Embedding
PROJECT

POLLUTANTS

Pollutants in Air and Water:

A GETTING STARTED GUIDE

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Pollutants in Air and Water

A GETTING STARTED GUIDE

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ABOUT THIS SERIES

This guide is part of our series of Getting Started Guides that supports your company to develop an embedded sustainability strategy. Each guide tackles a specific sustainability sub-issue and explores what your company needs to do to support the resilience of the environmental and social systems around you.

In each guide, we address relevant trends, system thresholds, key concepts, key actors, and key resources. We also offer guidance on how to address the impacts of decisions and activities in your operations and value chains as well as developing credible goals and outlining key corporate actions and internal targets that can help to provide clarity on the work ahead.

We recommend you read the first guide in the series, Getting Started Guides: An Introduction, which explains our overall approach and the value of setting a clear strategy anchored in your company's most material issues. It also explains how you can leverage process-based interim targets to clearly outline and track the specific actions that your company needs to take to achieve its high-level goals.

A complete list of focus areas and sub-issues can be found in our guide Scan: A Comprehensive List of Sustainability Issues for Companies.

This guidebook addresses **Pollutants in Air and Water**, which combines the sub-issues of **Particulates, Gaseous Air Pollutants and Odours**, and **Hazardous Chemicals** – all part of the broader sustainability issue of **Pollutants**.

1 SETTING THE STAGE – POLLUTION IS ON THE RISE

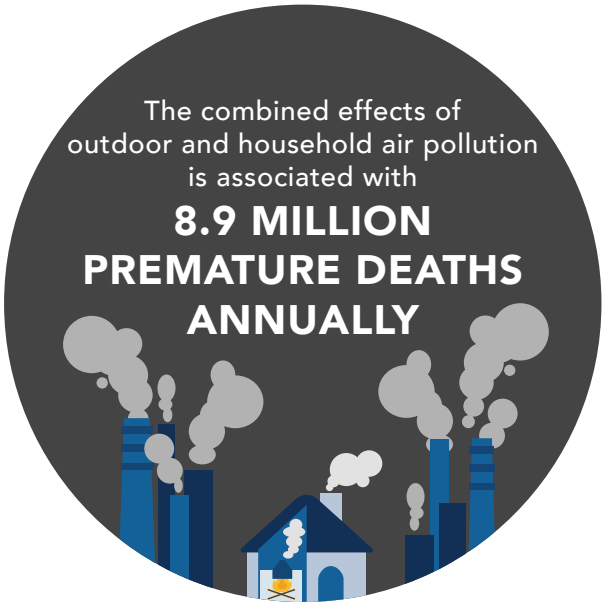
Unmanaged and improperly managed pollutants are having a dire impact on human health and are major contributors to the global climate and nature loss crises. These pollutants are contaminating the air, oceans, and other bodies of water and accumulating in living organisms with negative impacts for human and ecosystems health. Increasing levels of pollution also have significant economic impacts and reduce the productivity, cleanliness, liveability, and overall resilience of communities.

Pollutants in air and water are a universal issue. Data from the World Health Organisation (WHO) indicates that 99% of the global population is exposed to unhealthy levels of pollution and is breathing air that exceeds WHO guideline limits, with communities in low- and middle-income countries facing the highest levels of exposure. Additionally, low-income and minority communities are significantly more likely to be situated near areas where waste management activities and impacts are located, and as a result, these communities are much more likely to suffer from exposure to dangerous pollutants.

The Planetary Health Check, produced by the Stockholm Resilience Centre, notes that synthetic substances released into the environment have crossed a "planetary boundary" – where human-made changes to the Earth have fundamentally disrupted the stable environment of the last 10,000 years – to the point that they are damaging the biological and physical processes that underpin all life. Key drivers for the rise in pollution include the rapid increase in chemical production – both in volume and diversity – since the mid-20th century; the persistent and bioaccumulative nature of some chemicals; insufficient institutional capacity for chemical testing and monitoring (including research into new toxicological pathways and effects); and limited capacity to translate the data gathered into effective regulatory controls, resulting in weak enforcement of existing regulations.

AIR POLLUTION

Air pollution is the largest environmental cause of disease and premature death and the second highest risk factor for noncommunicable diseases. It is estimated that the combined effects of ambient (outdoor) and household air pollution are associated with 8.9 million premature deaths annually, with ambient air pollution accounting for 5.7 million deaths worldwide and indoor pollution accounting for 3.2 million deaths. Of these deaths, more than 90% occur in low- and middle-income countries.



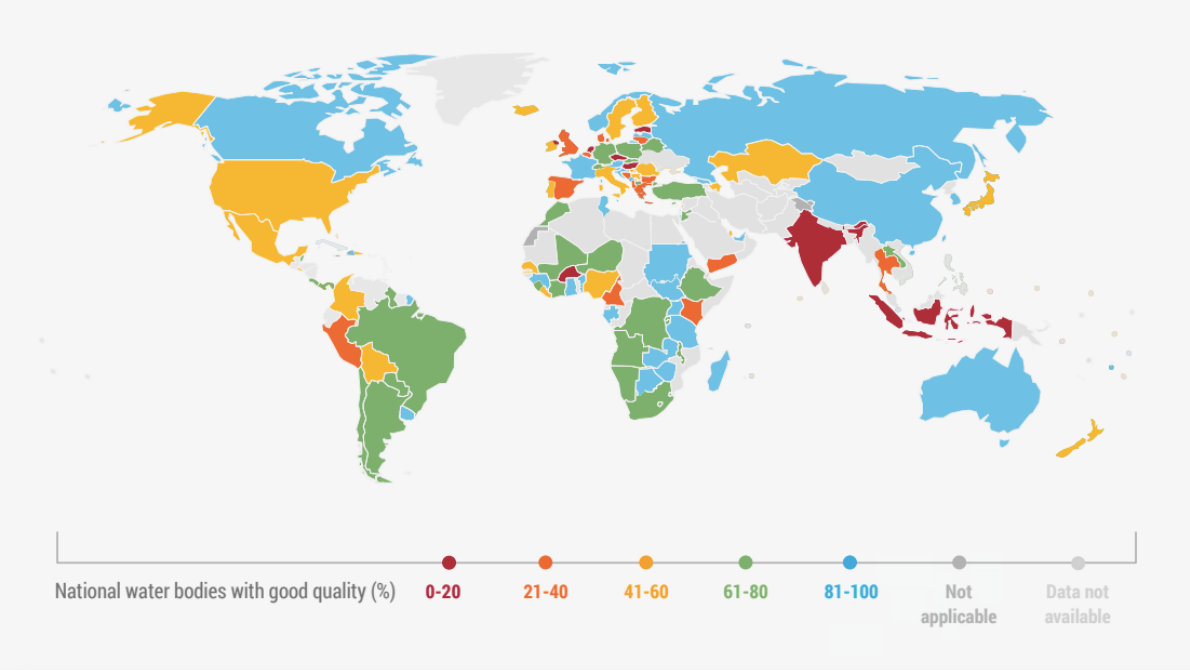
Air pollution is now recognised as the single biggest environmental threat to human health, and despite some notable improvements in air quality, the global toll in deaths and lost years of healthy life has barely declined since the 1990s. Worse yet, global pollution is on the rise, due to rapid economic growth, population growth, and insufficient environmental management. We provide further insights into pollutants in air in Climate Mitigation (Decarbonisation and Carbon Removal): A Getting Started Guide.

WATER POLLUTION

The crisis of pollutants in our air is inextricably linked to pollutants in our water. Nearly all human uses of water can result in water pollution. Pollutants contaminate water through effluent and leachate, such as from insufficient urban wastewater treatment, agricultural run-off, and industrial pollution. Additionally, as airborne pollutants return to the earth, through gravity or precipitation, they can find their way into water bodies.

Water can be contaminated by pollutants from manufacturing and agriculture, microplastics, and toxic compounds, including metals and metalloids such as lead, mercury, and arsenic (which we explore further in our forthcoming Metals: A Getting Started Guide). These pollutants can accumulate in ground, surface, and coastal waters that communities use for drinking, bathing, growing and gathering food, and countless other everyday activities, and can expose people to a broad range of health risks. The UN Environment Programme (UNEP) notes that more than 350,000 chemicals and mixtures of them have been registered for production and use, and that many of these chemicals find their way to freshwater systems and coastal waters. The accumulation of these compounds in water, along with the toxic stress they cause, can have long-lasting implications for aquatic ecosystems, human health, and more.

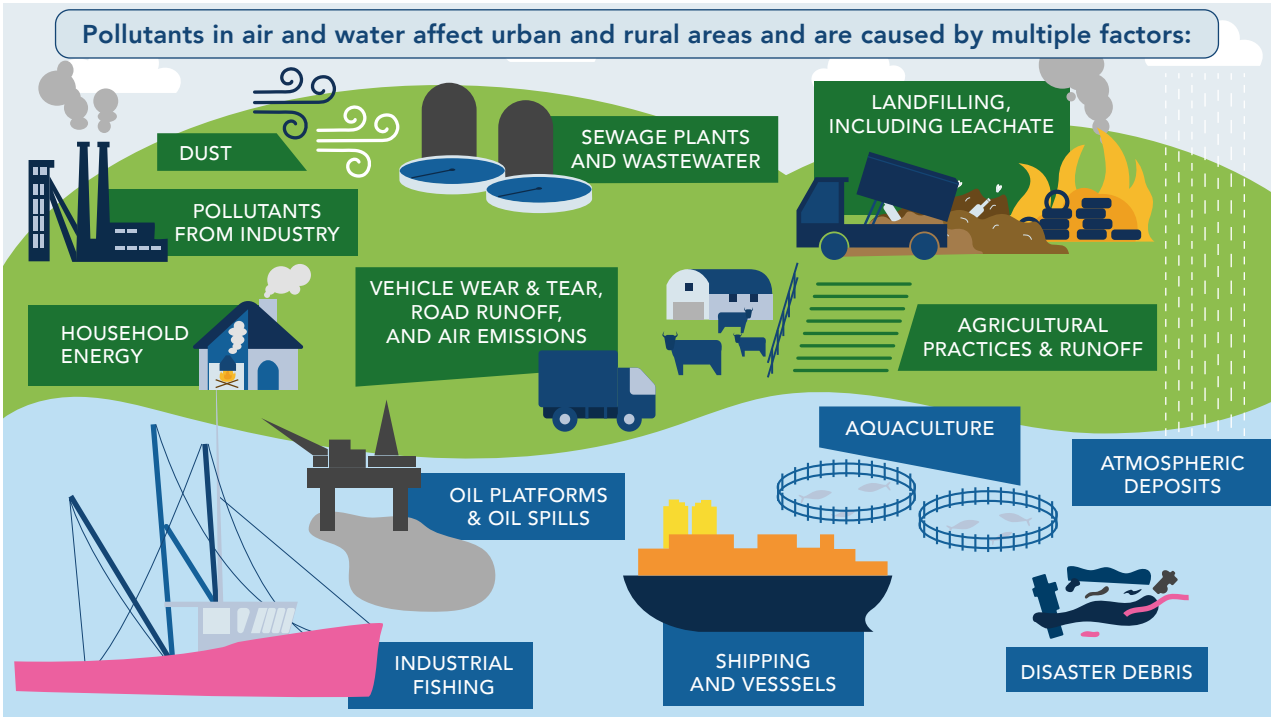
Pollutants in waters are also exacting a heavy toll on human health. UNEP reports that only 56% of all monitored water bodies worldwide are classified as having good ambient water quality, and the Lancet reports that pollutants in water are responsible for 1.4 million deaths annually. We provide further insights into pollutants in water in Water Quality: A Getting Started Guide.



Map of national SDG Indicator 6.3.2 scores from 120 countries, showing the proportion of water bodies with good ambient water quality. Source: UN-Water

UNDERSTANDING THE KEY SOURCES OF POLLUTION IN AIR AND WATER

The pollutants contaminating our air and water are a diverse mix of hazardous substances, and they derive from a wide variety of sources.

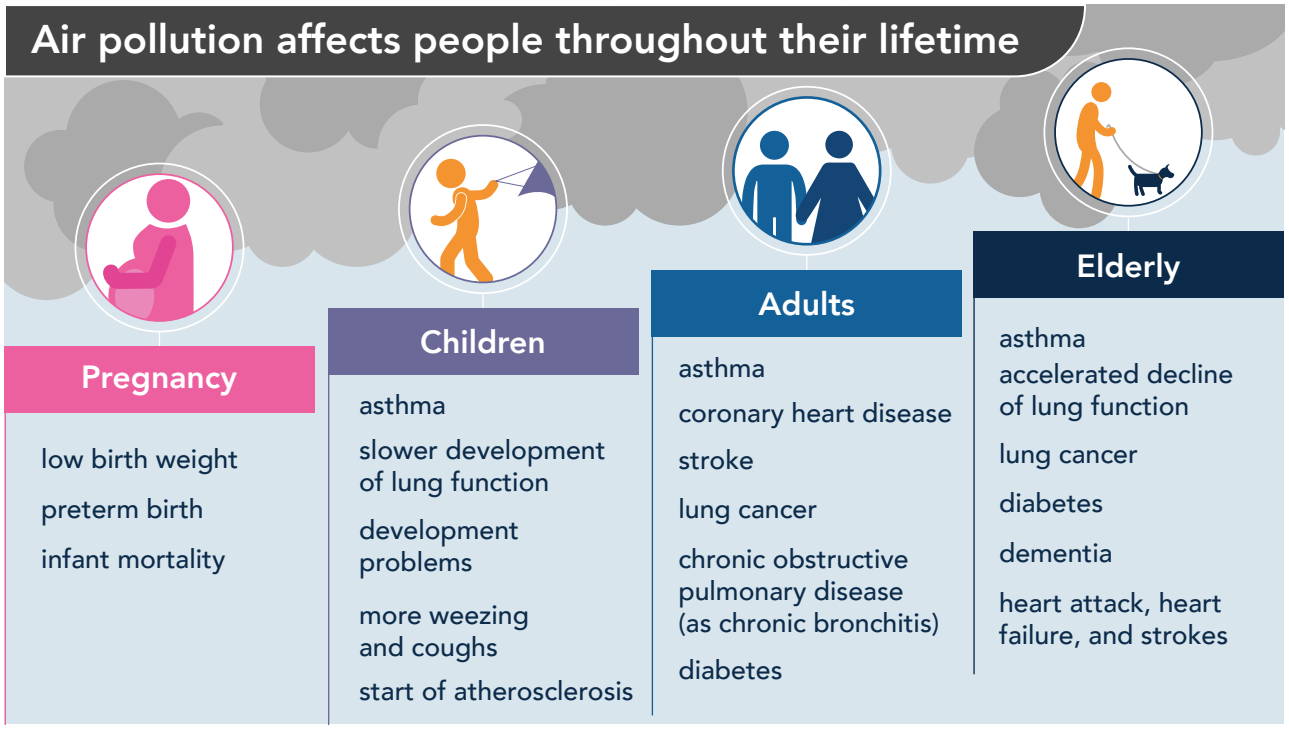


While nature releases hazardous substances into the air in the form of smoke from wildfires, methane and other gases from decomposing organic matter, and ash from volcanic eruptions, the majority of particulate and gaseous pollutants are produced by human activities. Some of the primary sources of air pollution include vehicle emissions, fuel oils and natural gas for cooking and heating homes, by-products of manufacturing and power generation (particularly coal-fuelled power plants), waste incineration, agricultural practices, and fumes from industrial processes and chemical production and use.

Water can also be contaminated in a variety of different ways. Nearly all human uses of water can result in water pollution. Insufficient urban wastewater treatment, agricultural run-off, and industrial pollution are worsening water quality around the world. Toxic compounds such as mercury and arsenic, organic micropollutants from manufacturing and agriculture, microplastics, and more can accumulate in ground, surface, and coastal waters.

UNDERSTANDING AND ADDRESSING THE IMPACTS OF POLLUTION IN AIR AND WATER

Both short- and long-term exposure to pollutants in air and water can create health problems. Exposure to pollutants is associated with a broad range of chronic and acute health conditions, including morbidity and (premature) mortality from cardiovascular and respiratory problems and diseases; reproductive, neurological, metabolic, and immune system disorders; adverse perinatal outcomes; and cancers. Pollutants in air can lead to excess levels of acid in lakes and streams, reduced soil fertility, changes in soil structure, crop and forest damage, and drive eutrophication. Pollution in water erodes water quality and is estimated to negatively impact nearly one-third of global biodiversity.



Air pollution effects by age, adapted from Public Health England

To address these impacts, governments, industry leaders, and non-governmental organisations are collaborating and forming coalitions to drive action. Nation states adopted the Stockholm Convention on Persistent Organic Pollutants in 2001, which helps protect human health and the environment from dangerous long-lasting chemicals by restricting and ultimately eliminating their production, trade, and use. In 2021, the Alliance for Clean Air was launched by the World Economic Forum to help businesses measure air pollutant emissions across value chains and create emission inventories. More than 175 countries endorsed a 2022 resolution at the UN Environment Assembly to establish a legally binding agreement to end plastic pollution and establish the Intergovernmental Negotiating Committee on Plastic Pollution to develop the agreement. Most recently, world leaders agreed to the Global Framework on Chemicals, which presents strategic objectives and targets to protect people and the environment from chemical pollution. The agreement calls for the sound management of chemicals and waste, including a call for action on highly hazardous pesticides and a crackdown on illegal chemicals.

THE RISK TO BUSINESS

Pollutants in air and water matter for business. Across a broad range of industries, businesses are facing credible and mounting risks from a decline in the societal acceptance of pollutants, an increase in abatement and pollution management costs, legislative and regulatory changes, and growing risk of legal challenges and litigation from parties that have suffered harm, loss, or damage from pollution.

Pollutants in air and water have a direct impact on the workforce. Exposure means increased hospital admissions, emergency room visits, and restricted activity days. Around 1.2 billion workdays are lost globally each year due to air pollution, and this could reach 3.8 billion days by 2060. Employees breathing polluted air are much more likely to get sick and experience reduced cognitive performance.

More broadly, pollutants in air and water have a significant impact on economies. It is estimated that air pollution results in USD $6 trillion in annual global health costs and reduces global GDP by

5% due to health impacts, lost productivity, and reduced life expectancy. Research by the CDP estimates that at least USD $77 billion is at risk due to water-related issues, including contaminated water. Further, the World Bank estimates that deteriorating water quality is a key factor in reducing economic growth and exacerbating poverty by nearly one third in some countries.

Businesses have a crucial role to play in protecting people and nature by eliminating pollutants from their own operations and in their value chains. Companies need to understand how their operations and value chains may be directly or indirectly contributing to air and water pollution and the cascading effects these impacts may have on their business, society, and the environment. They need to review and rethink their processes to limit, and ideally eliminate, the release of contaminants from their operations, value chains, and/or products; invest in innovation; and work with policymakers and peers to advance the resilience of key systems.

Note. Sustainability issues are generally systemic issues, because they are deeply interconnected and rooted in complex environmental, social, and economic systems. In these guides, a system threshold is defined as the point at which the resilience of an environmental, social, or economic system becomes compromised. This occurs when the total impacts imposed on the system exceed its capacity to assimilate those impacts.

SYSTEM THRESHOLD

There is a limit to the concentration and volume of pollutants that the Earth and particular ecosystems and communities can withstand before their resilience and well-being are significantly – and perhaps irreversibly – eroded. Novel entities are one of the nine Planetary Boundaries that support and regulate Earth's systems. Research suggests that the boundary for what is considered a safe operating space for novel entities has already been breached.

In the pursuit of a corporate strategy that addresses the issue of pollution in air and water, it is important for your company to determine appropriate and defensible limits within which it must function. Identifying the limits above which particular pollutants in air and water impact human health and nature – let alone threaten environmental, social, and/or economic collapse – is an urgent priority. For some pollutants, there may be no safe level of exposure below which adverse effects do not occur.

As an example of sources of information to guide your understanding of limits, the WHO global air quality guidelines (AQG) provide evidence-informed, quantitative, health-based recommendations for acceptable levels of many common pollutants, including particulate matter PM2.5 and PM10, ozone, nitrogen dioxide, sulphur dioxide, and carbon monoxide. These recommendations are expressed as short- and long-term concentrations and are associated with important risks to public health. The WHO guidelines also provide interim targets to promote a gradual shift from high to lower concentrations and their associated health benefits, as well as qualitative statements on good practices for the management of certain types of particulate matter for which available information is insufficient to derive AQG levels (yet still indicates risk).

KEY TOPICS ASSOCIATED WITH PARTICULATES:

- Dust
- Silica
- Particulate matter 2.5 and 10
- Diesel particulate matter
- Smog
- Microfibres
- Microplastics
- Asbestos

KEY TOPICS ASSOCIATED WITH GASEOUS AIR POLLUTANTS AND ODOURS:

- Volatile organic compounds (VOCs)
- Carbon monoxide
- Sulphur and nitrogen oxides
- Ozone
- Odours

KEY TOPICS ASSOCIATED WITH HAZARDOUS CHEMICALS:

- Caustic substances
- Disinfectants
- Glues
- Pesticides
- Solvents
- Flame retardants
- Polychlorinated biphenyls (PCBs)
- Fluorides
- Persistent organic pollutants (POPs)

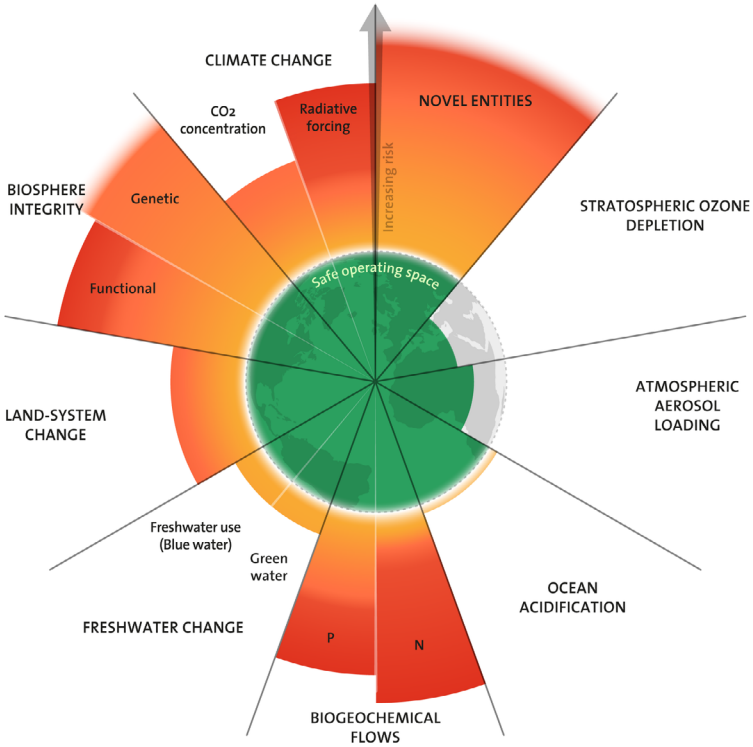
2 KEY CONCEPTS

THE BOUNDARY FOR NOVEL ENTITIES

The Earth is comprised of ecosystems that are vulnerable to change and have limited ability to support various ecosystem services, such as filtering and purifying air, water, and soil. Without our support, this capacity may be irreversibly reduced.

As humans, we have altered the world around us by introducing **novel entities** whose impacts and long-term consequences we often do not understand. "Chemical pollution" was included as one of the Stockholm Resilience Centre's nine planetary boundaries and was later renamed to "novel entities." Novel entities can be defined as "things created and introduced into the environment by human beings that could have disruptive effects on the earth system," or as novel synthetic chemicals that "…mobilize materials in wholly new ways, modify the genetics of living organisms, and otherwise intervene in evolutionary processes and change the functioning of the Earth system." They can also be understood as "new substances, new forms of existing substances and modified life forms," including "chemicals and other new types of engineered materials or organisms not previously known to the Earth system as well as naturally occurring elements (for example, heavy metals) mobilized by anthropogenic activities."

As shown in the diagram below, we have introduced more novel entities than the world can safely incorporate.



Source: The Nine Planetary Boundaries, by Stockholm Resilience Centre, 2023

Breaching the threshold of the planetary boundary for novel entities threatens the resilience of our global environment by destabilising the Earth's systems and causing irreversible damage. It also affects the status of other planetary boundaries. For example, greenhouse gases (GHGs) such as methane, carbon dioxide, and nitrous oxides are air pollutants that trap heat in the atmosphere and contribute to global warming and climate change. Chlorofluorocarbons (CFCs) damage the ozone, our shield against harmful UV rays from the sun.

Air quality is closely linked to the earth's climate and ecosystems globally; many of the drivers of air pollution (such as the combustion of fossil fuels) are also sources of greenhouse gas emissions. Although the term "air quality" is not easily defined, it can be understood to refer to the presence (or absence) and abundance of contaminants known to have a negative impact on the health and/or welfare of humans and/or the environment. It can also be influenced by factors such as wind, temperature, humidity, and rainfall; and natural geographic features, such as valleys or bodies of water.

Similarly, "**water quality**," as defined by the Alliance for Water Stewardship (AWS) Standard, is "the quality of a natural water body in terms of physical, chemical and biological parameters… Good water quality status is where it meets the requirements of native flora and fauna, and for human needs where applicable."

The effects of pollutants can be felt far away from their source because they can enter the air and water currents that circle the globe. The dynamic nature of our atmosphere, hydrosphere, and other geochemical cycles means that pollutants can travel far from their original source and can also disperse or concentrate in unpredictable ways – a phenomenon referred to as **transboundary transport**. Their impacts are also felt for a long time, as pollutants can persist for many years and accumulate in the environment and, in a process called bioaccumulation, in the organisms that live there. For example, plankton and other organisms near the bottom of the food chain consume microplastics and microfibers, which decreases nutrition, damages their health, and reduces their metabolism, which impacts their ability to feed and reproduce. These substances bioaccumulate and are passed along the food chain, increasing the concentration of harmful chemicals in the tissue of higher-order organisms.

A broad range of pollutants are having an impact on our air and water, and it can be helpful to group them into three overarching sub-issues: **particulates, gaseous air pollutants and odours**, and **hazardous chemicals**.

PARTICULATES

Airborne particulates, or particulate matter (PM), consists of airborne particles in solid or liquid form. Particles vary widely in size, shape, and chemical composition, and are often defined by their diameter for air quality regulatory purposes. Particulates may also be classified as primary or secondary, depending on the compounds and processes involved during their formation. Primary PM is emitted at the emissions source in particle form, such as stack emissions or dust from recently tilled fields. Secondary PM formation results from a series of chemical and physical reactions involving different precursor gases, such as sulphur oxides, nitrogen oxides, and ammonia reacting to form sulphate, nitrate, and ammonium particulate matter.

Two key categories of particulate pollution are **fine particulate matter (PM2.5)** and **coarse particulate matter (PM10)**. PM2.5 are particles that measure less than 2.5 micrometers (μm) in diameter, and typically consist of smoke, diesel particulate matter (in the form of small carbon particles or "soot"), and liquid or solid particles in aerosol. Some of the most common sources include combustion of gasoline, oil, diesel fuel, and wood burning. These sources also produce a significant proportion of PM10, which includes inorganic dust from construction sites, landfills, and mining (such as silica, asbestos, and coal), organic dust from agriculture and open

lands (such as mold spores, pollens, bacteria, and animal dander), smoke and ash from fires, and – notably, especially in recent years – microplastics and microfibres.

Adding to the problem of particulates, humanity is facing a pervasive (and growing) problem of microplastics, microfibers, and other harmful and potentially harmful human-generated **microparticles**. Once considered an eyesore, plastic waste has become a crisis topic. New research indicates plastic pollution worsens the impacts of all planetary boundaries, including climate change, ocean acidification, biodiversity loss, and other global challenges

Most alarming is their prevalence: microparticles have been found in every part of the planet, in virtually every crevice on Earth, and almost every part of the human body, including in blood, breast milk, the placenta, testicles, hearts, livers, kidneys, and the brain.

Microplastic particles can accumulate toxic chemicals, and plastic leachate disrupts hormonal mechanisms in animals and humans. Further, all synthetic textiles, from commercial fishing nets and synthetic apparel to carpeting and upholstery, shed microfibers through standard wear and tear and washing. These fibres – which are also often coated with potentially harmful dyes and chemicals during manufacturing – eventually find their way into food chains and into parts of the water table we access for drinking water.

Inexpensive and durable, plastics are resistant to natural processes of degradation, which significantly contributes to the prominence of plastic pollution. Over 9.2 billion tons of plastic have been produced to date, with half of that amount being produced in the past thirteen years alone. Every year 19-23 million tonnes of plastic waste leaks into aquatic ecosystems, polluting lakes, rivers and seas, and by 2050, in a business-as-usual scenario, it is expected that the oceans will contain more plastic by weight than fish.

GASEOUS AIR POLLUTANTS AND ODOURS

Gaseous air pollutants and odours include volatile organic compounds (VOCs), carbon monoxide, sulphur and nitrogen oxides, ozone, and noxious odours.

Volatile organic compounds (VOCs), such as benzene, formaldehyde, and toluene, are gases that vaporise at (or near) room temperature and are emitted into the air from a broad range of processes and products, such as fuel production and combustion and evaporation from adhesives, cleaners, paints and paint thinners, and solvents. Some VOCs are harmful by themselves, and others can react with other ambient gases to form new harmful pollutants.

Carbon monoxide (CO) is a colourless, odourless, poisonous gas that is produced by the incomplete burning of fuels, such as coal, wood, oil, kerosene, propane, and natural gas.

Nitrogen oxide gases (NOX) and Sulphur oxide gases (SOX), which are primarily created from fuel refining and combustion processes, dissolve in water vapour in the air to form acids, which can result in acid rain. They also interact with other gases and particulate matter in the air to form sulphates, nitrates, and other products that can be harmful to people and the environment, such as through the creation of smog, which we address in more detail below. Sulphates and nitrates are also key contributors to the secondary formation of particulate matter, and nitrogen dioxide (NO2) is one of the two "primary" pollutants – along with volatile organic compounds (VOCs) – that contribute to the formation of ground-level ozone, a "secondary" pollutant.

Ozone (O3) occurs both in the Earth's upper atmosphere and at ground level and can be helpful or harmful depending on where it is found. Stratospheric ozone occurs naturally in the upper atmosphere where it forms a protective layer that shields us from the sun's ultraviolet rays. Ground-

level ozone, however, is harmful to the health of humans, animals, and plants, and is the main ingredient in smog. It can also degrade and corrode materials, such as those found in buildings, bridges, and other human-made structures.

Odours from a wide range of sources can also affect local air quality. Common **noxious odours** include those related to waste management, sewage systems, livestock and crop farming, and emissions from vehicles and industrial processes. Although odours are often characterised as a nuisance rather than a health risk, odour complaints are an ongoing frustration for many communities and can contribute to stress-related impacts on health.

HAZARDOUS CHEMICALS

Hazardous chemicals include glues, solvents, thinners, cleaning products, pesticides, acids, and other substances that are wholly or partially comprised of dangerous compounds. They also include the broad category of persistent organic pollutants (POPs), often referred to as "Forever Chemicals" for their longevity in the environment.

Persistent Organic Pollutants (POPs) such as polychlorinated biphenyls (PCBs) and per- and polyfluoroalkyl substances (PFAS), which themselves include Perfluorooctanoic Acid, or PFOA, are also a notable concern. This group of compounds possess toxic properties, resist degradation, and are transported through air, water, and migratory species, often far from their place of release, where they accumulate in terrestrial and aquatic ecosystems.

PFAS – or "**Forever Chemicals**" – have emerged as particularly notorious persistent organic pollutants. PFAS are everywhere, from rainwater and Arctic ice to the sewage sludge used as fertilizer on farms. They have also been detected in the blood of 98-99% of all humans. Humans are exposed to PFAS in a variety of ways, but especially through the food we eat and the air we breathe outdoors, indoors, and at the workplace. PFAS have been widely used in pesticides and in industrial processes, and many products we use in our daily lives once contained (or still contain) PFAS, which have been added to improve product characteristics, such as flame retardants, waterproofing, or to provide non-stick features. Despite being banned decades ago, some of these chemicals are still detected at elevated levels today.

The 2004 Stockholm Convention on persistent organic pollutants calls for reduction or elimination of releases of POPs globally, with parties to the Convention committing to not produce or use the chemicals listed in its annexes. To date, 185 countries have ratified the Stockholm Convention and 34 POPs are listed. Yet, new chemicals are added regularly, and with global chemical sales forecasted to reach €6.2 trillion in 2030, it is crucially important that safer alternatives are found and that green chemistry prevents the replacement of POPs with regrettable substitutes.

SMOG

Lastly, particulates, gaseous air pollutants, and hazardous chemicals can interact in dangerous ways, such as by creating smog. **Smog** is a thick, atmospheric pollution formed by the reaction of pollutants with sunlight and atmospheric conditions. These pollutants include vehicle exhaust, industrial pollution, and emissions from burning fossil fuels and wood. Most of the smog we see today is photochemical smog, and is produced when sunlight reacts with nitrogen oxides (NOX) and at least one volatile organic compound (VOC) in the atmosphere. When sunlight hits these chemicals, they form airborne particles and ground-level ozone and create smog. Sulphurous smog can also result from burning coal and other fossil fuels and is characterised by high concentrations of sulphur dioxide (SOX) and particulate matter.

Smog can affect human health, the environment, buildings and structures, and the economy. The effects of smog can also be experienced indirectly, such as by eating plants that were grown in polluted air or meat from animals that were exposed to such conditions.

3 KEY PLAYERS

A wide range of organisations play a role in measuring and managing pollutants in air and water.

The World Health Organisation (WHO) provides guidance, monitoring, and reporting on global trends and changes in health outcomes associated with air and water pollution (and related actions) at the national, regional, and global levels. The WHO develops and updates air quality guidelines (AQGs), which provide thresholds and limits for key air pollutants, as well as practical guidance for countries on how to reduce pollution levels and improve air quality. The AQGs also include interim targets to encourage a gradual shift towards lower concentrations of pollutants. The WHO also produces guidelines on water quality and human health that are used as the basis for regulation and standard setting world-wide.

The UN Environment Programme (UNEP) promotes global action on air pollution and health. They provide data on the status of pollutants globally, as well as guidance on air quality standards, such as guidance on Ambient Air Quality Legislation. On water, UNEP provides data-driven insights for informing water quality policies; partners with stakeholders for sustainable water management; and supports countries in monitoring, assessing, and improving water quality. In particular, the Global Freshwater Quality Database GEMStat provides credible and comprehensive data on freshwater quality to support scientific assessments and decision-making.

The Climate and Clean Air Coalition (CCAC) is a partnership of over 160 governments and organisations committed to reducing short-lived climate pollutants (SLCPs), such as methane and hydrofluorocarbons (HFCs). CCAC members collaborate and share best practices, and the CCAC publishes regional SLCP assessments and funds projects in developing countries to enable actions that deliver climate and air quality benefits.

The Clean Air Fund is a global philanthropic organisation working with governments, funders, businesses, and campaigners. They provide grants to NGOs, charities, research organisations, and campaigners; run programmes and projects to tackle air pollution on a global scale; and work with partners to generate accessible and actionable data.

UN-Water is a coordination mechanism for the work of over 30 United Nations entities on water and sanitation issues around the world. It informs policy processes, addresses emerging issues, supports the monitoring and reporting on water issues (including wastewater treatment and sanitation for all), and builds knowledge for action.

The Alliance for Water Stewardship (AWS) is a global membership collaboration that contributes to the sustainability of water resources through the adoption of a universal framework for the sustainable use of water – the International Water Stewardship Standard. The framework helps water users to understand their impacts on water, including water quality impacts from pollutants, and offers guidance to achieve good water stewardship practices.

The Science Based Targets Network (SBTN) provides Freshwater and Ocean Hubs that offer guidance on corporate water stewardship and science-based targets for fresh and marine water. SBTN has also published detailed methodologies for companies to assess and prioritise impacts on freshwater quality and quantity.

4 COMMITTING TO TAKE ACTION – MID- AND LONG-TERM GOALS

Committing to take action on **Pollutants in Air and Water** can include addressing many of the key topics listed above. The mid- and long-term commitments that your organisation elects to make should be based on your identified priorities, areas of greatest impact, and your capacity to undertake the work required. It is important to note that this section does not provide all possible mid- and long-term goals related to this issue, but rather a sample of the goals that were most frequently adopted by companies in our research.

Common mid- and long-term goals and/or commitments on **Pollutants in Air and Water** include variations of the following:

Long-term goal: Eliminate the use of hazardous chemicals in our products

- 100% of hazardous "priority chemicals" present in our products and production processes will be phased out by 20[XX]
- 100% of hazardous "priority chemicals" present in our packaging will be phased out by 20[XX]
- Restrict and replace chemical classes of high concern with verified non-toxic substances by 20[XX]

Long-term goal: Zero impact on air and water quality from our operations by 20[XX]

- 100% of industrial emissions are safely abated or captured by 20[XX]
- Achieve zero discharge of untreated wastewater by 20[XX]
- Implement screening for impurities and fugitive pollutant emissions at all facilities by 20[XX]
- Support the responsible development of local air quality assessment and wastewater collection and treatment systems

Long-term goal: Continuously reduce our impact on the environment along our entire value chain

- Achieve 100% safe, screened chemistry at all strategic value chain facilities
- Require key suppliers to engage with vendors and implement appropriate safe chemistry standards and practices

Are you setting new goals or interested in benchmarking your goals against leading practice? To help advance progress in credible corporate sustainability goals, the Embedding Project maintains a public goals database containing leading sustainability goals and commitments set by large companies globally. Explore our Sustainability Goals Database for more mid- and long-term goals on Particulates, Airborne Gaseous Pollutants and Odours, and Hazardous Chemicals.

5 HOW TO GET THERE – PROCESS-BASED INTERIM TARGETS

Note. The following proposed timelines are only for guidance and are based on the pace outlined by other companies. The timeframe for actions and work for each step needs to be embedded in your organisational context, which may require different time allocations.

The sequence outlined below assumes that your company has significant impacts on **Pollutants in Air and Water** within its direct operations and that you will begin to engage with your value chain after learning and taking action to get your own house in order. Companies with greater impacts within their value chain may (and likely should) opt to engage with value chain partners at a much earlier stage.

YEAR 1: UNDERSTAND ISSUES RELATED TO AIR AND WATER POLLUTION

Understand the safe thresholds (if any) for the pollutants that derive from your operations and your value chain and clarify the legal requirements for compliance in the regions where you operate. Ideally, much of this work will have already been completed as a part of your organisation's regulatory compliance processes.

If you operate in regions or areas where regulations are lacking, aim to understand what action would be necessary to preserve and enhance the health and wellness of key social and environmental systems.

Explore how your industry, your operations, and your value chain may impact air and water quality. There are many different types of pollutants – if you are unsure of where to begin, you may want to start by building your understanding of pollutants of particular public health concern, which include particulate matter (PM), nitrogen oxides (NOX), sulphur oxides (SOX), carbon monoxide (CO), volatile organic compounds (VOCs), and ozone (O3).

Identify (and consider prioritising) pollutants in air and water that have been named by key authorities as being of particular concern to air and water quality in the areas where you operate. Further your understanding of the different air and water quality factors, such as transboundary transport, contamination, bioaccumulation, and more as they become relevant to your operational context.

It is worth noting that much of the work related to water quality will occur concurrently within a broader water quality strategy – further guidance on key approaches to addressing pollutants in water can be found in Water Quality: A Getting Started Guide.

YEAR 1: GATHER DATA AND ESTABLISH BASELINES

Review your current polices and processes regarding chemicals management and pollution control. Aim to understand your current systems, narrative, and the culture that exists around managing chemicals to minimise risk of harm to workers, communities, and the environment.

Determine current pollution levels using existing air quality data from public sources and by gathering data on air and water quality at your work sites, including effluents and potential point sources (such as stack emissions, wastewater discharge, or waste disposal) and non-point sources (such as chemical runoff and seepage) of pollution.

This process may require measuring a range of indicators for air and water quality linked to your operations to understand where you currently stand at a site-level. For each industry and company, the indicators measured will vary based on their operational impacts. Leverage your learnings related to relevant air and water quality issues to understand what parameters you should measure to establish a baseline and support effective future decision-making. Depending on the scope and scale of contaminants and their sources, your company may need to develop and implement a comprehensive process of continuous (and mobile) monitoring, using a combination of air quality sensors, real-time air and/or water pollution maps and exposure calculators, and data processing and modelling tools. You will also want to assess for potential gaps in monitoring.

CASE STUDY:

Teck Resources has set a goal to continuously reduce their mining-related impacts on air quality, such as reducing dust and sulphur dioxide emissions. To achieve this goal, Teck operates and maintains 18+ air quality monitoring stations in the communities surrounding their operations. Their monitoring systems provide a range of site-specific data, including – among other features – emissions data on sulphur dioxide emissions from stacks and stationary and mobile fossil fuel combustion; automated pollutant reporting against various thresholds; and predictive 72-hour dust forecasts.

For organisations whose products may release contaminants into the air or water in later parts of their lifecycle, such as plastics and textiles, it is crucial to understand and quantify the impacts of these products at the point that they may enter environmental systems. Proper waste management may be outside of your company's direct control once these products are purchased by customers. It is therefore crucial that you identify, estimate, and document how these contaminants may impact the environment to better understand and focus your efforts where they are the most relevant.

Examples of process-based targets for Year 1:

- By 20[XX], we will understand local and international regulations, standards, legislation, and associated commitments related to pollutants in air and water.
- By 20[XX], we will understand potential air and water quality issues associated with our industry, our operations, and our value chain, including the primary source(s) of pollutants.
- By 20[XX], we will gather data to assess air and water quality impacts from our sites and operations.
- By 20[XX], we will gather data on the state of air and water quality in the regions where we operate.
- By 20[XX], we will establish air and water quality baselines and trends.
- By 20[XX], we will establish a hierarchy of control to rank pollution controls from the most effective level of protection to the least effective level of protection.
- By 20[XX], we will review and revise best practices for personal protective equipment.

YEAR 2: UNDERSTAND POLLUTANT-RELATED RISKS

Pollutants in air and water have significant implications for businesses. Public awareness of environmental issues and expectations for action are growing, and companies are under increasing scrutiny. Organisations face stricter environmental laws and risk disclosure requirements, with non-compliance increasingly likely to result in legal action, fines, and damage to reputation. They also face physical risks, such as impacts on employee

health and on material assets and infrastructure (such as corrosion and discolouration from contaminants, as well as climate change-related impacts that may be exacerbated by pollutants). Your company needs to understand these pollution-related risks and the knock-on effects they can have on other issues, such as contributing to climate change.

CASE STUDY:

Haleon has established a Clean Breathing Institute to help reduce the impact of air pollution on respiratory health globally. The Institute conducts research on the disease burden, risk factors, and effective management of air pollution-induced respiratory illness, and provides educational resources to healthcare professionals on how to support patients to manage their exposure to air pollution, such as a handbook for pharmacists.

YEAR 2: IDENTIFY BEST PRACTICE AND AREAS OF IMPROVEMENT

Identify industry, regional, and/or catchment-specific guidance on best practices to reduce impacts on air and water quality in your operations. While this will look different for each industry, region, and catchment context, it can include aspects such as implementing clean technologies that reduce stack emissions, improving or redesigning operational processes to improve waste and wastewater management, and shifting to clean modes of power generation and cleaner heavy-duty diesel vehicles and low-emissions vehicles and fuels.

Examples of process-based targets for Year 2:

- By 20[XX], we will establish a measurement process to better understand and track our impacts on air and water quality from our direct operations and quantify baselines.
- By 20[XX], we will have undertaken air and water quality baselines in all of our direct operations.
- By 20[XX], we will understand air and water quality-related risks in our operations.
- By 20[XX], we will identify relevant best practice for ensuring air and water quality.
- By 20[XX], we will identify air and water quality-related risks related to the design and manufacturing of our products.
- By 20[XX], we will identify air and water quality-related risks related to the use and end of life of our products.

YEAR 3: SET TARGETS

Set site-based and/or catchment-specific targets that will align your organisation with the levels of air and water quality needed to ensure resilience and wellbeing – these should aim to bring your activities in line with national or local thresholds and goals for the region or catchment. At a minimum, these targets should be informed by WHO standards and align with WHO air and water quality guidelines. Your targets should also be guided by the precautionary principle, meaning that where there is a risk of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

While there may be several actors influencing air and water quality in the regions where you operate, leverage the social, economic, and technical information that you have to determine your 'fair share' of the effort. For example, WWF provides guidance on setting science-based water targets, and the Science Based Targets Network's (SBTN) freshwater science-based targets explore goal-setting for freshwater pollution.

YEAR 3: DEVELOP AN ACTION PLAN

Target your efforts on processes and sites that have the greatest impact on air and water quality and prioritise improvements that are the easiest to implement to jumpstart the process. Train employees on assessing impacts to air and water quality and engage them within the planning process to support the uptake of your action plan at the site level. Establish processes and methodology to effectively track and analyse impacts on air and water quality to evaluate your progress.

CASE STUDY:

Nike's approach to cleaner chemistry is multi-faceted. Their Code of Conduct requires chemicals to be properly managed across all facilities and includes strict compliance with their Restricted Substances List (RSL) and the Zero Discharge of Hazardous Chemicals (ZDHC) Manufacturing Restricted Substances List (MRSL). Nike has also continually developed and refined the list of chemicals that are restricted from use and actively monitors and controls over 400 substances. In their 2021 Impact Report, Nike published a target to find alternatives for their top 10 priority chemistries by 2025, as selected through a chemical assessment approach informed by human, environmental, and other factors. These goals went beyond the baseline requirements of Nike's RSL. To date, most of these substances – including PFAS and bisphenols – have been completely phased out of Nike's products and production processes.

Examples of process-based targets for Year 3:

- By 20[XX], we will determine progressive targets at appropriate levels (e.g. site-level or catchment-based) for air and water quality impact, such as quantity of pollutants discharged from operations (PPM), or [X]% of industrial wastewater reused.
- By 20[XX], we will develop an action plan to reduce our impacts on air and water quality.
- By 20[XX], we will determine the hazardous substances that can be substituted with non-hazardous substances, and – where substitution is not possible – apply other engineering control methods to mitigate exposure and emissions (e.g. the use of wet processes, collection systems, and controlled disposal of dangerous waste).

YEAR 4: EXTEND YOUR LEARNINGS TO YOUR VALUE CHAIN

For many companies, the greatest impacts on air and water quality reside within their value chain. Leverage your learnings from your efforts in your operations to reduce air and water quality impacts throughout your value chain. Share your air and water quality targets and insights with suppliers to encourage a greater understanding of impacts, the risks they pose to business, and the importance of action. Prioritise engagement with suppliers that have the greatest impacts and aim to co-develop solutions such as wastewater recycling or rethinking of materials and/or processes used to minimise adverse impacts on air and water quality.

YEAR 4: SUPPORT SYSTEM-WIDE CHANGES

Explore where your organisation has a broader role to play in improving air and water quality in the areas where you operate, and especially in areas with vulnerable people. Identify industry and/or local initiatives where your organisation's participation and contributions may help to foster greater impact. Much of the work related to reducing and eliminating pollutants is underpinned by the availability of robust and accurate data. Exploring whether and how your company can support improved data collection and monitoring can also be an important pathway towards broader industry and system-wide changes.

CASE STUDY:

As part of their commitment to the Alliance for Clean Air, IKEA is developing mitigation scenarios for air pollutants across the IKEA value chain. Through these scenarios, IKEA has been able to quantify the impact of their FY30 climate roadmaps on air pollutant emissions related to production, product transport and logistics services, product use at home, product end of life, and more.

Examples of process-based targets for Year 4:

- By 20[XX], we will work with our suppliers to support the uptake of practices that reduce pollutants in air and water across our value chain.
- By 20[XX], we will require suppliers to meet certain third-party hazard-based standards for chemicals.
- By 20[XX], we will require suppliers to ensure chemical substitutes are safe.
- By 20[XX], we will empower and train suppliers on practices to reduce the presence and impacts of pollutants in air and water in the production stage.
- By 20[XX], we will identify industry, local, and/or international collaboration opportunities to support systemic change towards reducing and eliminating pollutants in air and water.

RESOURCES

GUIDANCE

UNDERSTANDING POLLUTANTS IN AIR AND WATER

The WHO Global Air Quality Guidelines provide guidance on thresholds and limits for key air pollutants that pose health risks. These guidelines are developed through a transparent, evidence-based decision-making process, and provide interim targets to promote a gradual shift from high to lower concentrations of pollutants. The AQG also explains good practices for the management of certain types of particulate matter.

The new Global Framework on Chemicals provides a vision for a planet free of harm from chemicals and waste. Based around 28 targets, the framework outlines a roadmap for countries and stakeholders to collaboratively address the lifecycle of chemicals, including products and waste. It features a range of actions to ensure that a broad cross-section of stakeholders from governments, industry, international technical agencies, and civil society can support positive change on key topics, such as phasing out the most harmful chemicals, advancing circularity, and strengthening capacity-building, particularly in countries with insufficient enforcement regimes.

The Stockholm Convention on Persistent Organic Pollutants is a multilateral environmental agreement to protect human health and the environment from such harmful chemicals. This site is your one-stop shop for learning more about POPs. It provides essential information on initial and newly identified POPs; reports and decisions from the Convention; and brochures, leaflets, fact sheets, guidance manuals, and other publications.

TAKING ACTION ON POLLUTANTS IN AIR AND WATER

The Practical Guide to Chemical Management Due Diligence in Supply Chains was created by the Responsible Business Alliance to provide you with a standardised, due diligence process template for managing chemical risks. It reflects RBA member companies' experiences and learnings and seeks to promote a collective understanding among businesses, governments, non-governmental organisations (NGOs), workers' organisations, employers' organisations, the public, and other stakeholders on best practices for responsible chemical management conduct to safeguard workers' health and the environment.

The Plastic Leak Project Guidelines provide the first science-based methodology to map and measure plastic leakage across corporate value chains. This document provides a framework for understanding where (and how much) leakage is occurring and can help you to create impactful strategies and actions that effectively address plastic pollution and mitigate key business risks. Also available is a Plastic Leak Project Brief, which provides decision-makers with an overview of the guidelines, a summary of the challenges they help address, the business value of this metrics-based approach to building a plastics strategy, and more.

These Factsheets on Water Quality Parameters from the Environmental Protection Agency (EPA) can help you to become familiar with common parameters for monitoring water quality. The fact sheets explore aspects of water quality such as temperature, dissolved oxygen, pH, turbidity, nutrients, macroinvertebrates, e. coli, metals, and habitat conditions. Each factsheet examines key questions related to why and how measurements are made for the parameter in question, what can affect the parameter (positively or negatively), and the challenges of using the parameter.

The Alliance for Water Stewardship (AWS) Standard can help you to understand your water impacts and to work collaboratively and transparently for sustainable water management within a catchment context. The standard has five steps: 1) gather and understand, 2) commit and plan, 3) implement, 4) evaluate, and 5) communicate and disclose.

This Business guidance on the assessment of wastewater-related impacts from WBCSD can help your company to better understand and manage the impacts of untreated and partially treated wastewater. It provides a standardised, 5-step process for measuring, valuing, and managing the impacts of wastewater generated by your operating sites or those of suppliers.

TOOLS

Developed through a collaboration of the Stockholm Environment Institute, Climate and Clean Air Coalition, and the Inter IKEA Group, this Practical Guide for Business Air Pollution Emission Assessment has been created to help companies quantify air pollutant emissions across their value chain. The assessment enables businesses to create a global overview of their impact on pollution and to establish a baseline for setting credible targets.

The WHO's Air Pollution Data Portal can help you to quickly access data and databases, factsheets, interactive tools, and key publications on ambient and household air pollution.

The Global Environment Monitoring System for Freshwater (GEMStat) provides water quality data from around the world on parameters such as pollutants, nutrient levels, and more.

The Wastewater Impact Assessment Tool from WBCSD aims to provide a site-level assessment of the pressures resulting from the industrial activities, allowing users to visualise the impacts of wastewater.

Explore more curated resources on Particulates, Gaseous Air Pollutants and Odours, and Hazardous Chemicals on our website.

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