Bending the Pollution Curve

An Analysis and Prioritization of Pollution Management in Ethiopia

Rehabilitated Reppie Landfill in Addis Ababa.

Ethiopia has one of the fastest-growing economies in Africa, with an annual average GDP growth rate of 10 percent from 2005 to 2020, and significant progress in reducing poverty. This economic growth has also resulted in natural resource depletion, pollution problems, and environmental degradation, all of which threaten development gains. The country's capital, Addis Ababa, has been rapidly urbanizing, presenting many social and environmental risks including pollution (water, air, and noise), urban sprawl, solid and liquid waste management problems, illegal settlements, and loss of open green areas. Urbanizing secondary cities in Ethiopia face similar challenges.

The Environmental Kuznets Curve hypothesis suggests that, initially, economic growth increases pollution up to a certain income threshold, and then it begins to decrease pollution. Empirical studies of this phenomena have found, however, that countries can "bend the curve": with strong policy, political will, and public awareness, countries can grow without rampant pollution problems. The World Bank's "Ethiopia Pollution Management" study aimed to identify, diagnose, and evaluate key urban pollution issues facing Ethiopia and advise governments on developing and prioritizing pollution management interventions through a long-term perspective. This brief presents key results and recommendations for the study cities of Addis Ababa, Bahir Dar, and Hawassa.

Ethiopian Cities Face Significant Challenges from Air, Water, and Solid Waste Pollution

Air pollution: Addis Ababa and other Ethiopian cities are facing deteriorating air quality that undermines quality of life. In Addis Ababa, the main sources of air pollution are vehicle exhaust, residential activities, industry, and resuspended dust. In the capital, the population-weighted annual average of ambient PM2.5 concentration was 30-36 µg/m3 for 2016-2020, far above the WHO guideline of 5 µg/m3. Annual concentrations for 2016-2019 were estimated at 20 µg/m3 in Bahir Dar and 22 µg/m3 in Hawassa. If no preventive actions are taken by the government, air quality in urban Ethiopia will deteriorate over the coming years. Using Global Burden of Disease methods, ambient PM2.5 pollution is estimated to cause around 1,600 premature deaths each year in Addis Ababa, 90 in Bahir Dar, and 70 in Hawassa—along with an estimated 4,100 Years Lived with Disability in Addis Ababa and a proportional estimate in the secondary cities. As these figures represent only

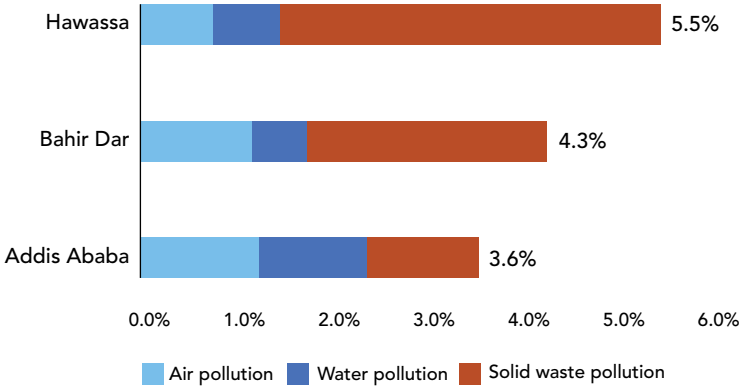
City view of Addis Ababa

the effects of PM2.5 pollution, they should be understood as only a fraction of the total impact of air pollution.

Water pollution: Ethiopian cities exceed national or international standards on various dimensions of water quality, including biological, chemical, and heavy metal contamination. Much of the pollution originates in industry: 89% of wastewater volume in Addis Ababa comes from the leather and footwear, food and beverage, and textile industries. Agricultural runoff, untreated sewage, improperly disposed solid waste, and non-point sources (such as stormwater runoff) are also sources of water pollution. These sources of pollution result in high levels of organic waste and bacteria in surface waters, eutrophication, heavy metal pollution, and ecological deterioration in the study cities, with the greatest contamination in Addis Ababa and Hawassa. Evidence also suggests that surface water pollution leads to contamination of groundwater, which is the main source of drinking water in some study cities. Studies in Addis Ababa indicate that around 25% of the population suffered from a solid waste or sanitation-related disease in 2008, and other research suggests a substantial burden of typhoid fever and diarrhea, diseases with probable links to water quality.

Solid waste management: About 70% of solid waste is collected in Addis Ababa, and around 80% in Bahir Dar and Hawassa, with uncollected waste resulting in significant solid waste pollution. Recycling rates are low in Addis Ababa (4-5%), unreported for Bahir Dar, and more substantial in Hawassa (19%). Ethiopia has few sanitary landfills, most of which are not properly managed. Most municipal solid waste is disposed of at open dumpsites, illegally littered or openly burned. The direct results of solid waste pollution in Ethiopian cities include the proliferation of infectious disease, exposure to hazardous waste, and aesthetic impacts such as foul odor. Landfill management is a serious challenge, as well: Leaching from improperly managed landfills can also pollute soil, groundwater, and surface water bodies, and solid waste litter can clog drainage systems to contribute to flooding and water pollution. Addis Ababa has a history of landfill safety issues, most notably the 2017 explosion and landslide at the Reppie landfill, which resulted in over 100 fatalities.

Estimated pollution cost by city (% of the city's GDP, 2019)



Pollution Costs Ethiopian Cities At Least 3-5% of GDP Each Year

This study estimated the impact of pollution related to air, water, and

City view of Addis Ababa

solid waste at 3.6% of the GDP each year in Addis Ababa, 4.3% in Bahir Dar, and 5.5% in Hawassa (see the Figure above). For all cities, air pollution costs were estimated based on the premature mortality and morbidity due to PM2.5 exposure, which amounted to 0.8-1.3% of GDP in the study cities. Water pollution costs amount to about 0.6-1.1% of GDP, though this is likely a significant underestimate. Finally, solid waste pollution costs 1.2-4.0% of GDP. These results should be regarded as order-of-magnitude estimates, aimed to help prioritize prospective pollution management interventions. While estimated costs for each form of pollution vary, the study concludes that all three forms of pollution deserve equal priority in pollution management, as the valuation methods used reflect only a portion of pollution costs.

A Framework of Priority Interventions Can Reduce Pollution

To begin intensifying pollution control efforts, authorities should focus on strengthening institutions, as well as consider highest-priority strategies for each pollution media. Improvements to institutional arrangements include establishing a clear and stable organizational structure to clarify agency roles and responsibilities; strengthening coordination between regulatory stakeholders; ensuring that agencies tasked with pollution management have sufficient staff and capacity; involving the public in pollution control efforts; and streamlining data collection, access to information, and knowledge management.

Air pollution: Control of air pollution requires regulatory and policy action, budgeting and capacity building, air quality monitoring, and further analytical work. High-priority actions to consider include a functional review of relevant government agencies to clarify roles, taxation and pricing policy to encourage cleaner vehicles, upgrading air quality standards, introducing low-sulfur fuel standards, building institutional capacity, and developing standardized systems for monitoring and reporting ambient air quality.
Water pollution: Several measures have the potential to quickly improve water quality in Ethiopian cities. Sources of water pollution were grouped in three categories, each of which have some priority areas. First, point sources of pollution, specifically from industries and commercial activities, should be tackled, for which authorities should aim to step up enforcement of existing regulations and examine areas to increase regulatory efficacy. Second, addressing water contamination from landfills and solid waste disposal sites should also be a priority, in addition to better understanding the hazard from unregulated solid and hazardous waste disposal. Lastly, the remaining non-point sources should be addressed in parallel with the other two categories with priority given to improvements in sanitation (starting with ending open defecation) and measures to prevent agricultural run-off. In addition to addressing the sources of pollution, it is important to strengthen water resource management, water quality monitoring, investment in high-quality distribution networks, and environmental enforcement.
Solid waste pollution: Priority areas of intervention in solid waste management include technical support, infrastructure investment,

Meskel Square, Addis Ababa

public awareness building, and inclusion. Cities should provide adequate technical expertise and training to the staff and operators of transfer and sorting stations to reduce the occurrence of improper waste disposal as well as improve the areas' overall cleanliness and safety. Physical improvements to solid waste management infrastructure should focus on collection, recycling, sanitary landfills, and safe closure and rehabilitation of old dumpsites. Public participation takes on particular importance in the management of solid waste. In particular, household participation in waste separation at the source is vital for enhancing recycling and composting practices. Local authorities in Ethiopia will also need to assess the feasibility of private sector participation and try to attract private investment. Lastly, the planning and development of integrated SWM systems should also address informal recyclers, whose livelihoods rely on waste picking and recycling activities and whose work should be recognized through formalization.

Pollution in Ethiopian cities currently has a large detrimental effect on the local environment, public health, and economic growth. International trends – as well as the Environmental Kuznets Curve– suggest that as economic development continues, air, water, and solid waste pollution will each continue to rise in Ethiopian cities. However, with a framework of priority interventions like those indicated above, the country can shape the trajectory of pollution and bend the curve.

This policy brief is based on the report *Bending the Pollution Curve: An Analysis and Prioritization of Pollution Management in Ethiopia*. The report is the output of the World Bank's Ethiopia Pollution Management Advisory Services and Analytics program. The full report can be reviewed and downloaded at https://openknowledge.worldbank.org/handle/10986/38032.

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