

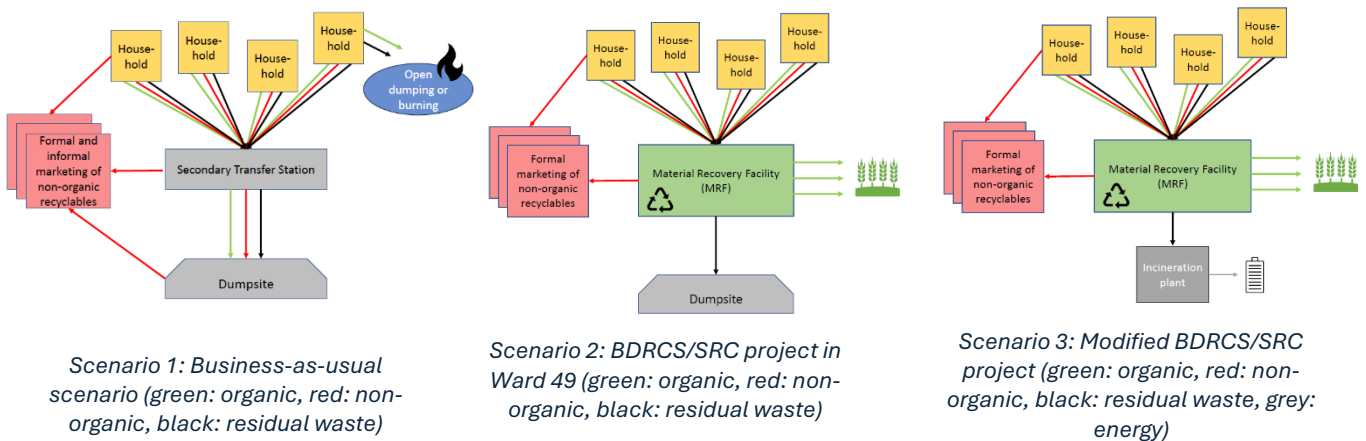
Benefits of Solid Waste Management for Climate Change Mitigation: A case study from Gazipur, Bangladesh

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Introduction

Bangladesh, a South Asian country, is projected to double its waste generation by 2050 due to rapid population growth, urbanization, and rising GDP. On average, 75% of the waste is openly dumped, 25% is disposed of on dumpsites, composted or recycled [1]. Unmanaged waste leads to a polluted environment, bad smell, social stigma pressure on scarce land, water logging of drains and canals, and ultimately to the spread of vector and water-borne diseases [2]. Waste along the entire waste stream from transportation, operation, treatment and final disposal further emits greenhouse gases (GHG), particularly methane (CH_4), carbon dioxide (CO_2), nitrous oxide (N_2O) and the short-lived climate pollutant black carbon (ca. 1000x more harmful to the climate than CO_2) [3]. Gazipur City Corporation (GCC) is the third largest city in Bangladesh with 2'674'697 inhabitants. In GCC, in the *business-as-usual* case, 50% of the waste is collected and disposed of on the dumpsite, 45% is illegally dumped, 3% is openly burned, and 2% is informally recycled. In *Ward 49*, an informal settlement in GCC, the Swiss Red Cross, the Bangladesh Red Crescent Society and the City Corporation have established a Solid Waste Management (SWM) system in which 50% is composted, 2% recycled and 48% disposed of on a nearby dumpsite.

Research question: What is the GHG and black carbon emission reduction potential from Solid Waste Management in Gazipur City Corporation?



Methodology

A life cycle assessment (LCA) of waste evaluates the impact of solid waste from its generation, transportation, processing and recycling and final disposal. LCA aids decision-making by quantifying the environmental impact of different SWM treatment methods throughout the life cycle of waste [4]. The *Estimation Quantification Tool (Version II)* developed by the Institute for Global Environmental Strategies in Japan, was used for the LCA to assess GHG and black carbon emissions associated with waste management [3]. It is used to compare emissions of the two SWM systems.

Key findings

About half of the household waste in Gazipur (outside Ward 49) is not collected but illegally dumped or incinerated, as the administration lacks labour and management capacity. This is not only harmful to the climate, but also leads to polluted waters and flooding due to clogged drains (in the already very densely built-up city), health damage for the population, bad odour, stigmatisation and overuse and erosion of the soil through chemical fertilisers instead of organic fertilisers through compost. (à cf. photo documentation at the end of the thesis!)

The SRC/BDRCS waste project in Ward 49 in Gazipur emits 58% less CO₂eq and 72% less black carbon (= soot, ca. 1000x more harmful to the climate than CO₂) than in the business-as-usual case in the remaining Gazipur City Corporation.

In Ward 49, emissions per household can be reduced from 70kg to 29kg through targeted waste collection, composting and recycling, or from 594 tonnes to 248 tonnes CO₂eq for the entire of Ward 49. Comparison: a flight Zurich-Dhaka-Zurich emits 3 tonnes of CO₂ per person.

Key Recommendations

- It is strongly recommended that all actors think of waste as a system that affects us all, not as individual components. Waste management is an opportunity, economically, socially, and environmentally.
- It is recommended to further expand waste segregation, composting and recycling in Gazipur City. In the medium run, the system can also be connected to the planned incinerator in Gazipur, but only non-compostable and non-recyclable waste should be incinerated. Yet, from a climate perspective, incineration only reduces GHG emissions if energy is recovered by connecting the incinerator to the electricity grid. This can make a significant contribution to the BDRCS strategy (resilience building of urban communities to respond to multi-hazard risks and climate-induced phenomena) and the goal of IFRC, which has identified climate change and environmental crises as one of the "most pressing challenges" of the coming years, including mitigation and adaptation.
- The waste management project in Gazipur is a flagship project in Bangladesh. BDRCS/SRC are encouraged to share their knowledge on waste management gained over the last 8 years with a broader public (PNS, NGOs of the WASH sector, UN, JICA, SDC, local governments...), e.g. through training, workshops or the writing of a waste manual. As there are multiple actors working on SWM in Bangladesh, they are encouraged to increase cooperation, learn from each other and join forces to lift SWM to the next level.
- Volunteers are a core competence of the RCRC Movement. The BDRCS volunteers can play a major role in disseminating waste knowledge and act as a bridge between technical organisations (e.g., JICA, other NGOs), the policy level (e.g., Ward or City Corporations), and the population.
- A business model for the entire Gazipur City Corporation should outline revenue from composting and recyclable sales, ensuring cost-effectiveness. Ward 49 may act as a viable role model case for urban Bangladesh once the upfront costs are covered. Further, exploring carbon credits is advisable, as vast amounts of carbon emissions are avoided through an improved SWM system. International organizations may thus invest upfront to build MRFs incl. composting centres all over the city, upgrade Secondary Transfer Stations or construct a new sanitary landfill. The City Corporation should provide the land and be actively involved.

- The City corporation is advised to establish a bylaw for the entire City Corporation on handling municipal solid waste. BDRCS/SRC may support this process based on their experiences from Ward 49. The City Corporation supported by BDRCS/SRC may further engage in a broader policy dialogue and advocate for national-level SWM.
- Further research is required to assess the benefits of other waste treatment methods not considered in this paper, such as the upgrading of the dumpsite to a sanitary landfill, anaerobic digestion or other biological mechanical treatment methods. Additionally, the link between GHG emissions and health outcomes should be scrutinized, comparing longitudinal disease-specific health data of local communities before and after an SWM is installed to provide evidence beyond environmental health assumptions. It may be assessed what barriers exist to expand the SWM to rural Bangladesh and how they could be overcome. Finally, it should be assessed how the multiple actors working on SWM in Bangladesh (NGOs, international organizations, bilateral development organizations, governments, private actors) could enhance their collaboration and benefit from each other's strength to push waste management in Bangladesh to the next level.

References

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