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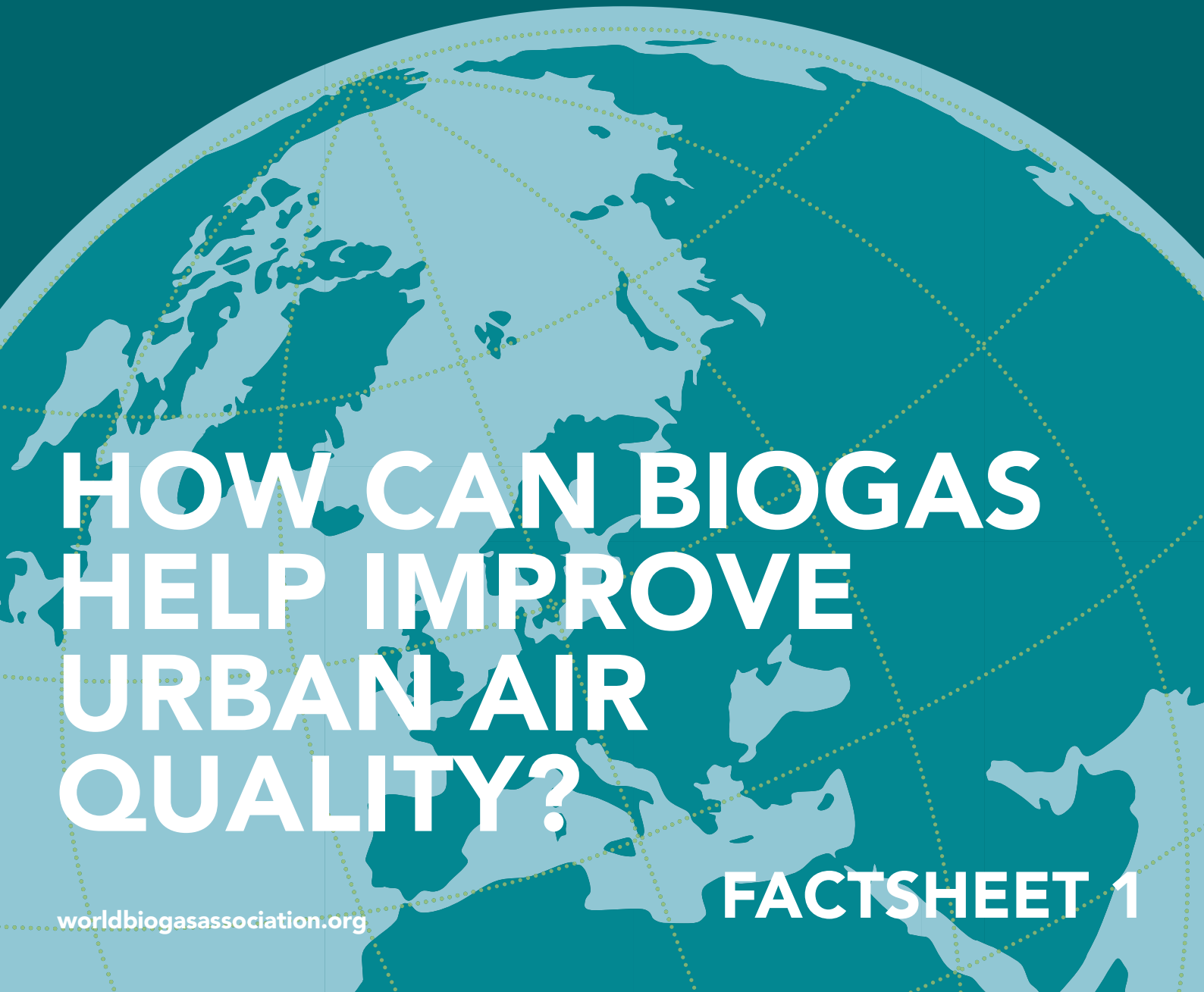
WORLD BIOGAS ASSOCIATION

This factsheet is part of a series being produced by the **World Biogas Association (WBA)** on the value of biogas production and use globally. You can find the full series on our website, **www.worldbiogasassociation.org**.



HOW CAN BIOGAS HELP IMPROVE URBAN AIR QUALITY?

FACTSHEET 1

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What is the problem?

Poor air quality has an adverse effect on environmental and human health. With increasing urbanisation and the growth of middle-class consumers in developing economies, cities are overcrowded and public services are being stretched beyond their capacity to cope. One outcome of deteriorating urban environments is that 98% of cities in low- and middle-income countries and 56% of cities in high-income countries with more than 100,000 inhabitants do not meet World Health Organization air quality guidelines (WHO, 2016).

In 2015, long-term exposure to poor air, specifically PM2.5, contributed to more than 4.2 million premature deaths worldwide, being the fifth leading contributor to early deaths globally (Health Effects Institute, 2017). Air pollution from Short Lived Climate Pollutants (black soot and methane) contribute both to poor air quality locally and climate change. The contribution of these pollutants to global climate change and evidence of its impact on the environment and society is well documented (see WBA factsheet on climate change).

Who should be acting to address urban air quality?

Achieving better air quality requires the support of policy makers from cities big and small, all community sectors, and all industries. Air quality is fundamental for the wellbeing of all, and so action to preserve it must involve everyone. Leadership should stem from governments as sustainable development concerns wider society and economy, but all of us need to buy into these policies in order to contribute to the promotion of sustainable development: mayors, municipalities, waste-management companies, utilities, building facilities, public transport operators, businesses, and citizens.

Why is biogas relevant to this challenge?

The biogas industry is uniquely positioned to help achieve reduced emissions and mitigate many of the impacts of poor air quality through providing renewable energy (in the form of heat, electricity, and vehicle fuel) and offering waste-management solutions.

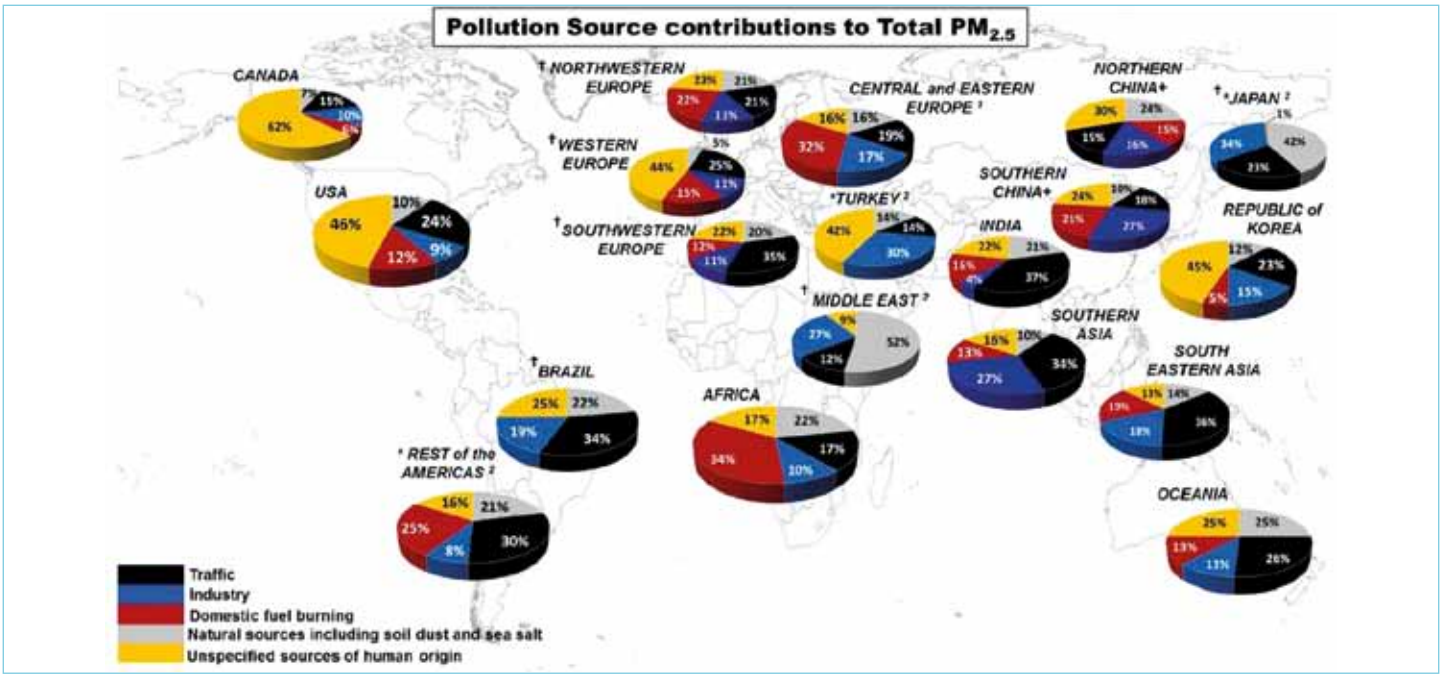
Biogas is generated through anaerobic digestion (AD), a natural process in which microbes digest organic material in sealed containers, producing biogas which can be used for cooking, heating, cooling, and electricity production or upgraded and used for vehicle fuel or gas-grid injection. This can be done on a micro scale (for buildings or small communities) and on a macro scale (for cities).

How biogas is involved in many different parts of the economy/environment

Biodegradable wastes are ubiquitous: they derive from multitudes of human social and economic activities. Such wastes can be found in: food waste from homes, restaurants, shops, and caterers; industrial production; agricultural wastes from animal husbandry, crop cultivation, and food production (such as dairy); and sewage sludge from wastewater treatment, both at city and local community level. All of these wastes emit methane but can be collected and taken to AD plants to produce renewable heat and energy, either for local use or for distribution into wider grids.

How can biogas help reduce urban air pollution?

The main sources of greenhouse gas (GHG) emissions in cities are related to the consumption of fossil fuels in the form of electricity, transportation, energy use in commercial and residential buildings (for lighting, cooking, heating, and cooling), industrial production and waste (UN HABITAT, 2011). Traffic, domestic fuel burning, and industrial activities (15%) are among the leading sources of particulate emissions (Karagulian F et al, 2015).



(Karagulian F et al, 2015)

Through substitution of fossil fuels for energy production, use of biomethane as vehicle fuel, capture of emissions from the organic fraction of municipal solid waste, landfills, and wastewater, adoption of biogas technology can contribute in a significant way towards mitigating both these impacts and achieving the UN Sustainable Development Goals (see our factsheet on how biogas can contribute to achieving the SDGs).

AT A GLANCE: USE OF BIOGAS IN PLACE OF FOSSIL FUEL CAN IMPROVE AIR QUALITY, HELPING TO PREVENT THE 4.2 MILLION PREMATURE DEATHS THAT RESULT FROM AIR POLLUTION WORLDWIDE.

WHICH URBAN AIR QUALITY CHALLENGES CAN BIOGAS RESOLVE?

Source of air pollution	Contribution of biogas
Energy	Over 30% of fine particulate matter in the urban air in Central and Eastern Europe and Africa originates from domestic burning of solid fuel such as wood and coal for heat and cooking (Karagulian et al., 2015). Replacing wood with biogas as domestic fuel would nearly eliminate particulate matter emissions. In addition, burning of fossil fuels for energy, whether by industry, power plants, or for domestic heating, is the most important contributor to GHG emissions. Replacing coal with biogas for electricity production would nearly eliminate particulate matter emissions and reduce carbon dioxide emissions by over 40% (based on IPCC, 2006).
Transport	Gas vehicles running on biomethane can lead to a 60-80% reduction in vehicle GHG emissions compared to gasoline (IRENA, 2017). Gas vehicles also emit lower NOx and particulate matter than their diesel-based counterparts (Low Carbon Vehicle Partnership, 2017). By transitioning away from petrol and diesel fuels to biomethane, cities can achieve both GHG emissions reduction and improved air quality. This has been done successfully in cities including Lille and Berlin (IRENA, 2017).
Landfill	**Diverting organic waste away from landfills:** By collecting and using food waste or the organic fraction of municipal solid waste for the production of energy, cities can not only generate their own renewable power via biogas but also divert the waste from landfills, where it leads to GHG emissions. This has been done successfully in Italy, Germany, the Netherlands, Belgium, Sweden, California, London, Scotland, Wales, South Korea and Paris, among others, but needs to become a more widespread practice around the globe. **Capturing emissions from organic waste in existing landfills:** Landfills are the third largest anthropogenic source of methane, accounting for approximately 11% of estimated global emissions. By capturing the estimated 799 million tonnes CO_2e emitted from existing landfills, air quality and sanitation in cities can be improved for its inhabitants and when used for energy generation, provide renewable energy. This has been demonstrated in numerous cities including Mariupol, Ukraine and São Paulo, Brazil (Global Methane Initiative, 2011).
Sewage	With growth in population and living standards in urban areas, increased consumption of both food and water has led to a rise in corresponding waste-related odour and GHG emissions. Anaerobic digestion of municipal wastewater and/or its co-digestion with food waste can improve the environmental and economic feasibility of wastewater treatment plants, as has been done in Los Angeles County, USA (American Biogas Council, 2016). If all of the world's human waste were to be collected and used for biogas generation, 45TWh of energy could be produced, whilst simultaneously capturing and recycling nutrients for future food production.

What policies are needed to create a biogas industry?

In light of the benefits biogas brings to air quality, every country should act to reduce air pollution, save lives, and tackle climate change, respecting the international accords to which most countries are signatories. Below are some policy suggestions for countries according to their level of income:

High-income economies

- Promote the use of upgraded biogas/biomethane in vehicles, improving air quality, reducing particulate matter and fine dusts, and reducing GHG emissions and noise. This can be achieved through stimulation of the market for gas vehicles, economic incentives such as fuel rebates for clean fuels, reduction in taxes when purchasing vehicles, or investment in (bio)gas filling stations. Subsidies will only be required until there is a sufficiently high carbon price.
- Promote reduction in and then the separate collection of food waste from businesses and households and their delivery to anaerobic digestion treatment plants. This may require statutory obligations on households and businesses.
- Make landfills progressively more costly in order to drive waste into recycling. Use landfill taxes to promote separate collection of waste and build treatment plants.
- Enable sale of renewable energy into national grids by obliging power companies to purchase renewable energy produced from biogas (whether as gas or electricity).
- Promote the installation of on-site anaerobic digesters where sewage is treated and use of energy for the sewage facility or local community.

Middle-income economies

- Agricultural or municipal wastes are still openly burned in 166 countries and are often transboundary in nature; over half of these countries do so without any air quality laws (Climate and Clean Air Coalition, 2016). Encourage agricultural conservation policies through regulations to discourage burning of crop residues and promote their collection through economic incentives, thus improving soil quality, water conservation, and harvest yields through returned nutrition to land, in addition to better air quality.

Low-income economies

- Provide alternatives to the burning of non-solid fuels for all domestic dwellings worldwide. Currently, more than 3 billion people use solid fuels and open fires for cooking and heating. Programmes to encourage use of cleaner fuels such as biogas exist in 133 countries but barriers of cost, communication, and tradition remain. WBA recommends further efforts be made by every state to promote biogas cooking/heating stoves to improve air quality throughout the world.

WBA can assist governments and cities in the development of these policies and assist with the drafting of funding proposals to support policies.

What can you do now to make a difference?

a. As a policy maker you can *initiate a discussion with stakeholders* on implementing the policy priorities listed above. Comprehensive support from wide sectors of the economy and society will be needed to implement policy changes. WBA can facilitate the discussion around changes to energy and waste-management policies.

b. Analyse *which policies are achievable in what time frame* in your specific context. Small steps forward are better if they are all you can achieve, rather than attempting a major reform that is widely opposed. WBA can help you understand and implement policies.

c. *Encourage understanding* of how other countries and cities have succeeded in adopting policies. WBA can help you with arranging site visits, meeting officials from other countries, and exchanging experiences.

d. As a business, *sustainable practices should be made a core value*. Biogas adoption may help reduce GHG emissions in your operations, reduce the treatment costs of biodegradable wastes, and create energy and heat for your plant needs.

For more information on the SDGs and biogas, please read our comprehensive report available for free at **www.worldbiogasassociation.org/wba-report/**.

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