seen in the 1970s which did result in dramatic conservation and fuel substitution measures, as well as long gasoline queues. Such action is not, however, to be recommended, not least because of its impacts on the economies - and consequently also the environment - of Third World countries and the states of Eastern Europe.)

To return to the industrialized nations, the calls for increased E & P, often presented in seeming isolation to other energy security routes, was also worrying. In the first place, such calls of course were part and parcel of the same obsession with secure supplies already discussed, but within a longer time framework. Indeed, because of this framework and the fact that E & P could not answer any immediate needs, such calls

[3]Such a full price pass through would apply to all energy sectors - industry, residential, transport - but would need to go hand in hand with targeted government subsidy for those members of society less well able to pay (the old, the poor). In addition to allowing prices to rise governments should provide financial incentives for the implementation of energy saving management systems and technologies in all sectors.

could be viewed as a firming up of the supply orientation for the longer term, a further displacement of the need to look to end-use. The calls came from both government and industry. In the second place, all production activity, even outside of designated environmentally sensitive areas, carries with it some environmental price tag, a fact that cannot be disregarded though at the same time must not be dramatized. Calls to open areas previously closed to drilling operations, however, tell a slightly different story. Whilst on the one hand, and as with other areas, the possible environmental impact should not be overstated (few things in life are ever simplistically black or white, good or bad: witness the now famed story of the Alaskan caribou following the construction of the TransAlaskan pipeline[4]), it is the case that opening up hitherto virgin territory such as ANWR to E & P would involve some environmental degradation/alteration and affect upon the area's wildlife, flora and fauna. What is of greater significance, however, at this stage, than speculation as to possible actual environmental effect about which much has already been written is the attitude or thought process which such calls evinced. Calls for leasing in declared sensitive areas, calls to reverse existing environmental legislation (there are enough problems getting new legislation on the books), have implications far beyond regional environmental concerns.

Of greatest potential environmental significance, however, was the impact of the crisis on the Third World and Eastern Europe and fears for future consequences. On the immediate level, and in addition to the type of human hardship indicated in the review, higher prices and the imperative to meet basic energy needs caused (and would cause) further degradation in some areas in land and air quality (increased lignite burn in Eastern Europe; increased biomass fuel use in some developing countries). The imperative to meet basic needs could turn attention very much to the short term, pushing any embryonic environmental initiatives to the background. In the context of these cash-strapped regions of the world, higher prices mean a diminishment in domestic willingness and capability to consider and invest in environmental programmes, be they curative clean-up ones or the introduction of preventative advanced technology systems. Unlike the industrialized nations, conservation for the short term at least means austerity for many a consumer in the street. Already spending an average of 25 per cent of public development budgets on power, the developing countries simply will not have the funds available to meet energy needs, respond to the energy imperatives of the development process and invest in environmental protection. Investment from the outside could also receive a knock on the head, both in the context of the West's own spectre of recession and if the environmental problems of these regions worsen. For example, the major deterrent before the crisis to bids by West German companies to buy into or acquire existing East German refining, distribution and service operations was the environmental cost factor, i.e. the costs of cleaning up decades of waste at old sites, replacing inefficient plant, and so on. If matters worsen further, the companies - with their own problems to face - may be unwilling to make the necessary investment (unless government aid is forthcoming). The same could hold true for other West-East, North-South initiatives.

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[4]Environmentalists lobbied vigorously against the construction of TAPS, arguing that it would disorientate the caribou and cut off traditional migratory routes to breeding grounds etc. In fact when the pipeline went into service, the animals flocked to its elevated path to enjoy the warmth of the heated oil inside. The pipeline became a favourite place for procreation and far from being decimated, as feared, the herds grew dramatically in size.

4.2 The Positive Side of the Balance

The positive side of the story of the first three months of response to the crisis included the new prospects for increased use of renewable energy resources. While this revived interest trod a more conservative and guarded path than was the case in the 1970s, nevertheless estimates on the potential contribution of solar, wind and biomass ranged high. Statements from the US Union of Concerned Scientists put the potential contribution, with government sponsorship, of renewables to all the country's energy needs at 50 per cent by 2010 (*Platt's Oilgram News* 2 October). Although such estimates were undoubtedly unrealistic and optimistic - they would necessitate a revolution in political thinking - there remained the fact that a serious reassessment of renewables was back on the agenda. On the natural gas front there were by the second and third months of the crisis various moves for increased usage and plans to reduce flaring. The environmental benefits of gas burn over coal and oil have already been indicated; the benefits of not flaring - i.e. wasting a resource whilst adding to the atmospheric burden of greenhouse gases - are self-evident. Worldwide demand for natural gas has been steadily growing in recent years as it became increasingly regarded as an underutilized source of relatively low-cost energy which could meet environmental requirements and be used in a wide range of markets. The question of future growth, to which the current crisis might provide further incentive, is discussed by Philip Barnes in Paper 5 of this series, *Can Natural Gas take the Strain?*

Other positive aspects were the absence of any crisis induced emergency lifting of the restrictions on ANWR; the direction which discussion on the stymied Point Arguello project took, i.e. a possible breakthrough for starting production but with no relaxation in the demands for appropriate environmental protection[5]; the calls for a new consumer-producer dialogue and the international initiatives regarding financial assistance for less developed countries (both of which will be returned to in our conclusion); and above all the slight shifting of sights in the industrialized nations away from supply to end-use and conservation measures.

The evidence of moves to curb future consumption and map conservation onto national energy policy agendas was a welcome signal. This above all was where the environmental backdrop discussed in Section 2 and the imperative of domestic energy security came together, as statements from the consumer nations themselves made clear. What was particularly important was the move in some countries to *mandate* conservation: most consumers are enthusiastic environmentalists until such time as personal effort or expenditure are involved. Thus, for example, a US nationwide poll conducted by Texaco Inc. on 18-19 August showed respondents giving 100 per cent backing to the need for a new energy policy in the wake of Iraq's invasion and worries over domestic supply, but 86 per cent said that such a policy should only contain "voluntary" conservation effort, while 71 per cent opposed higher gasoline taxes. They also opposed allowing gasoline prices to rise to market levels (*Platt's Oilgram News* 24 August). This poll falls against a background of a survey conducted earlier in the year in which 46 per cent of American

[5]Discussion centred on the use of common carrier pipelines plus alternative proposals for radar controlled tanker systems to minimise the risk of accident and spill.

citizens consciously styled themselves as "definitely green" (reported in *The Guardian*, 3 March).

Regarding demand restraint, not all nations responded like France, Italy, West Germany and Japan. As was noted in the review, the US administration merely urged voluntary conservation. In fact it actively opposed the introduction of mandatory measures, as for example in regard to a debate in September on legislation to increase vehicle efficiency to over 40 mpg: in the wake of Iraq's invasion, the Senate voted 68-28 to bring the measure to the floor but heavy lobbying by the Bush administration stripped 11 votes from the majority and guaranteed the defeat of the motion (*Platt's Oilgram News* 27 September). It is perhaps significant that the nation spearheading international response to the annexation of Kuwait - the most oil consumptive country in the world - together with its staunchest ally in the endeavour, Britain, are the ones showing the least inclination to impose energy saving measures or articulate the key role of conservation for future energy policy. This to one side, however, initiatives were taken in some industrialized countries. Moreover, it should be noted that the second two months of the crisis had opened with a quite significant statement by the US EIA regarding a shift in its orientation *vis-à-vis* data collection. As reported in *Platt's Oilgram News* (29 August) the EIA was to start "attempting to move toward desegregation of much of its regular reports, particularly as they pertain to regional supply and demand . . . [it will] beef up its collection and monitoring of renewable energy and conservation, with more emphasis upon end-users . . . EIA's data collection in the past has been orientated toward the supply side, but in the future it will move toward questioning how to use energy more efficiently".

5. Conclusion: How Robust is the Environmental Agenda?

The crisis has highlighted a number of key issues. The renewed concern for domestic supply security stands to threaten or to confirm in the long term the economics-energy-environment interplay which we outlined at the start of this paper. Events to date have shown a mixture of response: an initial, and perhaps short term, throwback to supply orientation; a medium partial shift to perspectives of end-use and conservation. Everything occurred - and continues to occur - against a backdrop of environmental awareness. No one abandoned the global institutional building processes that had been put in train before the annexation of Kuwait. Recognition has been given to the impact, present and future, of the crisis on the less developed regions of the world, and calls for new international initiatives and dialogue have been made.

How robust is the environmentalism that has developed in the last decade? Despite calls at the start of the crisis for a return to policies of "sound energy and economics", it would seem from later indicators that it might well stand the test of time. Indeed, the crisis could act as a catalyst to accelerated action. The basic tenets of environmentalism were developed, or at least most publicly articulated, during years of relatively low oil prices and secure supply (the mid to late 1980s; conservation drives in the context of the 1979 supply/price crunch were essentially a response to economic requirements rather than the energy-environment-economics interplay). Various initiatives like the American Clean Air Act, the Swedish programme to abandon nuclear power, and the EC SAVE programme emerged during these years. There was, however, a considerable and increasing disjunction between what was being said and what was being done: the late 1970s-early '80s downward turn in energy consumption in the industrialized nations started to plateau and then reverse after 1986 and the era of soft energy prices. The economic momentum for conservation was not replaced with an environmental momentum. Despite a burgeoning of environmental discussion and analysis, a sense of complacency and comfort set in regarding our energy use. That could now change.

The present oil price increases, while (as yet) nowhere near the hikes of 1973 and 1979 in magnitude, occur in context of that environmentalism. Already we have seen in the industrialized nations moves toward considered conservation much earlier on in the wake of this crisis than was the case in 1973 and 1979. Should there be war in the Middle East and a consequent dramatic rise in price and longer-term volatility, the momentum would be accelerated. In the event of a peaceful settlement followed by lower prices, the momentum could still continue. There would remain nagging doubts about the possibility of future upheavals, supply shortfalls, and price volatility. Supply security has been put firmly back on the agenda by Saddam Hussein's invasion of Kuwait and nations will need to consider their longer-term energy position. The imperatives of environmentalism will have to be mapped into their longer-term considerations, if only as a consequence of initiatives taken to date: targets outlined at the Second Climate Conference this November, and to be finally agreed upon at the UN Conference on Environment and Development in Rio de Janeiro in 1992, will require the use of substantial energy resource substitution, conservation, advanced technology systems, and general energy efficiency.

Under either scenario - war in the Middle East or negotiated settlement - the developing

regions of the world will be most severely affected and the least well able to turn their attention to the environment. International co-operation is central to the environment debate - and co-operation between "North" and "South" particularly important. We may wonder how robust the international response regarding aid to these developing regions will prove to be in the longer term. Will it weaken and as time passes remain concentrated on the so-called "front line states", or will the calls for western financial assistance to the developing world as a whole - plus reassessment, in co-operation with recipient countries, of the debt issue and aid orientation - which were itemized in our review translate into reality? Certainly the need will be there. The problems are not going to go away overnight. The indicators to date may be read with tentative optimism.

Fears for energy security, fears for economic well-being, fears for the environment converge on a path of conservation and energy efficiency, for both North and South. Regarding the latter, the old adage of "the poor always pay" is apposite: with little or no budgetary slack, inefficient plant, appliances and vehicles are kept running; "new" inefficiencies are bought in from the industrialized nations (the western cast-offs). Energy bills are therefore unnecessarily high, as are hazardous emissions to the atmosphere. The development process could only be furthered by improving efficiency. For the industrialized nations too, energy efficiency is an appropriate route. As was proved in the 1970s and 1980s, reduction in energy consumption can go hand in hand with economic growth. The myth that all spare slack with respect to conservation etc. was used up in these years needs to be dispelled. As was noted in our report *The First Oil War* (O.I.E.S., August 1990), research and testing of efficiency technologies and energy management systems in all sectors continued apace during the late 1980s. For transport alone - mentioned at the outset of this paper as the fastest growing sector and the one where concerns over both demand and the environment come most crucially together - manufacturers have ready to go to market vehicles which substantially improve on present average fuel economies and which they themselves have termed "crisis vehicles". This could be the crisis to force governments into mandating the use of such vehicles. The use of mandate for conservation in all energy sectors is essential.

For producer countries too there could be benefit from a renewed drive to conservation in the consumer nations. On the most general level, reduction in the levels of hazardous emissions from fossil fuel combustion would obviously benefit their environment as well as that of the consuming nations. Transboundary pollution and global warming are a threat to all countries. More specifically, all consumer countries must in some sense pay for their protection of the environment. High oil prices would encourage further conservation and would to some degree make up for revenue lost to producers through lower volume sales. But what of a scenario of lower prices? For the producer oil is a precious commodity, an income earner for their development process and a resource which is not inexhaustable. For the consumer country also, oil is a precious commodity and will remain irreplaceable for many years to come in certain energy sectors. Under the old rules of economics, demand restraint leads to lower oil prices and a return to more profligate energy use - and eventually to new crises. Could this cycle be broken? Would it be possible, given the environmental imperatives, the current initiatives of international co-operation and the calls for renewed dialogue between producers and consumers (which specifically cite the environment as an issue for discussion), to artificially maintain a high oil price to the benefit, ultimately, of all concerned? Could

all *producers* agree to incorporate in their oil price a valuation of oil which reflects both its "preciousness" (to them and to the consumer) and a valuing of the environment (an implicit carbon tax, but imposed from the producer not the consumer)? This could be a new avenue for discussion.

To conclude: the environmental movement has a certain head of steam behind it. In some senses it is not dependent, either positively or negatively, on supply or price. In the longer term the polarization of views expressed at the start of the crisis may disappear as a deeper appreciation of the requirement to meet all needs sets in. It is early days. We do not know what will unfold. It seems clear, however, that the environmental momentum cannot be undone. We propose that the emphasis contained in the following extract from the *Oil & Gas Journal* 17 September, is misplaced:

> Energy policy should seek status at the top of the national agenda. Environmentalism has smothered energy concerns for too long . . . Some pressure groups would make conservation the focus of energy policy. Their emphasis is wrong. Conservation does deserve attention in energy policy. But energy security means ensuring that energy supply limits never constrain the country's ability to grow economically or to defend itself militarily. Conservation is part of the equation. Future supply is a bigger part.

We recommend instead the statement made by the Louisiana Department of Environmental Quality on 18 September:

> Increased supply is not the solution to meeting energy needs but rather conservation measures like those practised in Germany and Japan *(Platt's Oilgram News)*

There have been indicators in the medium term that show this could in fact be the route forward. We could be crossing a threshold.

OXFORD INSTITUTE FOR ENERGY STUDIES
57 WOODSTOCK ROAD, OXFORD OX2 6FA ENGLAND
TELEPHONE (01865) 311377
FAX (01865) 310527
E-mail: publications@oxfordenergy.org
http://www.oxfordenergy.org