

QUALITY: UNKNOWN – KEY MESSAGES

Message # 1- The world faces an invisible crisis of water quality. Its impacts are wider, deeper and more uncertain than previously thought. and require urgent attention.

Key data points:

- Each year, about **1000 new chemicals** enter the environment
- **80% of the world's wastewater** is released to the environment without treatment
- Synthetic fertilizers have transformed agriculture and enabled lives, but it has also claimed lives. **About 30 – 50% of nitrogen applied to soils leaches into rivers and the air, suffocating aquatic life, worsening climate change and shortening lives through contaminated waters**

While much attention has focused on water *quantity* – too much water, in the case of floods; too little water, in the case of droughts – water *quality* has attracted significantly less consideration. This report shows that urgent attention must be given to the hidden dangers that lie beneath the water's surface:

- Water quality challenges are not unique to developing countries but universal across rich and poor countries alike. High-income status does not confer immunity - challenges with pollutants grow alongside GDP. And as countries develop, the cocktail of chemicals and vectors they contend with change – from fecal bacteria to nitrogen to pharmaceuticals and plastics, for example.
- What we think of as safe may be far from it. Water quality is complex and its impacts on health and other sectors are still largely uncertain. Worse, regulations guiding safety standards are often fragmented across countries and agencies, thus adding to this uncertainty. This report shows that some pollutants in water have impacts that were previously unknown and occur at levels below established safe norms.
- The forces driving these challenges are accelerating. Intensification of agriculture due to subsidies for nitrogen fertilizer, land use changes due to agricultural extensification, more variable rainfall patterns due to climate change and growing industrialization due to countries' development all continue to grow. This means increasing number of algal blooms in water which are deadly for humans and ecosystems alike.

Message #2 – Poor water quality threatens growth, harms public health and imperils food security.

Key data points:

- Water pollution reduces economic growth by **a third**
- Nitrogen in water can increase childhood stunting by **as much as 19%** and decrease adult earnings by **as much as 2%**.
- Enough food is lost due to saline waters each year to feed **170 million people every day**

Using new data, this report demonstrates the importance of water quality across a range of sectors and how its impacts cut across nearly all of the SDGs. Poor water quality stalls economic progress, stymies human potential and reduces food production:

- Water pollution endangers economic growth. The release of pollution upstream acts as a headwind that lowers economic growth downstream.
 - When Biological Oxygen Demand (BOD) – a measure of how much organic pollution is in water and a proxy measure of overall water quality – passes a certain threshold, GDP growth in downstream regions is lowered by a third.
 - In middle-income countries – where BOD is a growing problem because of increased industrial activity - GDP growth downstream of highly polluted areas drops by half

There are a number of reasons for this, including:

- Nitrogen in water shortens people and shortens their lives. Much of the nitrogen applied as fertilizer eventually enters rivers, lakes and oceans where it transforms into nitrates. Nitrates in water are responsible for fatally inflicting Blue Baby Syndrome, which starves infants' bodies of oxygen. This report finds that those who survive the consequences of early exposure to nitrates can be condemned to long-term damages throughout their lives – they grow up shorter and earn less than they would have otherwise. Stunting is a red flag indicator for the risk of physical and cognitive deficits.
 - Nitrate exposure in infancy:
 - Wipes out much of the gain in height seen over the past half-century in some regions
 - Harms children even in areas where nitrate levels are deemed safe.
 - While an additional kilogram of nitrogen fertilizer per hectare increases agricultural yields by as much as 5%, the accompanying run-off and releases into water can increase childhood stunting by as much as 19% and decrease adult earnings by as much as 2%. This suggests a stark trade-off between using nitrogen to boost agricultural output and reducing its use to protect children's health.
- Salinity diminishes agricultural productivity. Saline waters and soils are spreading throughout much of the world because of increasing rates of water extraction, droughts and rainfall shocks, sea-level rise, and poorly managed irrigation systems. This report shows that agricultural yields fall almost exactly in line with increased salt concentrations in water. That is to say – more salt in the water means less food for the world.
 - This report also reveals that enough food is lost due to saline waters each year to feed 170 million people every day – that's equivalent to a country the size of Bangladesh. Such a sizable loss of food production to saline waters means food security will continue to be jeopardized unless action is taken.
- Even as these impacts are being felt, emerging pollutants are entering the world's waters – their impacts are still unknown but present a hazard that may further exacerbate existing problems.

Message #3 – The outlook is stark - but change is possible. Increased awareness, strengthened prevention and smart investments using new technology are needed to turn back the tide of water pollution.

The challenge is daunting, but it is not insurmountable. Solutions exist for countries at all stages of development. The way forward requires a mix of approaches that focus on information, prevention and investment:

- Information is both a resource and a rallying cry. The first step to tackling the water quality challenge is recognizing the scale of it. The world needs reliable, accurate and comprehensive information so that new insights can be discovered, decision-making can be evidence-based and citizens can call for action. Encouraging and enabling this information and its sharing is fundamental to the social contract, and critical to getting water pollution under control.
 - Advances in technology make measurement more feasible and reliable. Multi-layered monitoring systems involving several parties can improve the reliability and credibility of data collected. Remote sensing and machine learning can provide an additional and independent layer of verification.
- Prevention is better than cure. While sunlight may be the best disinfectant, legislation, implementation and enforcement are also crucial to scrub the world's waterways of pollution. Information and transparency must be coupled with well-designed, effectively implemented and scrupulously enforced regulations for firms and individuals to adhere to water quality guidelines.
 - New technologies can be harnessed to improve enforcement in these circumstances. For instance, smart contracts - rules written in computer code that are embedded in a blockchain and automatically execute when the conditions are met – could be used to enforce payment from polluters.
 - Land use policies that preserve critical forests, wetlands and natural biomass are key to protecting water supplies and preventing pollution from entering waterways. Smart spatial planning of these land use policies around critical water resources can maximize their effectiveness.
- Invest in what works. Pollution that cannot be prevented must be treated. Wastewater treatment has a vital role to play – it is crucial for a country's health, food security and economy by helping remove pollution and debris. Investments in wastewater treatment are a down payment on a cleaner future.
 - Investments need to be accompanied by incentive structures that monitor performance, penalize profligacy and reward success. The right combination of carrots and sticks can help drive effectiveness, innovation, and attract private investments.