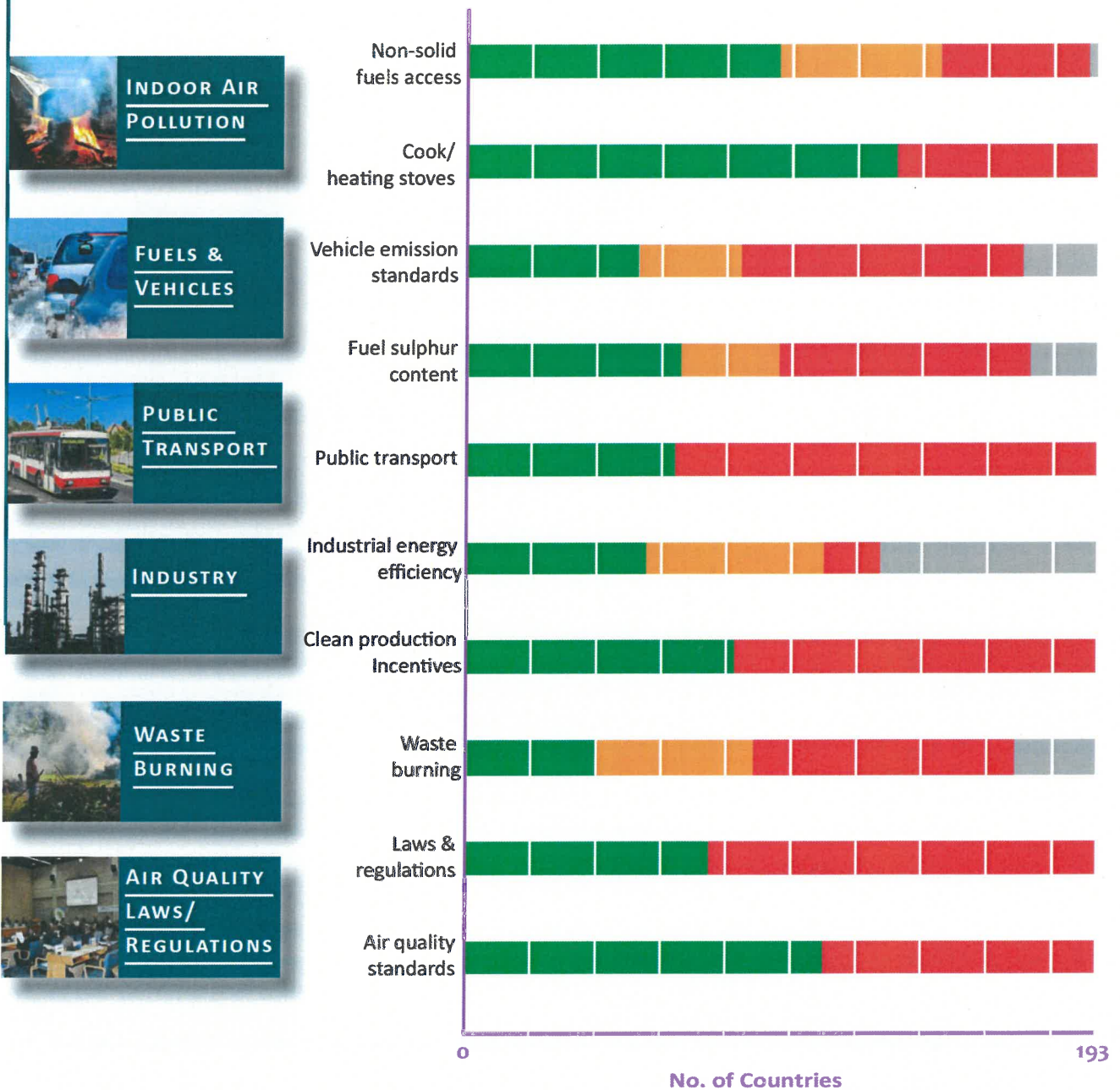


# ACTIONS ON AIR QUALITY

*Policies & Programmes for Improving  
Air Quality Around the World*



## Where is the world in taking action to improve air quality?



This publication provides a snapshot of the progress being made to adopt and implement key actions that can significantly improve air quality. Many of the 193 countries have implemented policies and activities (green) and others are in process (orange), while others still have to adopt or implement them (red). Grey means data was not available.

## AIR QUALITY POLICY ACTIONS WORLD-WIDE

In 2012, the World Health Organisation (WHO) estimated that poor air quality causes between 7 and 8 million premature deaths every year. This makes air pollution the leading environmental cause of premature deaths. Exposure to indoor and outdoor air pollution is closely linked to increased occurrences of cardiovascular diseases, such as strokes and heart disease, as well as cancer and respiratory diseases.

Recognising the growing global threat of air pollution, the United Nations Environment Assembly (UNEA) adopted resolution 1/7: *Strengthening the Role of the United Nations Environment Programme (UNEP) in Promoting Air Quality* in June 2014. UNEP was requested to make an overview of the actions taken by governments to promote better air quality. The results are shared in an online catalogue of 193 countries<sup>1</sup>. Based on the catalogue, fourteen sub-regional reports and this global summary were prepared describing ten key actions being undertaken by governments around the world to improve air quality.

From the analysis of the data provided by governments and other publicly available materials on air quality, a set of ten key policy actions were identified that if adopted would significantly improve air quality. This report presents an overview of these ten policy actions and indicates how many countries have adopted these actions (green), are on the way to adopting them (orange), or have yet to adopt or implement these actions (red). Although “green” indicates countries that have adopted these policy actions, it does not necessarily indicate that these countries have already fully implemented these policies.

These ten policy actions are organized into six categories; 1) indoor air pollution, 2) vehicle emissions, 3) public and non-motorized transport, 4) industrial emissions, 5) open burning of waste, and 6) national air quality standards and regulations. World maps indicating where all countries are in regard to the six categories are provided in the global snapshot at the end of this report.

Progress has been made across these categories in different countries and there are illustrative case studies demonstrating good practices to be found across all geographic regions. When analysing the air quality policies and programmes for the 193 countries a few crosscutting challenges were distilled: ineffective implementation and enforcement of existing policies and regulations; limited cooperation between national and city administration; the universal need for monitoring and assessment; and the importance of behavioural change and public participation through awareness and stakeholder involvement.

This report takes stock of the progress being made globally in introducing ten key policy actions to improve indoor and outdoor air quality.

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<sup>1</sup> Details can be found at: <http://www.unep.org/transport/airquality/>

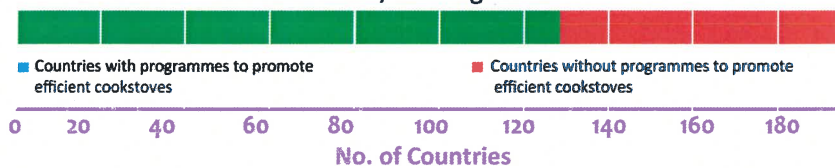


## INDOOR AIR POLLUTION

Access to Non-Solid Fuels



Efficient Cook / Heating Stoves

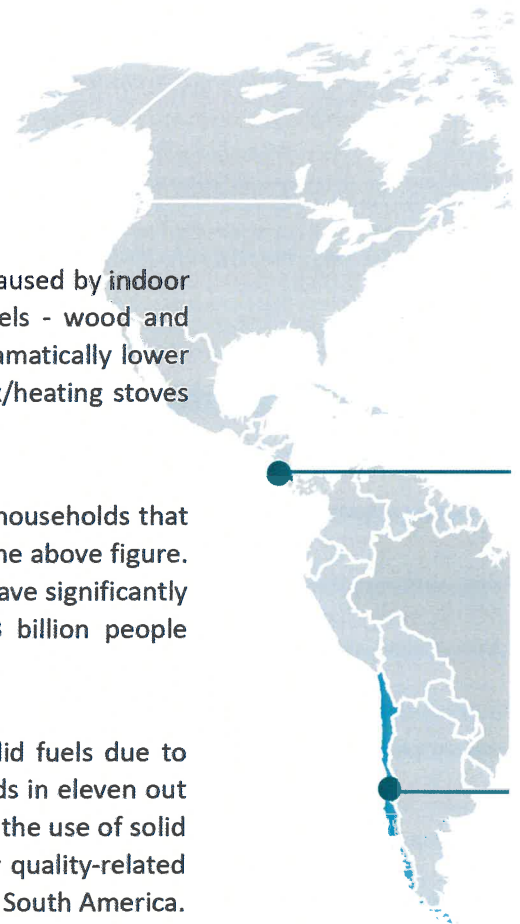


Around half of the estimated 7-8 million premature deaths annually are caused by indoor air pollution, the main source being cooking and heating with solid fuels - wood and other biomass based fuels - over open fires. The two actions that can dramatically lower biomass use and improve indoor air quality are the use of efficient cook/heating stoves and cleaner burning fuels.

Out of the 193 countries, 97 countries have increased the percentage of households that have access to cleaner burning fuels to greater than 85%, as indicated in the above figure. However, more than half of the world's population live in countries that have significantly lower access rates to cleaner burning fuels. As a result, more than 3 billion people continue to use solid fuels and open fires for cooking and heating.

Even with increased access to cleaner fuels, households may opt for solid fuels due to affordability and / or reliability. For example, more than 85% of households in eleven out of twelve Caribbean countries have access to non-solid fuels. Despite this, the use of solid fuels to meet household energy demand is the predominant driver of air quality-related health impacts in the sub-region. A similar situation is found in Central and South America.

133 of the 193 countries have programmes to promote the use of efficient cook/heating stoves. In most OECD countries these programmes are aimed at promoting efficient heating stoves, while in most developing countries they are aimed at promoting efficient cook stoves. Although these programmes exist, they do not always translate into a wide uptake of the clean stoves due to issues of culture, affordability and marketing. Therefore, the "green" in the figure above indicates countries that have programmes to promote efficient cook/heating stoves and does not indicate the effectiveness of these programmes.



In the **United Kingdom**, The Quality Assured Fuel Scheme provides recognised standards for wood and biomass fuel quality, and a scheme for testing and approving solid fuel and biomass appliances. A national information campaign was implemented in 2015 to provide information and encourage uptake of more efficient and cleaner wood burning stoves.



To promote the use of clean fuels, **Costa Rica** provides tax benefits and subsidies for LPG (cooking gas). The national electricity company provides solar panels for lighting to households that are not connected to the grid.

The **Indian** Ministry of New and Renewable Energy launched a programme in December 2009 aimed at distributing more than 2.7 million cook stoves in the country. Several initiatives ensured that the cook stoves were culturally acceptable and locally appropriate. In addition, the cook stoves had to be efficient, cost effective, durable and easy to use. To achieve these requirements, the ministry increased investment in research and development and established a state-of-the-art facility for testing, certifying and monitoring the cook stoves.

The Sustainable Heating Programme under the Ministry of Environment in **Chile** exchanges old wood stoves with new efficient stoves such as wood pallet stoves, gas stoves and certified wood stoves. This programme is mainly implemented in polluted cities where one of the principal causes of air pollution is residential wood burning.





## FUELS & VEHICLES

Vehicle Emission Standards



Fuel Sulphur Content

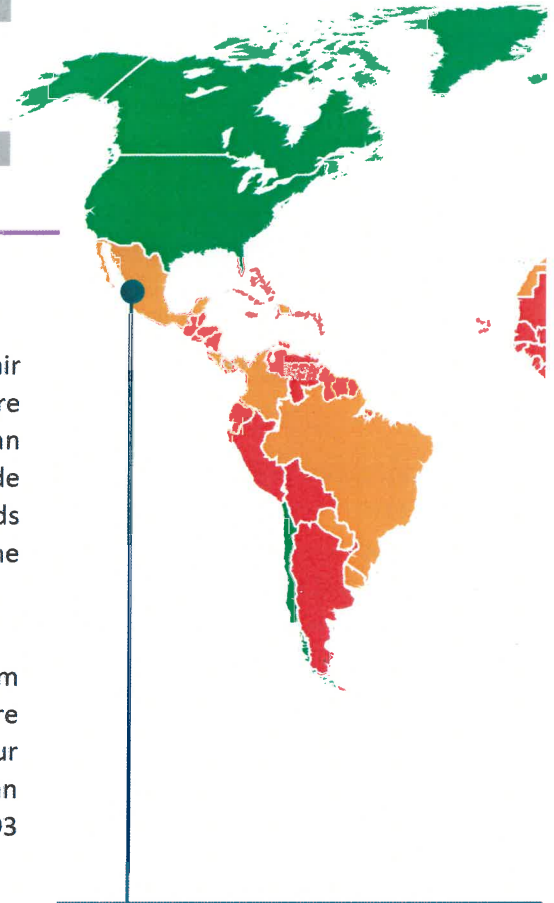


0 20 40 60 80 100 120 140 160 180  
No. of Countries

Reducing vehicle emissions is an important intervention to improve air quality, especially in urban areas. Policies and standards that require the use of cleaner fuels and advanced vehicle emissions standards can reduce vehicle emissions by 90% or more. 29% of countries worldwide have adopted Euro 4 and above (or its equivalent) emissions standards (22% are actually on Euro 5 or 6). However, half of the countries in the world (90) have not adopted any vehicles emissions standards.

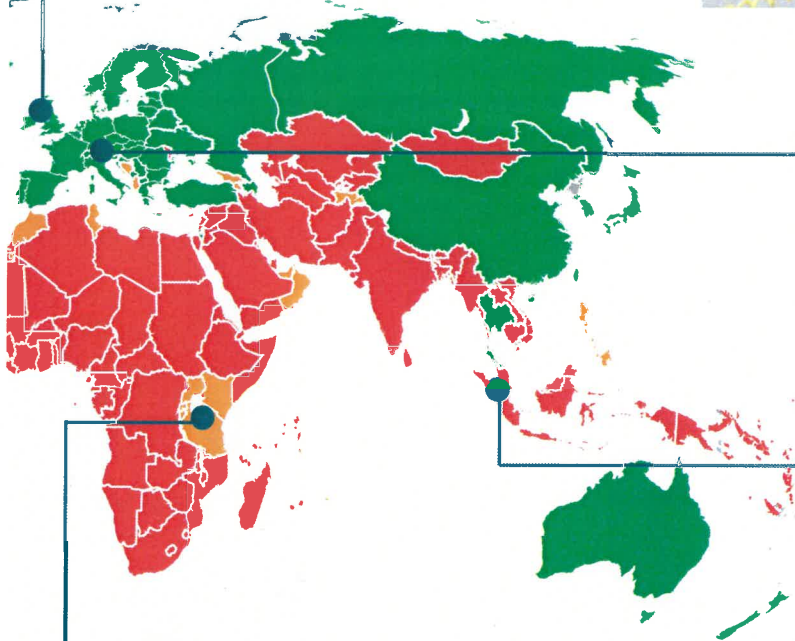
Fuels and vehicles work as a system and therefore to achieve maximum benefits both have to be improved simultaneously. One key measure for fuel quality is its sulphur content. A maximum allowable sulphur content of 50 parts per million (ppm) is the level at which advanced clean vehicle technologies can bear significant air quality benefits. Out of 193 countries, 66 countries (34%) have a 50 ppm or better standard.

North America, some of North Asia and most of Europe have stringent standards for both light and heavy duty vehicles, and provide ultra-low sulphur fuels. This has resulted in decreased emissions from the transport sector. However, transport is still a significant source of outdoor air pollution, especially in urban areas, due to the sheer number of vehicles. Therefore, policies that have successfully reduced urban air pollution from transport have combined the introduction of cleaner fuels and vehicles with actions to promote alternatives to private car use.



Although the national standard in **Mexico** is 500 ppm sulphur content in diesel, ultra-low (15 ppm) sulphur diesel is used in three major metropolitan areas, the northern border cities and eleven national freight corridors. This provides the benefits of cleaner fuels to high-density population centres in advance of a country-wide introduction of a national low sulphur standard.

**Norway** is actively promoting the purchase of electric vehicles. Incentives such as purchase tax and VAT exemptions, as well as bus lanes access and exemptions from road tolls, are considered major drivers of the increased electric vehicle ownership. In 2015 a quarter of all new vehicles sales were electric.



- Countries with low Sulphur fuels (50ppm) and advanced vehicle emission standards (Euro 4)
- Countries with either low Sulphur fuels (50ppm) or advanced vehicle emission standards (Euro 4)
- Countries with neither low Sulphur fuels (50ppm) nor advanced vehicle emission standards (Euro 4)
- No data

By implementing the European Commission directives on vehicle emissions, the 28 **European Union** member states have tightened their vehicle emission standards to Euro 6 /VI (for light and heavy duty vehicles). A directive from the European Commission moved all countries to low sulphur fuels and ultimately to ultra-low sulphur (10ppm) fuels for both petrol and diesel.

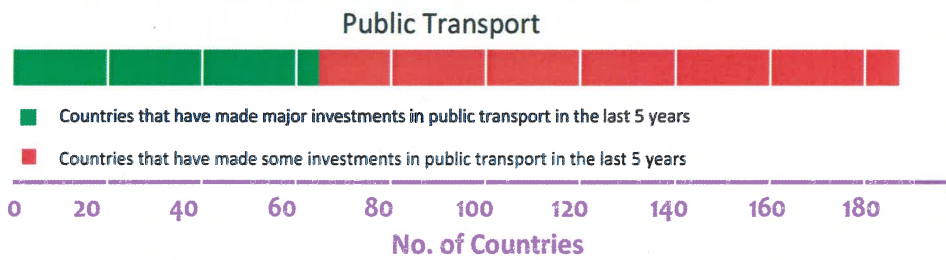
Discussions on implementing Euro 4 light-duty vehicle emission standards and low sulphur fuel (50ppm petrol and diesel) started in **Thailand** in 2008. The initiative was led by the Pollution Control Department and supported by other government agencies, oil companies and stakeholders. These standards were implemented in 2011 and the level of air pollutants (SO<sub>2</sub>, CO, TSP, PM<sub>10</sub> and NO<sub>x</sub>) in Bangkok decreased notably as a result, despite the sharply increasing vehicle population.

In 2013, the **East African Community (EAC)** initiated discussions on the implementation of harmonized low sulphur fuel standards for East Africa. The EAC Secretariat gazetted the harmonized low sulphur standards by the end of 2013 with an effective implementation date of 1 January 2015. As a result, the five East African member states – Burundi, Kenya, Rwanda, Tanzania and Uganda – moved as a block to low sulphur (50 ppm) fuels as of January 2015.





# PUBLIC TRANSPORT



Given the increased congestion experienced in many urban areas, maintaining and increasing the modal share of public transport is essential for increasing mobility while decreasing transport emissions. The above figure indicates that many countries have made significant investments in expanding public transport systems over the past five years. In the figure, a 'red' rating in some cases indicates countries that have well-established and efficient public systems that did not require major investments in the last five years. Conversely, a 'green' rating doesn't suggest that the public transport system is sufficient; rather it indicates that significant efforts are underway to expand public transport. 65 out of the 193 countries have made significant investments in expanding and / or upgrading public transport systems in the past five years.




In the last five years major investments in public transport were carried out in highly urbanised countries in South America and Europe. In addition, countries with megacities - cities with more than 10 million inhabitants - recorded increased investments in public transport. For countries experiencing rapid urbanisation rates, investments in public transport were meager in the last five years, with only seven countries in Africa making major investments in public transport.

For public transport systems to be efficient, consideration must be given to how people travel from home to the bus/train stations and vice versa. Consequently, investments in Non-Motorised Transport (NMT) infrastructure must go hand in hand with public transport investments. In most instances, NMT is often not prioritised, even though significant proportions of the population in many countries walk or use bicycles.









**Singapore** has a comprehensive public and non-motorized transport system with a citywide network of walking and biking paths, trains and buses. The Transport Master Plan will double the rail network by 2030 to 360km, increase the number of trains, buses and bus routes, and give buses priority on the road. In addition, the city will build 200km of sheltered walkways, add more integrated transport hubs so people can easily switch between different modes, and expand the cycling path network to over 700km in length

TransJakarta is a Bus Rapid Transit (BRT) system in **Jakarta, Indonesia**. The buses run in dedicated lanes, and ticket prices are subsidized. In 2014, the buses carried 111.6 million passengers. Currently TransJakarta has the world's longest BRT system (208 km in length), with 12 primary routes and 10 cross-corridor routes, with three more corridors being added. In addition, there are 18 'feeder' routes that continue into the municipalities surrounding Jakarta.



**Japan's** four major islands, Honshu, Hokkaido, Kyushu and Shikoku, are covered by an extensive and reliable network of railways. 72% of passenger-km in Japan is by rail, while only 13% is by motor vehicles. Globally, the country has the fourth highest distance travelled by passengers on railways in a year (after India, China and the European Union). The privatised network requires few subsidies and runs extremely punctually; it is a cheaper and faster option compared to driving within major cities. NMT is also popular, and Tokyo is doubling the amount of bicycle lanes to encourage cycling; 16% of commuters already use bicycles. There is a Cycling Embassy of Japan to further promote cycling.

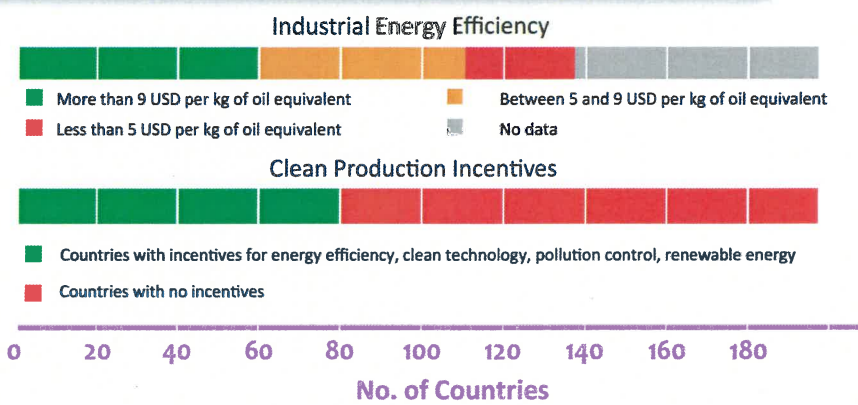
In **Bolivia**, a new municipal bus system in La Paz serves remote hillside neighbourhoods with three routes, with another four to follow. To further reduce emissions from transport, the government of Bolivia is offering loans to taxi and mini-van unions to purchase modern buses that run on natural gas, while diesel-powered buses are being converted to compressed natural gas as part of a national project.



Curitiba, **Brazil** has integrated its zoning laws and transportation planning to promote high-density development adjacent to high-capacity transportation systems. The city uses participatory city planning that emphasizes public education, discussion and agreement. As a result, 80% of Curitiba's commuters use the bus rapid transit system to travel to work, causing a reduction of about 27 million auto trips per year. Compared to eight other Brazilian cities of similar size, Curitiba uses about 30% less fuel per capita and has one of the lowest rates of ambient air pollution in the country. There are 50 times more people using public transport now than 20 years ago; 1,100 buses make 12,500 trips every day, serving more than 1.3 million passengers.



# INDUSTRY

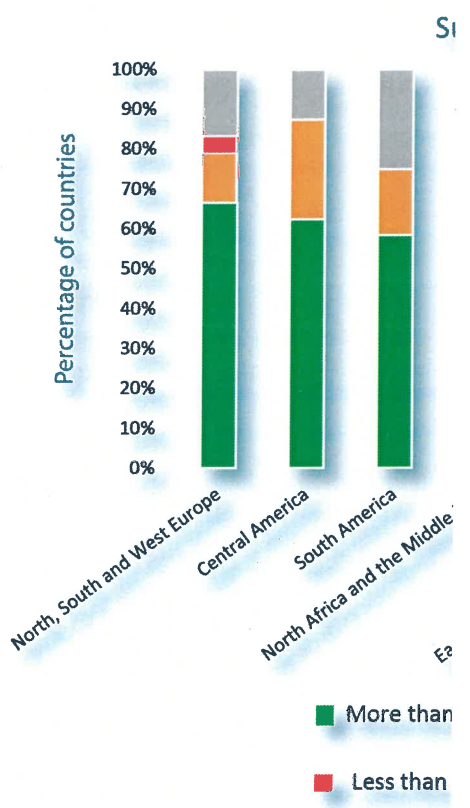


Economic incentives can spur investments in cleaner technologies that reduce air pollution. In many countries, energy production is one of the leading sources of air pollutants. Therefore, policies and programmes aimed at increasing energy efficiency and production from renewable sources are considered to have a direct impact on a country's air quality. In addition, some countries are putting in place programmes and incentives to clean up existing power plants that use fossil fuels.

Based on publicly available data and government reports, at least 82 countries (42%) out of 193 have incentives that promote investment in renewable energy production, cleaner production, energy efficiency and / or pollution control equipment.

Energy efficiency is an indicator of the potential of a country's industrial sector to impact air quality. Low energy efficiency generally indicates the use of outdated technologies which tend to emit more air pollutants.

In the top figure above, the green colour indicates countries that have high industrial energy efficiency, measured as GDP per unit of energy used. Some countries in this category have taken actions to encourage investments in cleaner and efficient production. However, the green also indicates countries with limited industrial base and therefore their GDP is primarily derived from less energy intense sectors such as agriculture. However, future economic growth could lead to increased industrial activity and increased air pollution if outdated technologies are used

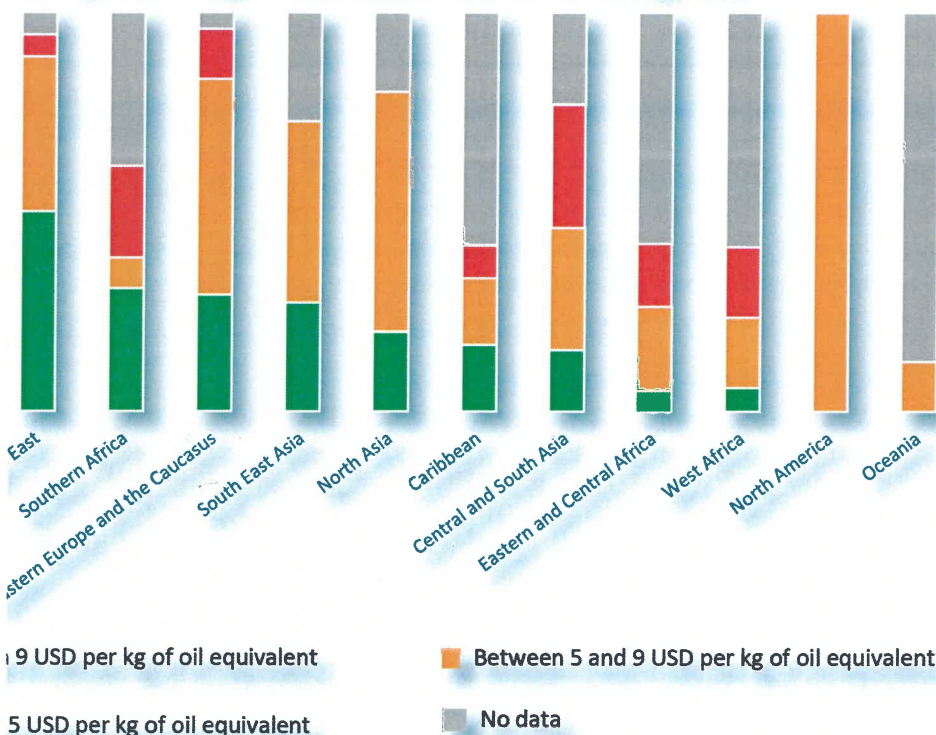


In 2012, **Brazil's** national emissions from older industrial facilities, including steel mills, aluminium smelter factories. The Brazilian Energy Producers to spend 0.5% of their revenue on investments in renewable energy.

In **South Africa**, energy production from coal power plants is a leading cause of air pollution. To minimise this dependency on coal, the South African government has initiated several incentives and support schemes to encourage investments in renewable energy production, including various funds, tax allowances and deductions.

In **Sweden**, potential air pollution impacts are a factor taken into account when issuing industrial permits. In addition, a sulphur tax is charged for electricity and heat production from sulphur containing fuels. The tax can be reduced if the sulphur emissions are mitigated through exhaust emission control systems.

Sub regional energy efficiency (GDP per unit of energy use)



Companies in **Denmark** are obliged to use the best available technology, and this contributed to a 26.3% improvement in energy efficiency between 1990 and 2010, and a 20.2% improvement in overall final-consumer efficiency.

emission standards were applied retroactively to existing boilers, electrical turbines, oil refineries, steel mills, lead foundries, cement kilns and fertiliser plants. The Energy Efficiency Program requires electricity companies to invest in energy efficiency projects. Institutional and economic incentives to spur investment in energy efficiency especially wind, solar and mini hydro.

**Singapore** provides tax incentives to encourage the switch to cleaner, energy efficient equipment and to install pollution control equipment. In order to monitor air pollution emissions from stationary sources, there are industrial CCTV systems and telemetric in-stack continuous monitoring systems. Air quality data is updated hourly on the National Environment Agency's website.



## WASTE BURNING

Open Burning of Agricultural and/ or Municipal Waste



Open burning of waste emits air pollutants that are known to have severe health impacts. An estimated 166 out of 193 countries (86%) practice open burning of agricultural and / or municipal wastes, as shown in the figure above. In countries where municipal waste burning is frequently practiced, some or all waste streams are not collected by the authorities. This increases the likelihood of households burning their solid wastes on their own premises, despite regulations banning the practice.

Open burning of agricultural waste is also a major driver of deteriorating air quality, both locally and regionally. Due to long range transport of these emissions, their impacts can be experienced in other regions.

The green colour indicates countries where open burning of municipal waste is regulated and generally not practiced, and open burning of agricultural waste is controlled and allowed with special permits. The orange colour indicates countries where policies and regulations prohibiting open burning of municipal and or agricultural waste may exist but are not implemented or enforced, and thus open waste burning of either (municipal or agricultural waste) is commonly practised. The red colour indicates countries where open burning of both municipal and agricultural waste is commonly practiced.

The figure above only summarizes open burning of wastes, and therefore emissions from forest and savannah fires are not included.



The Environment and Energy Management Agency of **France** aims at producing more than 100 TWh of energy from biogas annually by the year 2050. To achieve this, it plans to build at least 600 biogas plants every year to handle various waste streams. Most of the biogas produced will be injected into the national grid, and approximately a third of it will be used for electricity generation, while 20% of it will be used to produce heat. Meanwhile, on-farm and centralised biogas plants are used as a means for managing agricultural waste.



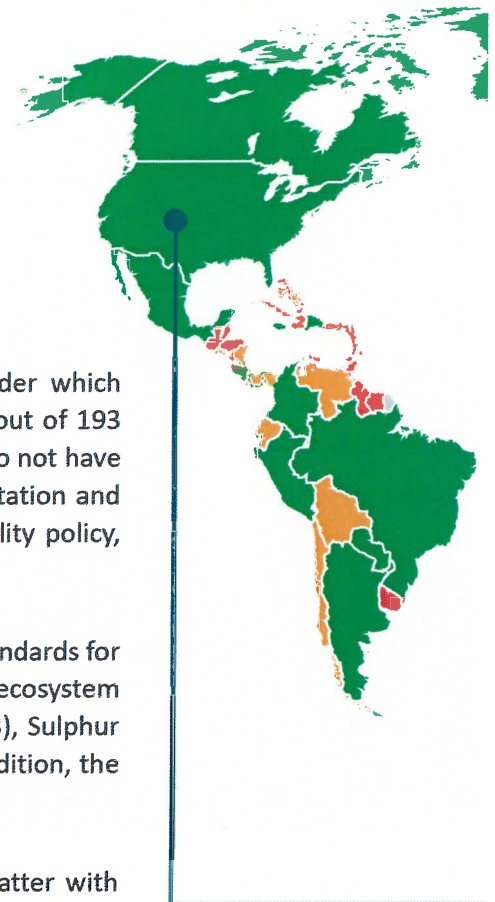
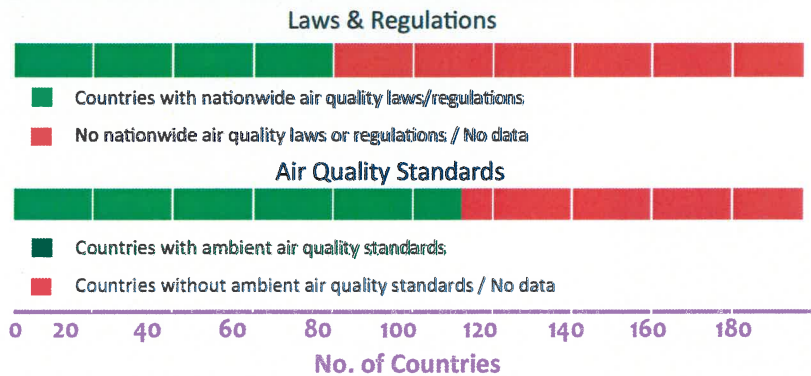
In the last decade, the District of **Caterina, Italy** has been able to increase its waste recycling rate from 35% to over 80%. The District was also the pioneer in waste separation at source, and has instituted several waste prevention policies. Among them is the “pay as you throw” policy, where the cost of waste collection varies depending on the amount of waste generated.

In 2005-2006, more than 25 million hectares in **Brazil** were under conservation agriculture. Under conservation agriculture, crop residue from the previous harvest is left on the land rather than burned. In addition to lowering air pollution, this practice significantly improves soil quality, water conservation and harvest yields. The production of conservation agriculture equipment in Brazil has enabled the adoption of the practice.





## AIR QUALITY LAWS / REGULATIONS



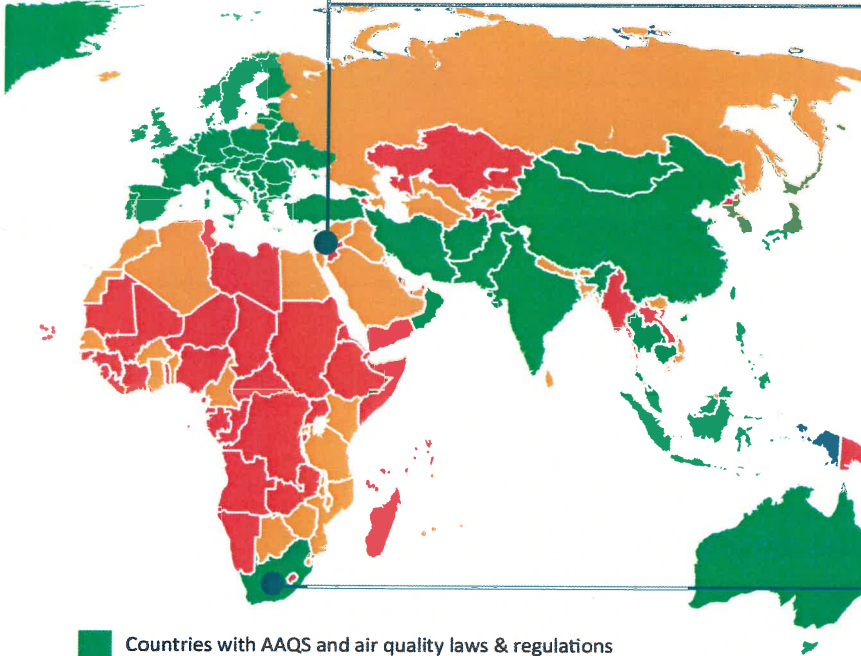
National Ambient Air Quality Standards (AAQS) provide a framework under which local and state policies, actions and programmes can be harmonised. 109 out of 193 countries (56%) have established AAQS. However, some of these countries do not have the accompanying laws and regulations that would facilitate the implementation and enforcement of the AAQS. Only 73 countries (38%) have a specific air quality policy, Act or Rules.

Although 109 countries have established AAQS, not all the countries have standards for the six criterion pollutants that are considered most harmful to human and ecosystem health. These six criterion pollutants are Carbon monoxide (CO), Ozone (O<sub>3</sub>), Sulphur oxides (SO<sub>x</sub>), Nitrogen oxides (NO<sub>x</sub>), Particulate Matter (PM) and lead. In addition, the AAQS in some countries do not meet the WHO recommended standards.

In many countries, particulate matter is regulated as PM<sub>10</sub> (particulate matter with a diameter less than 10micrometers). Several studies have indicated that PM<sub>2.5</sub> (particulate matter with a diameter less than 2.5 micro meters) is more detrimental to human health than PM<sub>10</sub>, and therefore there is a need to also regulate PM<sub>2.5</sub> concentrations.

In addition to the establishment of AAQS, air quality monitoring and modelling are important tools necessary in air quality management. In most countries, air quality monitoring is conducted sporadically, if at all. With little air quality data, it is difficult to evaluate the potential air quality impacts on a country from various sources, and therefore impacts can be underestimated

**Israel's** Clean Air Law of 2008 is the principal legislative instrument for controlling air pollution in the country. It sets requirements for emission permits from major industrial polluters. Emissions permit regulations require applications to be based on Best Available Techniques. To improve enforcement of laws and regulations, the Ministry of Environmental Protection implements spot checks. Violations of emission standards lead to any of a number of penalties, including temporary or permanent shutdown of a business, clean up and remediation orders, permit revocation, fines and / or possible imprisonment. Industries are also required to report on the results of their self-monitoring once a year.



- Countries with AAQS and air quality laws & regulations
- Countries with either AAQS or air quality laws & regulations
- Countries without AAQS and air quality laws & regulations
- No data

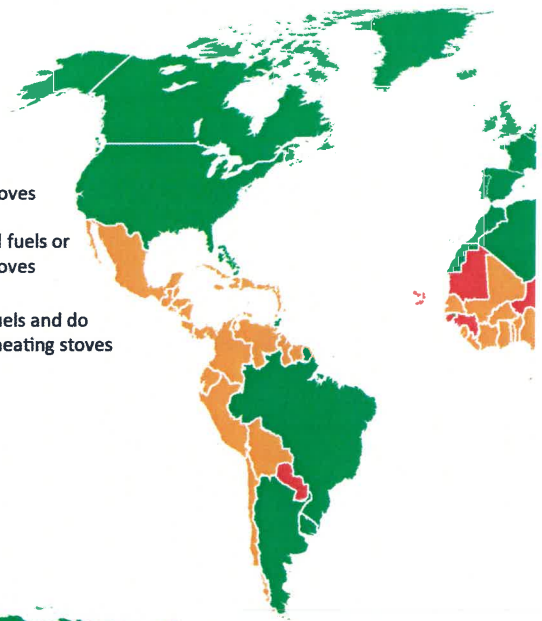
In **South Africa**, the Air Quality Act includes a national air quality framework that establishes air quality management measures. Areas where air quality is of particular concern can be designated as priority areas for air quality management. Once these areas have been established, regulations for implementing and enforcing air quality management plans are put in place. This ensures that resources, both human and monetary, can be mobilised and used to improve air quality in the priority localities.

The **USA** Clean Air Act provides the principal framework for national, state, tribal and local efforts to protect air quality, public health and welfare nationwide. The law requires the US Environmental Protection Agency (EPA) to establish national ambient air quality standards based on the latest science and to regulate emissions of listed toxic air pollutants. It requires states to adopt enforceable plans to achieve the standards. Penalties can be levied on states where the standards are not being met. The EPA uses civil and criminal enforcement for violations that threaten communities and the environment.

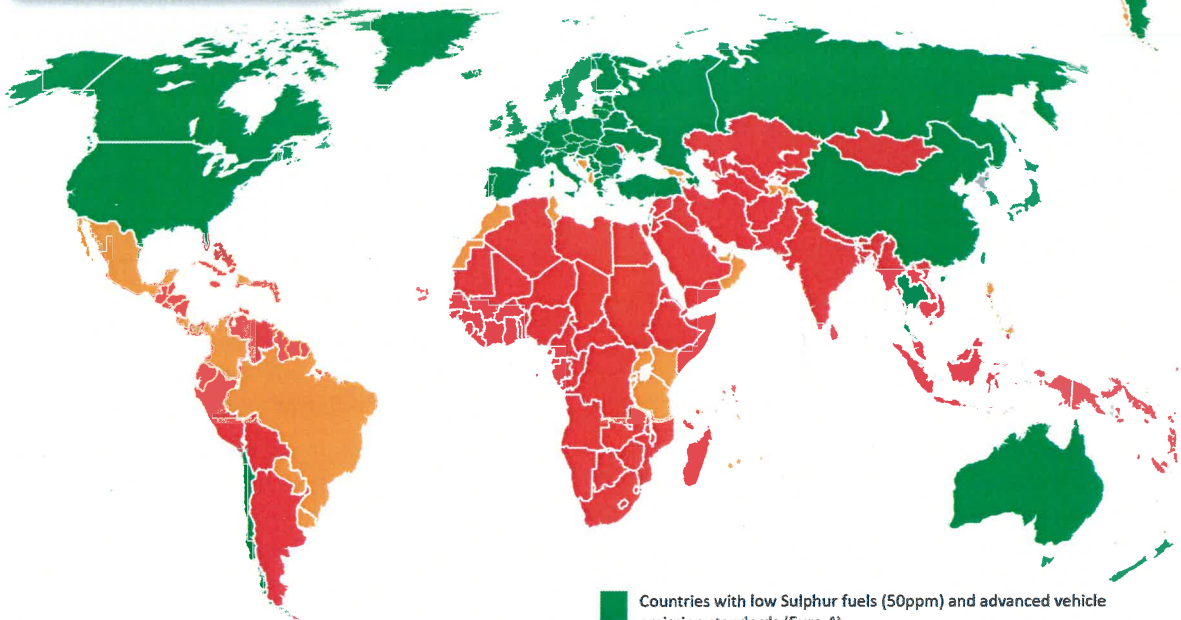


## GLOBAL SNAPSHOT

- Countries with good access to non solid fuels and programmes to promote efficient cook/heating stoves
- Countries that lack either good access to non solid fuels or programmes to promote efficient cook/heating stoves
- Countries that have no good access to non solid fuels and do not have programmes to promote efficient cook/heating stoves
- No data



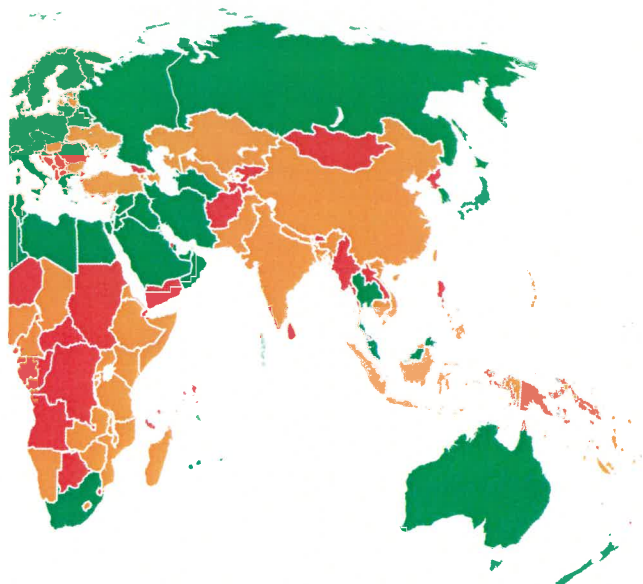
## FUELS & VEHICLES



- Countries with low Sulphur fuels (50ppm) and advanced vehicle emission standards (Euro 4)
- Countries with either low Sulphur fuels (50ppm) or advanced vehicle emission standards (Euro 4)
- Countries with neither low Sulphur fuels (50ppm) nor advanced vehicle emission standards (Euro 4)

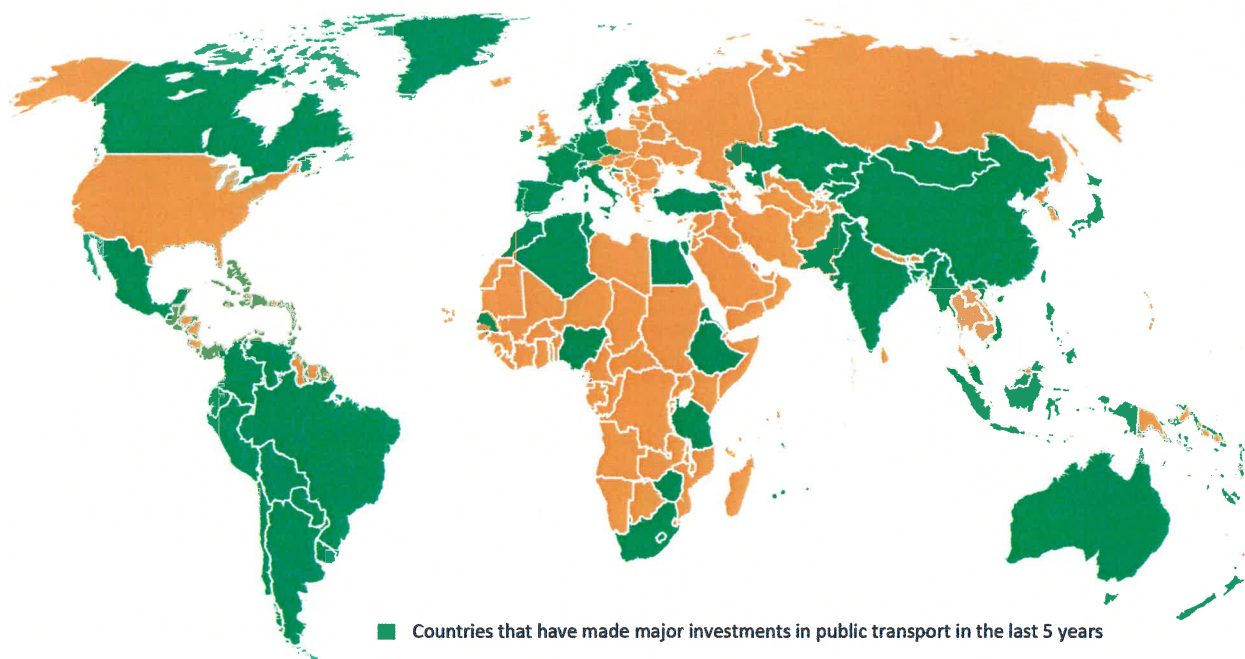


## INDOOR AIR POLLUTION



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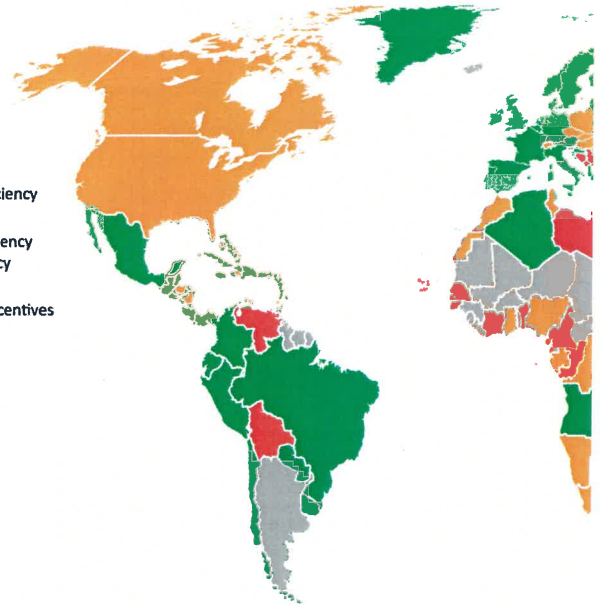
## PUBLIC TRANSPORT





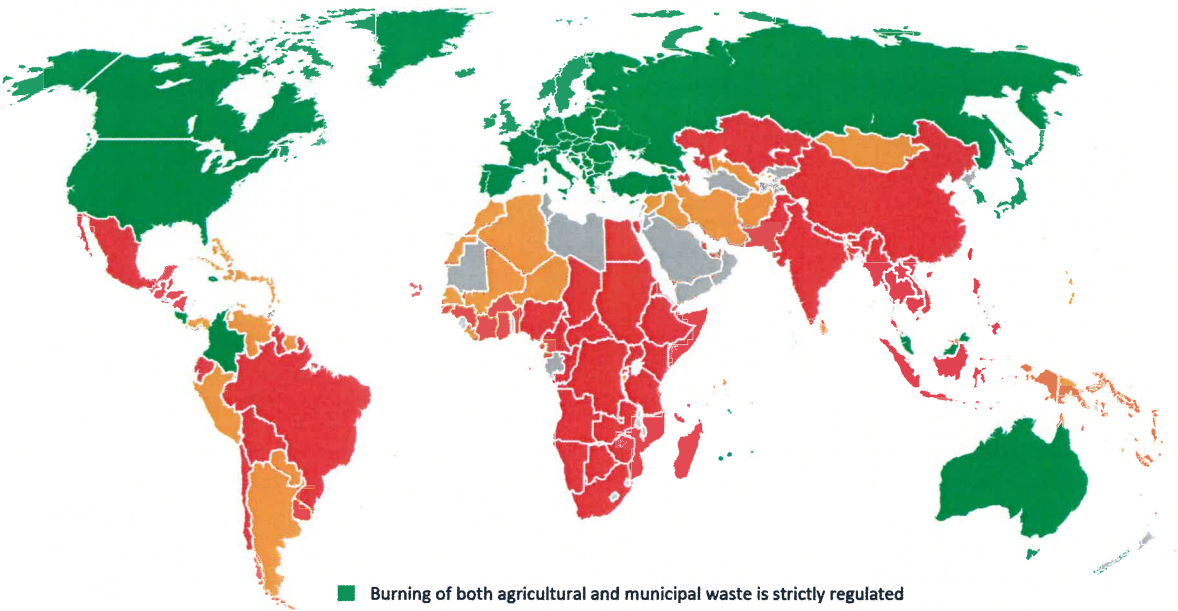
## GLOBAL SNAPSHOT

- Countries with incentives and high industrial energy efficiency
- Countries with incentives and low industrial energy efficiency or no incentives but have high industrial energy efficiency
- Countries with low industrial energy efficiency and no incentives
- No data

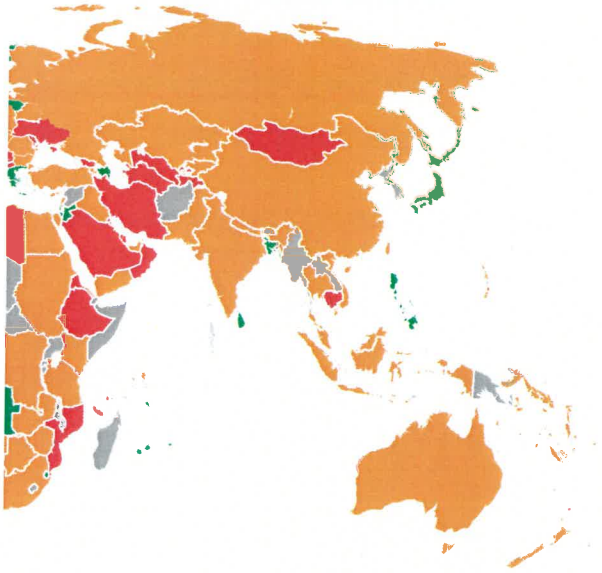


## WASTE BURNING

- Burning of both agricultural and municipal waste is strictly regulated
- Burning of either agricultural or municipal waste is regulated but still practised
- Burning of both agricultural and municipal waste is not regulated and is commonly practised
- No data

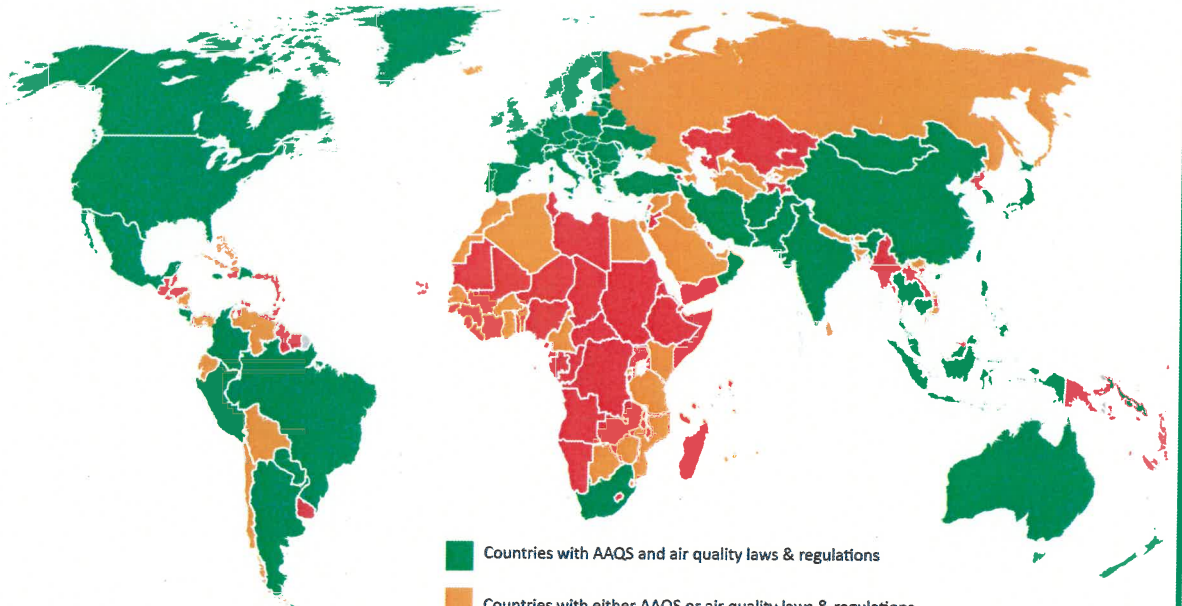






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## AIR QUALITY LAWS/ REGULATIONS



-  Countries with AAQS and air quality laws & regulations
-  Countries with either AAQS or air quality laws & regulations
-  Countries without AAQS and air quality laws & regulations
-  No data

For a detailed description of actions taken by countries to improve air quality, fourteen sub-regional reports and a methodology note on how this report was prepared, please go to <http://www.unep.org/transport/airquality/>

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