Investment Case for Air Pollution Reduction in Ethiopia

Executive Summary

Suggested citation. UNDP, Ethiopia Environmental Protection Agency and Ethiopia Ministry of Health. Investment Case Study for Air Pollution Reduction in Ethiopia. United Nations Development Programme; 2024. Licence: CC BY-NC-SA 3.0 IGO.

This document was produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

Investment Case for Air Pollution Reduction in

Ethiopia

Burden

Air Pollution

In Ethiopia, nearly

39,000

people die each year due to household air pollution (HAP).

HAP[1] causes

281 trillion ETB

(US$8 billion) in economic losses each year, equivalent to 4% of GDP, and 53% of the 2023 government budget.

In Ethiopia, ambient air pollution (AAP) levels are nearly

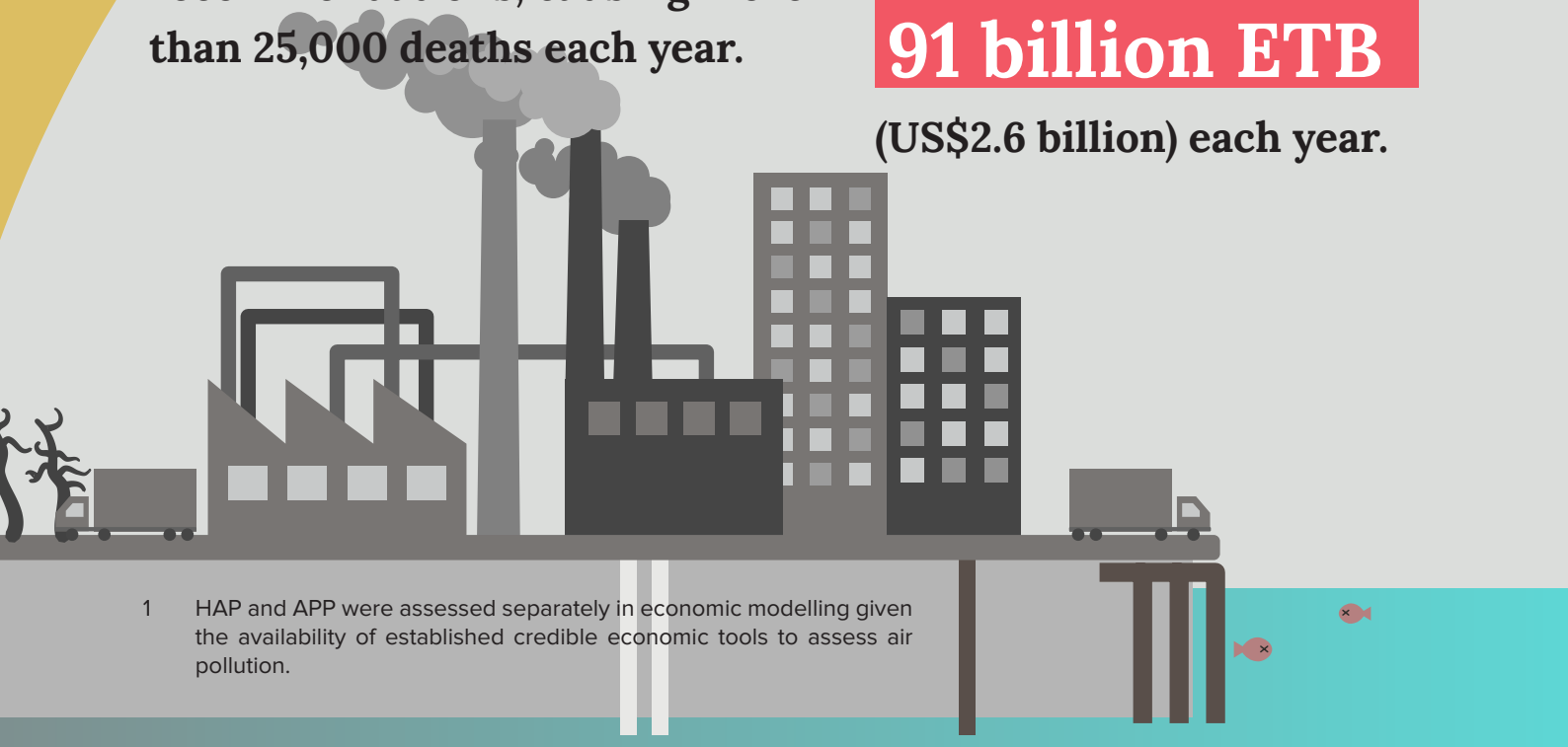
five times

higher than the WHO's 2021 Air Quality Guideline recommendations, causing more than 25,000 deaths each year.

The AAP-related health burden is equivalent to

91 billion ETB

(US$2.6 billion) each year.



1 HAP and APP were assessed separately in economic modelling given the availability of established credible economic tools to assess air pollution.

Why invest?

The HAP analysis simulates a ten-year program estimated to generate economic benefits of more than

84 billion ETB

(US$2.4 billion) and prevent about

6,000 premature deaths.

Transitioning from traditional biomass cookstoves to cleaner cooking technologies can result in large environmental gains reducing pollutant emissions with annual reductions equal to

20%

of Ethiopia's target reduction of CO_2-equivalent emissions by 2030.


Wegagen Bank
OBS TV
Radisson

Air pollution accelerates climate change and damages all aspects of planetary health, including food systems and human health. Among others, air pollution is linked to stroke, heart disease, respiratory diseases, lung cancer, adverse pregnancy outcomes and poor cognitive development. In addition, air pollution is linked to higher mortality rates, especially among the most vulnerable [1].

Two major sources of air pollution: ambient air pollution (AAP), also referred to as outdoor air pollution, and household air pollution (HAP) referred to as indoor air pollution are of major concern in Ethiopia.

This report summarizes the findings from a comprehensive assessment of the health, economic, social and environmental impacts of ambient and household air pollution in Ethiopia, focusing on examining possible government-led interventions that could mitigate these impacts. This assessment included two main components: 1) an institutional and context analysis (ICA) on air pollution in Ethiopia and 2) an economic analysis of the health and economic burden of HAP and AAP, as well as the economic returns from investing in interventions to address both HAP and APP.[1]

The analysis includes the impact of AAP on the six following diseases: acute lower respiratory infection, chronic obstructive pulmonary disease, ischemic heart disease, lung cancer, stroke and type 2 diabetes. For HAP, the analysis estimated the impact of the same diseases, except for type 2 diabetes as this is not part of WHO's The Benefits of Action to Reduce Household Air Pollution (BAR-HAP) Tool.

Six interventions were analysed in this investment case:

One to address HAP:
1. Transitioning from biomass to electric cook stoves, supported by a 70 percent subsidy for fuel and stoves.

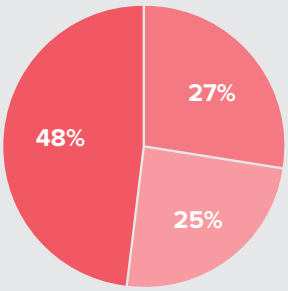
Five to address AAP:
2. Installing passive diesel particulate filters for local transportation buses manufactured before 2006.
3. Improving smoke control in restaurants.
4. Improving waste management practices to reduce incineration.
5. Transitioning from standard to low-sulfur diesel for all vehicles.
6. Improving maize fertilization practices.

1 HAP and APP were assessed separately in economic modelling given the availability of established credible economic tools to assess air pollution.

Burden

HAP

Household air pollution (HAP) in Ethiopia causes nearly 39,000 deaths and 281 trillion ETB (US$8 billion) in economic losses each year, equivalent to 4% of GDP of the 2023 government budget. These economic losses are comprised of:



1. Health and social burden

Health and social burden representing 136 billion ETB (US$3.9 billion).

2. Environmental losses

Environmental losses equivalent to 77 billion ETB (US$2.2 billion).

3. Time losses

Time losses equivalent to 69 billion ETB (US$1.96 billion).

AAP

Ambient air pollution (AAP levels in Ethiopia are nearly five times the WHO's recommended limit, exposing people to a national average of 23.5µg/m³ of PM2.5. AAP is responsible for over 25,000 deaths and 1 million disease cases every year. The health burden of AAP generates on average annual economic losses estimated at 91 billion ETB (US$2.6 billion) over the period 2024-2050. 99% of these economic losses are associated with premature mortality.

1. Premature mortality

91 billion ETB (US$2.6 billion) in economic losses associated with premature mortality.

2. Healthcare expenditures

243 million ETB (US$6.94 million) in healthcare expenditures to treat AAP-attributable diseases.

3. Productivity losses

117 million ETB (US$3.35 million) in workplace productivity losses (absenteeism and presenteeism)[2].

2 Absenteeism is when employees have unscheduled absences from work due to illness or injury whereas presenteeism is when employees are at work but not functioning at full capacity due to an illness or injury.

Benefits

By acting now, the Government of Ethiopia can reduce the national burden from air pollution. The investment case findings demonstrate that implementing air pollution control interventions would reduce costs and save lives.

The HAP analysis simulates a ten-year program[3] in which more around 5.8 million households using traditional biomass cookstoves will be equipped with cleaner cooking technologies. Throughout the duration of the program, the transition is estimated to:

1. Economic benefits

Generate economic benefits of more than **84 billion ETB** (US$2.4 billion), much greater than the governmental expenditure of only **12.7 billion ETB** (US$363 million). For every US$1 invested by the government, the program yields a net gain of **US$5.7**. The return-on-investment (ROI) is even higher (**US$19.7**) when taking into account the savings made by households in fuel costs.

2. Save fuel costs

Save households **8.7 billion ETB** (US$250 million) in fuel costs, representing an average saving of **1,610 ETB** (US$46) per household.

3. Prevent premature deaths and disease

Prevent about **6,000** premature deaths and **190,000** disease cases.

4. Save households time

Save households over the 10 year duration of the programme around 15 days per year, totalling nearly 6 months of time saved.

5. Environmental gains

Reduce pollutant emissions with annual reductions equal to 20 percent of Ethiopia's target reduction of nearly 70 million tons of CO_2-equivalent emissions by 2030.

6. Promote sustainability

Prevent the unsustainable harvest of over 25 billion kg of wood, equivalent to preserving over 120 million trees, combating deforestation and forest degradation.

The analysis modelled the health and economic benefits of five interventions targeting the road transport, industry, waste management, and agricultural sectors to reduce AAP. While these interventions are expected to prevent more than 4,000 disease cases and 115 deaths by 2050, their ROIs were found to be below 1, meaning a return smaller than what is being invested. However, there are other benefits not captured by a ROI, such as the benefits to well-being, mental health, emotional health and society, among others. This also highlights a mismatch between these interventions modelled and the primary sources of $PM_{2.5}$ emissions in Ethiopia including windblown dust which is a natural phenomenon.

3 Due to stipulations in the BAR-HAP tool, the most appropriate timeframe for this intervention selected was 2020 to 2030. Thus, the model uses assumptions and parameters that were valid in 2020, and projects these impacts up until 2030.

Recommendations

The results of this analysis and the following recommendations can be used by national stakeholders to strengthen the rationale for bold actions that can begin to transition Ethiopia to cleaner and more efficient technologies:

1. Invest in the intervention to transition from traditional biomass stoves to electric ones coupled with a 70 percent subsidy.

- Ensure that the necessary infrastructure, such as reliable electricity supply and distribution networks, is in place to support the use of electric stoves.
- Increase public awareness about the health, environmental and economic benefits of electric stoves over traditional biomass stoves.
- Provide technical support and training for the installation, use, and maintenance of electric stoves.
- Monitor the distribution and usage of subsidized stoves and evaluate the impact of the policy on reducing biomass use and improving health outcomes to facilitate making necessary adjustments to the program.

2. Ensure the implementation and enforcement of existing air pollution regulations.

The, EPA, Ministry of Justice, and any additional appropriate regulatory bodies should ensure that the air pollution control legislation is followed and enforced. In addition, the Government of Ethiopia should also strongly consider updating the 2003 Guideline Ambient Environmental Standards for Ethiopia so that target air pollutant levels are in line with most recent WHO guidelines.[4]

3. Initiate coordination mechanisms and financing amongst national stakeholders on air pollution.

In accordance with the Investment Case for NCD Prevention and Control in Ethiopia [2], it is recommended that Ethiopia establish a national multisectoral NCD coordination mechanism and integrate air pollution as a key priority.

4 World Health Organization, WHO global air quality guidelines: particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Bonn, Germany: WHO European Centre for Environment and Health, 2021.

4. Strengthen national commitments for environmental protection and air quality.

The Government of Ethiopia should prioritize the finalization, implementation and enforcement of the multisectoral action plan being developed through the UNDP-supported project. The government should also work to develop a dedicated national budget for air pollution control.

5. Increase availability of data on levels of air pollutants and their sources.

It is strongly recommended for Ethiopia to enhance air quality monitoring ability, improve inventory management of emissions and improve cooperation and data sharing between the local, regional and the national levels.

6. Consider the implementation of the five interventions to reduce ambient air pollution:

- installing passive diesel particulate filters for local transportation buses manufactured before 2006;
- improve smoke control in restaurants;
- improving waste management practices to reduce incineration;
- transitioning from standard to low-sulfur diesel for all vehicles; and
- improving maize fertilization practices.

Even with no economic returns, as modeled under this investment case, the population of Ethiopia would gain considerable health benefits from implementing these interventions.

7. Increase research of cost-effective interventions to reduce AAP.

The findings underscore the necessity of developing localized interventions tailored to Ethiopia's unique environmental and socio-economic context.

8. Strengthen education and outreach activities to increase public awareness of the dangers of air pollution and the benefits in its reduction.

The EPA along with the Ministry of Health, the Ministry of Education, and the Ethiopia Communications Authority can conduct public awareness campaigns, prioritizing use of radio channels and supplementing with text, SMS and social-media campaigns.