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# Global Strategy for Lower Sulphur Fuels of the Partnership for Clean Fuels and Vehicles

## Introduction

The three founding objectives of the Partnership for Clean Fuels and Vehicles (PCFV) include the global elimination of leaded gasoline, phase down of sulphur in fuels, and the concurrent adoption of cleaner vehicles. These objectives were further refined into targets during the 4th annual Global Partnership Meeting of the PCFV held on 14-15 December 2005 at UNEP Headquarters in Nairobi, Kenya. In addition to setting a global target date for the elimination of leaded gasoline by end 2008, PCFV partners prioritised the reduction of sulphur in vehicle fuels worldwide to 50 ppm or below concurrent with clean vehicles and clean vehicles technologies. This is to be achieved through regionally and nationally determined roadmaps and timelines. With the completion of the PCFV Working Group on Sulphur's report *Opening the Door to Cleaner Vehicles in Developing and Transition Countries: The Role of Lower Sulphur Fuels* in February 2007, global guidance became available to countries seeking to transition to lower sulphur.<sup>1</sup> The report provides information to policy makers in developing and transition countries on the effects of sulphur in vehicle fuels and options to lower sulphur levels to reduce vehicle emissions.

This strategy paper, looking at the current status, progress to date, targets, and challenges, details the PCFV sulphur reduction approach for the following regions:

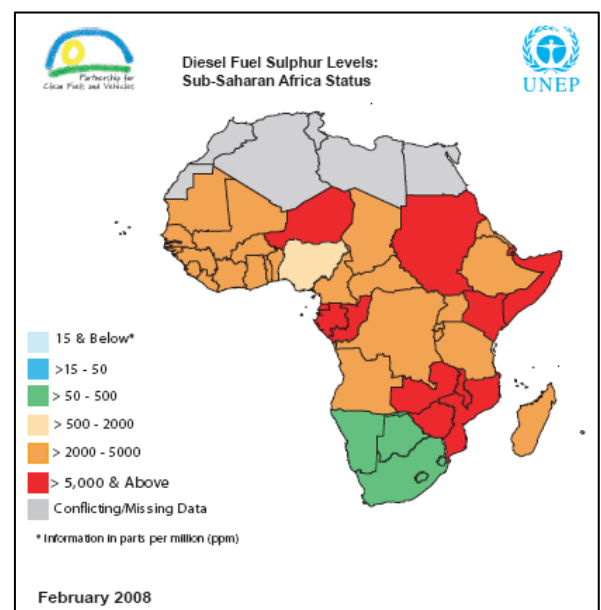
- Sub-Saharan Africa
- Central and Eastern Europe
- Latin America and the Caribbean
- Middle East, North Africa and West Asia, and
- Asia and the Pacific.

## 1. Sub-Saharan Africa

### 1.1 Current Situation:

The Sub-Saharan African region has among the highest sulphur levels worldwide. The average levels for diesel fuels are 5,000 ppm and 1,000 ppm for gasoline, and levels as high as 10,000 ppm in diesel fuels are not uncommon. Sulphur reduction efforts in the region will continue to focus on working with governments and the private sector in determining steps to improve fuel quality, in particular diesel, at the sub regional level.

There are, however, significant sub-regional differences in the sulphur diesel levels, with the Southern African region having the lowest sulphur levels and Eastern Africa the highest levels. These sub-regional differences are discussed below.



<sup>1</sup> The report and translations (including French, Chinese and Russian) are available from [www.unep.org/pcf](http://www.unep.org/pcf)



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*Southern Africa:* The sub-region is leading in lowering sulphur levels in fuels because of South Africa's improved standards – currently at 500 ppm for both and diesel, with some 50 ppm available in major urban areas. By upgrading all 6 refineries before January 2006, South Africa was able to not only phase-out leaded gasoline, but also reduce sulphur levels in fuels. Consequently, countries that import fuel from South Africa namely Namibia, Swaziland, Lesotho, Botswana, Southern Zimbabwe, and Southern and Central Democratic Republic of Congo have benefited through import of lower sulphur fuel (500 ppm). The highest sulphur levels are found in Zambia, at 7,500 ppm due to an old refinery. Malawi, Mozambique, and Zimbabwe import their fuel requirements through a common storage facility located in Mozambique, thus the Mozambique diesel specification of 5,500 ppm dominates. Angola, a refining country, has diesel sulphur specifications at 3000 ppm, while Madagascar - at 5000ppm - relies on imports after closing its refinery.

*Eastern Africa:* The sub-region has the highest diesel sulphur levels, with Kenya and Sudan having national standards of 10,000 ppm, Eritrea at 7,000 ppm and the remaining countries at 5,000 ppm. Only Mauritius has made efforts to reduce sulphur, with the current levels at 2,500 ppm. There are two refining countries- Kenya and Sudan. The Kenyan refinery is old and cannot produce lower sulphur fuels in its present state. However, there are plans to upgrade it from 2008 and once completed, the sulphur content in diesel and gasoline is expected to be 30 ppm. Fuel import facilities in Kenya also serve the neighbouring countries of Uganda, Rwanda, Burundi, Northern Tanzania and Eastern Democratic Republic of Congo and the import specification for diesel fuels is 5,000 ppm.

*West and Central Africa:* The lowest diesel sulphur levels in the sub-region are found in Nigeria (1,330 ppm) due to sweet crude, while the highest levels are in Gabon, which has an old refinery. Equatorial Guinea, Congo (Brazzaville), and Niger are between 8,000-10,000 ppm. The refineries of Ivory Coast, Ghana, Senegal, and Cameroon provide the sub-region with the bulk of the fuel required. The national standards for diesel fuels in these countries are at 5,000 ppm sulphur. There are plans to upgrade the Ghana refinery to produce 500 ppm from 2009.

## 1.2 Progress to Date

All *national level* activities carried out by the PCFV during the leaded gasoline phase-out campaign also incorporated sulphur reduction as the next step towards improving air quality in the region – this includes Kenya, Uganda, Tanzania, The Gambia, Benin, Togo, Nigeria, Ghana and Somalia. Since the sub-regional phase-out in 2006, the PCFV is focusing on sulphur reduction in diesel fuels and cleaner vehicles. In May 2006, the PCFV supported a national workshop in Nigeria on sulphur reduction and cleaner vehicles where a task team was formed to review the national sulphur standards for both diesel and gasoline. The PCFV has also supported national level activities on sulphur reduction and cleaner vehicles in the Democratic Republic of Congo, where the consensus was on 500ppm diesel. The PCFV also supported a national workshop in Liberia on cleaner fuels and vehicles where sulphur reduction was discussed.

At the *sub-regional level*, four workshops have included sulphur discussions. In March 2008, the PCFV and other partners coordinated a sub-regional workshop for Southern Africa in which sulphur reduction was discussed both at policy and ministerial levels. In June 2007, the PCFV supported a sub-regional workshop for Malawi, Mozambique, Zimbabwe, and Tanzania on sulphur reduction and cleaner vehicles. In August 2005, the PCFV supported a workshop for Eastern Africa on the finalisation of leaded gasoline phase-out where sulphur reduction as a next step was addressed. And in June 2005, the PCFV made a presentation on the benefits of lowering sulphur levels in fuels at a workshop organised by the World Bank for Western and Central African countries.

At the *regional level*, sulphur reduction has been discussed - both at technical and ministerial levels - at two conferences. At the conference to review progress on *Phasing Out Leaded Gasoline in Sub-Saharan Africa* held



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in May 2004 at UNEP Headquarters, sulphur issues as a next step were discussed and also at a regional conference on *Better Air Quality (BAQ) for Sub-Saharan African Cities* held in July 2006 at UNEP Headquarters.

### 1.3 Targets Set

At the BAQ conference in 2006, a 3-step sulphur reduction approach was recommended:

- The specifications that could be achieved without major refinery investments; in particular sulphur levels, should be immediately reduced as much as possible with existing facilities. This could be different in each sub-Saharan Africa sub-region.
- The next step corresponds to the threshold of 500 ppm for max. sulphur content in diesel and gasoline, which is an important threshold for running modern vehicles with emission control technologies.
- The 50 ppm level should remain as a longer term goal.

The ministerial segment of the conference recommended as the way forward, sub-regional workshops to determine the sub-regional targets and timelines for the three steps mentioned above. The first sub-regional workshop for Southern Africa took place on 5-7 March 2008 in Lusaka, Zambia. A sub-regional ministerial agreement will be discussed by the Southern Africa Development Community (SADC) in July 2008 and thereafter presented to the SADC Council for possible inclusion in the SADC Environment Protocol. The targets set on sulphur reduction by the draft agreement are as follows;

- Enact regulations to reduce sulphur levels in fuels to 500 ppm by the end of 2010, as an intermediate step for countries that import refined fuel;
- Enact regulations to reduce sulphur levels in fuels to 50 ppm from 2010 onwards for both refining and importing countries; and
- Promote the harmonisation of fuel standards.

Malawi, Mozambique, Zimbabwe, and Tanzania have set targets to lower sulphur levels to 500 ppm by December 2008 and 50 ppm in 2010. South Africa, which had earlier set a target of 50 ppm by 2010, will be reviewing this date from September this year. Ghana has also indicated that they may be able to move to 500 ppm by 2009 once their refinery is upgraded.

In 2008/09, the PCFV will continue to support national level and sub-regional activities to lower sulphur in fuels in the region. The PCFV is planning to support a sub-regional workshop in Togo that will include Benin and Nigeria to address sulphur reduction. An Eastern Africa sub-regional workshop as BAQ follow-up is planned in 2008 and the Western-Central African event will be coordinated together with the World Bank in 2009. National level follow-up activities are planned in Kenya, Mauritius, Seychelles, Madagascar, Nigeria, Ethiopia, Djibouti, Uganda, Mozambique, The Gambia, Zambia, Malawi, South Africa, Benin, Togo, Cameroon, Ivory Coast, Nigeria, Botswana, Angola, Lesotho, and Namibia during this period.

The PCFV is also on the steering committee of a World Bank funded study on the refinery sector in Sub-Saharan Africa. The study will review the health benefits of cleaner fuels - in particular the lowering of sulphur levels in accordance with the proposed regional 'AFRI' specifications of the African Refiners Association - against the costs of several refinery upgrading options. AFRI-1 sets the diesel sulphur level at 8,000 ppm, AFRI-2 at 3,500 ppm, AFRI-3 at 500 ppm and AFRI-4 at 50 ppm.

### 1.4 Challenges



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The main challenges for lower sulphur fuels in the region include: prioritizing cleaner fuels and vehicles in the region as a solution to worsening urban air quality; providing clear cost/benefits on lowering sulphur (including investments required to improve current refineries) for decision makers; and the challenges inherent in the current configuration of partial state ownership in many refineries. Countries that import their refined fuel requirements or rely on neighboring countries for also face somewhat different challenges from refining countries. The PCFV, through regional, sub regional and national activities is addressed the diversity of

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## 2. Central and Eastern Europe

### 2.1 Current Situation

The region has a spectrum of fuel quality standards at the national level. Central European countries (including the new EU member states Bulgaria, Romania and EU candidate Croatia), have phased out leaded gasoline and have adopted sulphur levels of 50 ppm or below. In contrast, diesel containing at least 2,000 ppm sulphur and gasoline with around 1,000 ppm are available on the market in Azerbaijan, Moldova, Russia, Serbia, and the Ukraine.

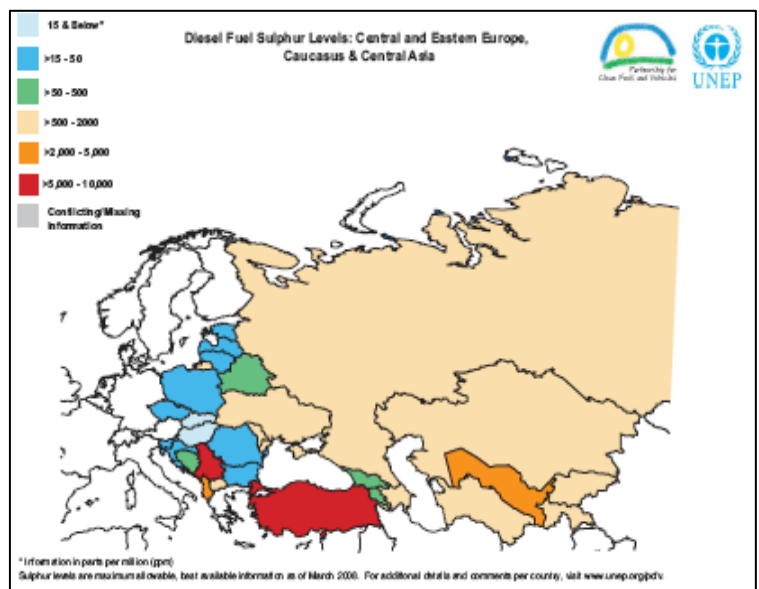
Some east Europe and Caucasus countries use the Russian GOST 305/82 Standard for diesel fuel, specifying 2,000 ppm sulphur. The exceptions are Belarus, Armenia, and Georgia, whereas in Russia a number of grades ranging from 10 ppm – 2,000 ppm are marketed. In south Europe Serbia, Montenegro, and Albania continue to use high sulphur fuels (national standards of 10,000 ppm, 10,000 ppm, and 2,000 ppm respectively). The status of Turkey remains unclear, as a number of fuel grades (including 10 ppm and 7,000 ppm diesel) are produced and marketed in the country.

### 2.2 Progress to Date

In most southern and eastern Europe countries there is interest and commitment to align national legislation with the European directives on fuels and vehicles. The 'Euro IV' Directive 98/70 for fuel entered into force in 2005, requiring sulphur content of gasoline and diesel at 50 ppm maximum. The 'Euro V' revised Dir. 98/70 standard requiring 10 ppm sulphur enters into force on 1 January, 2009.

The PCFV, with the support of the Regional Environmental Center (REC) headquarters and country offices, launched its activities in the region in 2005. Since, the PCFV Clearing-House (CH) has supported work in Albania, Bulgaria, Turkey, Serbia, FYR Macedonia, and Bosnia and Herzegovina.

UNEP, together with the REC headquarters, ensured that cleaner fuels and vehicles (including lead phase-out and low sulphur targets) were discussed during the Environment for Europe (EfE) ministerial conference in Belgrade October 2007. However, the ministerial declaration fell short of concrete commitments and targets for eastern Europe, Caucasus and Central Asian countries: *'We reiterate our commitment to eliminate lead from petroleum and to take steps to significantly reduce the amount of sulphur in motor fuels, with roadmaps and*





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*appropriate timeline, in order to improve human health and the environment, including through participation in and support for, the UNEP Partnership for Clean Fuels and Vehicles.'*

Despite numerous high level interventions, the government of Serbia remains unmoved on sulphur and lead, and the ensuing refinery privatization does not require improved fuel specifications until at least 2010. A PCFV technical and political mission to Belgrade was undertaken 21-23 August 2007. As importing countries from Serbia, Bosnia and Herzegovina and Montenegro rely on fuel produced in Serbia. While an intervention in Montenegro may be possible due to its lack of a refinery, the situation in Bosnia and Herzegovina remains static as its own refinery was privatized with the proviso that fuel specifications remain unchanged up to 2010; similar situations exist in Serbia and FYR Macedonia. The remaining south Europe countries continue to adopt Euro fuel and vehicle standards (i.e. Croatia and FYR Macedonia) and the PCFV CH is working directly in Macedonia on lead phase-out, to be followed by additional sulphur and vehicle projects as required.

The PCFV CH is also working with the REC Caucasus office in Georgia to extend support to east Europe and Caucasus countries (Belarus, Ukraine, Moldova, Russia, Armenia, Georgia and Azerbaijan), with an initial regional meeting in Tbilisi in January 2008 yielding new information on fuel quality at the national level (now available on the PCFV website) and interest from countries in PCFV support for their plans to go low sulphur and improve vehicle standards – all of these countries are unleaded.

### **2.3 Targets Set**

The joint conclusions document of the 2005 CEE regional conference did not include specific targets related to sulphur. However, these countries would mostly likely follow EU levels in future standard revisions and refinery upgrades and future PCFV work in the region would refer to EU standards in terms of intermediate steps and the 50 ppm or below PCFV target. The Efe ministerial process did not yield a consensus target for the region due largely to Serbia opposition, but it did reinforce commitment to going 'low' sulphur and unleaded. The outcomes of the Tbilisi regional conference included language on 'Euro' fuel and vehicle quality standards and at least four countries already have ongoing improvement programs and plans.

### **2.4 Challenges**

The main challenges for cleaner fuels and vehicles in Central and Eastern Europe region, as identified during the 2005 regional conference, include: improved incentive structures promoting cleaner fuels and vehicles for local consumption; greater awareness on the role of improved fuels and vehicle standards in improving local air quality; improved compliance systems for fuels and vehicles; improved training of practitioners; and development of national plans for sulphur based on regional trends and best practice. Refineries are, in some cases, still state-owned, often posing additional challenges for financing upgrades. There also seems to be a lack of transparency and willingness to modify the legal basis and standards during refinery privatizations.

Countries in the east Europe and the Caucasus region face similar challenges, including a general lack of incentive structures for cleaner fuels and vehicles, and have expressed interest in strengthening fuel and vehicle compliance systems. National government, private sector and NGO partners are needed in Moldova, Belarus, Ukraine, Russia, Armenia, and Azerbaijan. In Georgia the PCFV CH is already working with REC Caucasus on the way forward in the country, in addition to Armenia and Azerbaijan. In Russia, the CH is building cooperation with the Scientific and Research Institute of Motor Transport on possible future joint activities in the country.



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### 3. Latin America and the Caribbean

#### 3.1 Current Situation

Diesel sulphur levels in South America vary from 5,000 ppm in Venezuela to 50 ppm available in Chile's urban areas. Argentina, Brazil, Chile, Colombia, Uruguay, and Peru all have plans to move to 500 ppm, and in most cases 50 ppm for metropolitan areas, by 2009-2010. According to ARPEL, investment in cleaner fuels to reach 50 ppm will cost over 6 billion USD for the region. With the exception of some countries (Venezuela, Brazil and Colombia) 'low sulphur' means 50 ppm.

At the same time, vehicle emission standards are being reviewed and tightened in Argentina, Chile, and Brazil, where planned standards correspond to 'Euro' 4 for new light-duty gasoline and diesel vehicles. Chile and Ecuador also have ongoing heavy-duty diesel vehicle retrofit projects combining emissions control technology with low sulphur fuels in existing vehicles.

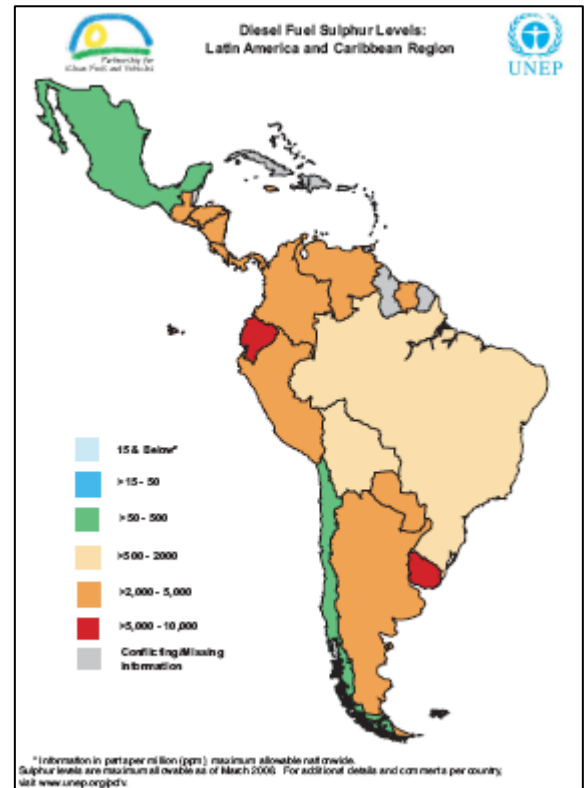
In Central America, due to the lack of oil production in the region (Guatemala and Belize are the only producers), there is an import dependency for oil needs. Central America receives oil under preferential terms and pricing from Mexico and Venezuela (sour crude). Under the PetroCaribe initiative, Venezuela supplies oil to Belize and 12 Caribbean members (EIA, [www.eia.doe.gov](http://www.eia.doe.gov)). Central America also lacks refining capacity, with the only units in Costa Rica, El Salvador and Nicaragua. In 2002, Panama and Guatemala both closed their refineries, due in part to increasing competitive conditions of the global market. Mexico, Venezuela, and China are all considering building refineries in the region.

In terms of sulphur levels, Mexico is the most advanced in the region; in 2006 Mexico passed legislation calling for gradual reductions of sulphur content in gasoline to 80 ppm beginning in 2006 and diesel reduction to 15 ppm, beginning in 2007. The rest of the countries vary between 4,500 – 5,000 ppm.

Most Caribbean countries import oil from Mexico and Venezuela under favorable terms. The PetroCaribe agreement also stipulates that Venezuela's state-owned oil company, PdVSA, will enter into partnerships to improve oil infrastructure in the region. There are numerous proposals in various stages of development to significantly increase refining capacity in the Caribbean, mostly for eventual export to the United States. Jamaica's state-owned Petrojam operates a refinery near Kingston (current standard in Jamaica is 5,000 ppm diesel). In 2006, Petrojam began the front-end engineering work to increase the capacity of the facility and improve the plant's ability to produce cleaner products.

#### 3.2 Progress to Date

The PCFV has worked in LAC since 2004 with events in Guatemala and El Salvador. The Central American meetings recommended feasible sulphur reductions to 500 ppm and up to the ideal of 15 ppm by 2015. The PCFV also coordinated the South America Sulphur in Vehicle Fuels Conference 13-14 February 2007 in Quito, where participants from Argentina, Brazil, Chile, Colombia, Ecuador, Uruguay, Venezuela, and Suriname agreed that a subregional target of 50 parts per million sulphur diesel is attainable by all countries within the next





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few years, and recommended bringing cleaner fuels and vehicles, including the issue of a regional approach to low-sulphur fuels, to the region's environmental ministerial forum.

The PCFV has worked at the national level in Mexico (promote the passing of the low-sulphur legislation approved in 2006), Colombia, and Chile. Activities in Colombia and Chile will likely continue in 2008, but interventions (and partners) are required in, for example, Peru, Bolivia, Ecuador, Jamaica and Uruguay - these countries that require some support in moving forward on the sulphur issue. There has not been any concrete interest from Venezuela to address sulphur in fuels.

Ministers attending the Sixteenth Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean (LAC) in the Dominican Republic agreed '*to promote the reduction of sulphur content in fuels, targeting a goal of 50 parts per million of sulphur with an emphasis on countries with air quality problems in their metropolitan areas.*' Decision 8 of the Forum on *Better Fuels for Better Air Quality* acknowledges the work of the Partnership for Clean Fuels and Vehicles (PCFV) in the region to date, advocates improving fuel quality in LAC in line with the global goals of the PCFV, recognizes ongoing efforts by countries to improve fuel quality, and requests technical, financial and capacity support, especially at the country level. Building on this regional consensus around a clear target, the PCFV CH is now working on following up at the national level with countries that have ongoing plans for low sulphur, to ensure momentum is not lost and outstanding issues (including fuel pricing) are addressed. This will be supported through close cooperation with a regional partner institution.

Depending on the identification of a local partner institution in the sub region, the CH plans to organize an event on fuels and vehicles in the Caribbean in 2008 as the subregion invests in refinery upgrades.

### **3.3 Targets Set**

The LAC 2008 ministerial meeting consensus on 50 ppm provides an important regional target for countries in the region. Sub regional and national activities will build on this target by supporting the development of timelines and plans.

### **3.4 Challenges**

Finding national-level partners has been a challenge in LAC. In addition to building a regional network of practitioners, the PCFV CH is working on addressing this through a partnership with a regional institution.

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## **4.0 Middle East, North Africa and West Asia**

### **4.1 Current Situation**

The Middle East, North Africa and West Asia (MENAWA) region is composed of 19 countries. This region is responsible for the production of a major portion of the world's crude oil. Despite this fact, some countries in the region house some very old refineries and fuel standards are much less stringent in terms of sulphur and additive contents when compared to those of, for example, the US and Europe.

The levels of sulphur in crude oil in the region varies, but can generally be characterised as sour (as high as 3.5 % or about 35,000 ppm). A few countries such as Algeria, Libya and Yemen have sweet crudes that contain



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no more than 1,000 – 2,000 ppm sulphur; however, this quality crude is often exported for a higher price and cheaper crude with higher sulphur content is imported and refined.

The popularity of diesel fuel due to its cheaper price and greater fuel mileage (both in comparison to gasoline) in MENAWA, has given rise to relatively large numbers of diesel vehicles which contribute to high levels of PM pollution in cities. Processed diesel sulphur content is mostly over 5,000 ppm in the region, with some exceptions in Kuwait, Bahrain, Libya, Morocco, Tunisia, and Israel. Morocco provides a small volume of 350 ppm sulphur diesel at a much higher price for a niche market. However, the national standard is set to change to 50 ppm from January 2009. The corresponding regional map illustrates the current sulphur levels in the region.

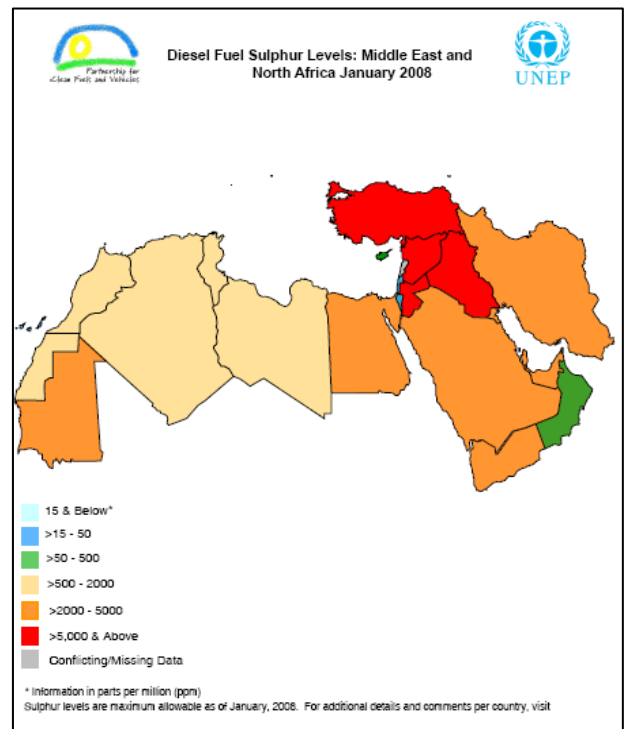
Some multinational oil companies have started the process of refinery upgrades in the region to meet the rising global demand for low sulphur fuels. But the cleaner fuel remains to be distributed on the wider market in the region.

#### 4.2 Progress to Date

Some countries, including Israel, have already made great progress in reducing sulphur levels; Bahrain has also started producing fuel with sulphur levels below 50 ppm, but only for the export market and not for the local market. While general consensus was reached on the need to phase-out leaded gasoline from gasoline in all Arab League countries, the issue of reducing sulphur in fuels was received with mixed results; on the whole there was a lack of political will to move on this issue.

Following previous national and international events, a regional meeting for MENAWA was held in May 2006. This meeting focused largely on the developing countries of the Arab League with a focus on leaded gasoline phase-out and, lowering fuel sulphur levels and introduction of clean vehicle technologies for the region. By 2006, a few countries in the region had already started the process for reduction of sulphur fuel levels on their own (Saudi Arabia, Bahrain, Kuwait). This move was chiefly due to economic forces: in recent years, a large price differential between sweet and sour product due to the high demand of low sulphur products on the world market had created an economic incentive for oil exporting countries to carry out further desulphurization operations in their own refineries as a value added measure. But these cleaner products have not always found their way into the local markets. The most important development from this meeting was the forwarding of a resolution to the League of Arab States Ministerial Meeting in December 2006 in Algiers, where a resolution was passed by the ministers present: *“Appreciating the efforts exerted by Arab States that have been using Unleaded Petrol; and inviting other Arab states to achieve this (goal) by year 2008, utilizing the support provided by UNEP vis-à-vis the PCFV Initiative; as well as inviting all Arab States to reduce sulphur contents in diesel.”*

At a meeting jointly hosted by the PCFV and the Asian Clean Fuels Association, the PCFV presented on sulphur issues at a Policy Development Meeting for the Middle East and North Africa held in June 2006 in Cairo, Egypt. The meeting was attended by representatives from Egypt, Morocco, Libya and Tunisia. Other work at national level (focusing mainly on leaded gasoline phase-out, but also addressing the sulphur issue) commenced after this conference. The PCFV is currently working with Yemen, Jordan (including Iraq and Palestine through Jordan) in planning a transition to lower sulphur fuels.





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A further meeting on fuels quality and sulphur reduction, mainly for the more developed Gulf Coast Countries (GCC – Bahrain, Kuwait, Oman, Saudi Arabia, Qatar, and United Arab Emirates) that have the means and a newly developed interest to improve fuel quality, was held in March 2008. Other countries from the League of Arab States also attended, with the main objective of the meeting being to launch national level activities and reach regional recommendations on how to proceed to lower sulphur fuels and improved vehicle standards. While the meeting did not reach consensus on a 50 ppm target proposed, countries agreed to propose the standard for consideration of the Gulf Standards Organization. Oman has recently reached the 50 ppm objective for sulphur levels in diesel and the meeting encouraged others to discuss and agree on a sub-regional standard for sulphur levels. The PCFV will also translate sulphur publications into Arabic to begin regional awareness campaign of fuel quality.

The PCFV CH plans to organize a sub-regional workshop for Morocco, Tunisia, and Algeria to discuss leaded gasoline phase-out in which sulphur reduction will be also discussed. Another sub-regional workshop for North Africa to be organized together with the Sahel and Sahara observatory (OSS) on air pollution will discuss sulphur reduction as well. National activities are planned in Egypt and Libya.

#### **4.3 Targets Set**

The GCC meeting outcomes encouraged to move to 50 ppm immediately. However, some League of Arab States countries may make this transition in 2 steps, moving to 500 ppm (or slightly below) and then to 50 ppm. In some cases, the availability of sweet crude could allow these countries to mix a higher proportion of this lower sulphur product with the existing high sulphur diesels that they purchase in order to reduce sulphur levels without assuming high refinery revamp costs. Morocco has already set national standards at 50 ppm from January 2009.

#### **4.4 Challenges**

The main challenges for cleaner fuels and vehicles in the MENAWA region include: strategies needed to address ageing refinery technology that is prevalent in every country; lack of public awareness on the benefits of cleaner fuels (including NGOs) and awareness for decision-makers; lack of incentive structures for cleaner fuels and vehicles; capacity for fuel quality control; and the need for improvements in fuel and vehicle standards and compliance systems.

A positive economic impetus apart from high global oil prices that has resulted in more profits for the MENAWA countries is the large demand for low sulphur products by the West. This demand has created a relatively large price differential between sweet and sour oil products making it advantageous for the region to upgrade their refineries and make better profits on this superior product, incorporating this value addition in their own refineries.



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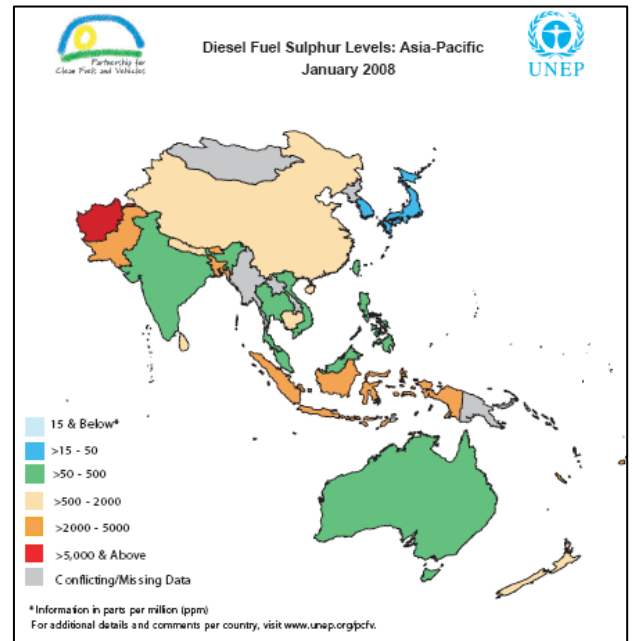
## 5. Asia and the Pacific

### 5.1 Current Situation

As demonstrated by the regional sulphur in diesel map, Asia contains a wide variety of national sulphur standards - from 15 ppm in Japan to 10,000 – 11,000 ppm in Afghanistan.

The rapid urbanization of Asia and in particular the formation of mega-cities has generally translated into poor air quality in many Asian cities. A lot of this air pollution is due to the large and growing number of vehicles to be found in these cities (for example, Beijing is projected to have some 3.5 million vehicles by 2010, this is more vehicles than most nations in Africa would have). This trend makes cleaner fuels and vehicle standards a priority in the region, with renewed focus on Asia within the PCFV.

While the growth of this trend has basically levelled off due to policies that restrict diesel engine use in private vehicles, in China some 30 % of the vehicles are diesel, in India this figure is closer to 60 % and the rest of Asia falls between 40-55 %. The levels of diesel sulphur fuels by country are provided in Diesel Sulphur map above. Although there are very few countries at 10,000 ppm or higher, however, a large group sits at 5,000 – 500 ppm and a moderate number of countries are already down to 500 ppm and below. The Pacific Islands (not so visible on the map) are nearly all at 5,000 ppm.



### 5.2 Progress to Date

Most countries in the region have shown a clear progression of phasing down their sulphur fuels levels in the 1990s and are continuing with this trend in the current decade. Examples are India that went from 5,000 ppm in 1996, to 2,500 ppm in 2000 and has arrived at 500 ppm today; India plans to go down to 350 ppm sulphur diesel by 2010.

A 2004 PCFV workshop in Vietnam showed progress in the country from 10,000 ppm to 5000 ppm in a decade. Other projects in the area have included work on after treatment (diesel vehicle revamping) projects by partners in Thailand. The meeting held in Tbilisi in January 2008 included countries in Central Asia; all of the countries are between 2,000 and 5,000 ppm and involvement at the national level is dependent on work with local partners.

The Clean Air Initiative – Asia is the most active PCFV partner in the region. An Asian Road Map on Clean Fuels, developed in late 2006, yet to be released, will include fuel quality and sulphur level recommendations. A delegation of these governments met at the Better Air Quality (BAQ) conference in December 2006 in Asia.

### 5.3 Targets Set

Some countries in Asia have already moved to 50 ppm or below (Japan and South Korea), with plans for lower sulphur fuels in India and China; in China 50 ppm sulphur diesel is now available in large urban areas of the country. Indonesia has reduced diesel sulphur levels from 5,000 ppm to about 2,000 ppm (levels are even



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lower in urban areas such as Jakarta) with the aim of going to 500 ppm and finally to 50 ppm in the future. The PCFV is set to enter into a strategic cooperation partnership with CAI-Asia and work with CAI-Asia to implement and support 11 countries in the region develop Clean Fuels Road maps with corresponding time-lines: the issue of sulphur reduction in fuels will be at the core of these roadmaps.

#### **5.4 Challenges**

The main challenges for cleaner fuels and vehicles in the Asia Pacific region are similar to the other PCFV regions in terms of lack of incentives awareness and local market demand. A positive development in the region is derived from the vehicle manufacturing sector that has started manufacturing vehicles that need low-sulphur fuels. This has sometimes led to the introduction of low-sulphur fuels on a limited market basis (e.g. Malaysia), but has the effect of opening the door for future growth of this fuel type.