Towards a Circular Economy at School – Insights and Best-practices from Nepal

'Towards Zero Waste at Schools' aims at developing innovative solutions for reuse and recycling at schools, maximising on synergies between water, sanitation, waste, environment and energy. The approach was applied at a school in Kathmandu, Nepal. Adeline Mertenat[1], Alexander Garcia Kappeller[1], Anjali Sherpa[2], Mingma Sherpa[2], Christian Zurbrügg[1]

Introduction

The concept of a circular economy has gained a lot of traction as a positive, solution-based perspective for achieving economic development within increasing environmental constraints. Best-practices and case studies from low- and middle-income countries are rare and public awareness and understanding of the related benefits of maximising closed-loops for resource management is still limited. For many years, we have been conducting applied research on different biowaste valorisation options. Through this experience, a solid knowledge base exists and forms one part of a holistic solution to achieve 'circular waste management'. In 2018, we started the project 'Towards Zero Waste at Schools' (ZW@S), which focuses on moving towards a 'Circular-Waste' approach at school level. Project materials will be developed to introduce environmental education and effective circular economy approaches in any school setting. This project engages teachers and the future generation – the students – by connecting them to experiential learning around sustainable development. And it targets learning, application and practice, so that students become agents of change and ambassadors for sustainable behaviour and a cleaner world with a circular economy.

Step-by-step approach

The approach designed for achieving a 'Circular-Waste' solution in schools consists of four main steps. First, an overview study at national level is done, regarding all past and existing educational environmental sanitation initiatives in schools, to identify successes, barriers and key stakeholders in the specific country. The second step then, at school level, is to conduct a baseline assessment to obtain in-depth information related to waste, water and sanitation management, as well as assess existing curricula content and behaviour practices. Based on the results obtained from this participatory assessment phase, the next step initiates a planning phase, comprising the development of possible improvement scenarios for waste reduction and recycling solutions, as well as curricula development. The main school stakeholders decide when the last step takes place, and what curricula and resource recovery activities would be covered during the implementation, monitoring and adjustment phase. During implementation, research questions related to effective behaviour change interventions at the schools and the impact of behaviour change in surrounding communities, as well as innovative waste management solutions, are addressed by the research team. Participatory approaches are used throughout the whole process to ensure that the real needs and expectations of the schools are considered, and to ensure the long-term sustainability and ownership of the selected improvements.

This step-by-step approach is currently being applied at Budhanilkantha School in Kathmandu, Nepal, as a first case-study. Preliminary results are presented below, with a special focus on solid waste management issues.

Anonymous

Photo 1: Students group – Action Plan development workshop.

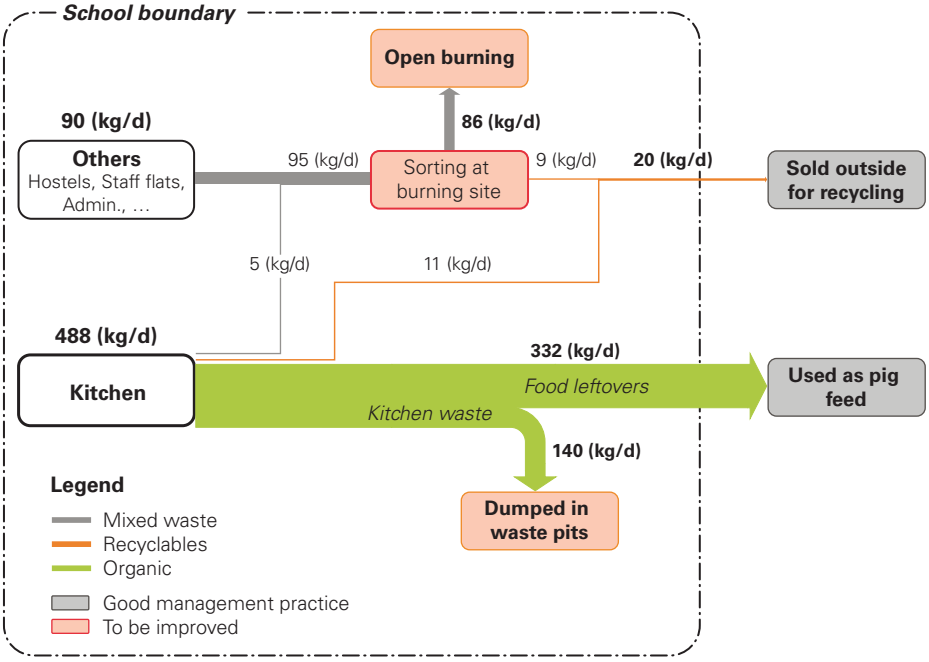

Figure: Simplified waste flow, management practices and room for improvements in BNKS.

Budhanilkantha in Nepal

Budhanilkantha School (BNKS) is a boarding school with grades 5 to 12, including the Advanced Level of Cambridge University, UK. With around 1 100 students coming from all over Nepal, it aims at quality education for 'rich and poor alike' in an environment that fosters unity and equality. Apart from high academic standards, BNKS also imparts multi-dimensional skills and leadership qualities through an array of sports and extracurricular activities. Due to the school's

policy to strive to continuously improve the quality of education and services provided to the students and the staff residing on the school campus, BNKS was identified as an appropriate location to implement a 'Circular-Waste' approach.

Waste assessment

The current solid waste management situation and practices at BNKS, presented in the Figure, were assessed by observations done of the school infrastructure and current waste-related practices, interviews with school stakeholders, as well as an on-site waste audit that measured solid waste quantities and composition. Results showed that ~580 kg of waste are produced daily, of which 86 % is organic, 10 % are inorganic recyclables and 4 % is non-recyclable (sanitary pads, diapers, dust, light plastic, etc.). When looking at the source of the waste, the kitchen contributes 84 % of the total waste produced, of which 96 % is organic. 70 % of this organic waste, which consists of leftover cooked food, is currently collected by a farmer to feed pigs at his farm. The other organic waste from the kitchen is dumped in a waste pit inside the school compound. The waste produced in the other school areas, such as student hostels, staff flats, administration offices, etc., is collected as mixed waste and disposed at a burning site located inside the school compound. Before the waste is burned, some recyclables are extracted by a waste picker and sold outside the school to a scrap dealer.

The assessment showed mainly two challenges for waste management at BNKS:

1) **Resource recovery:** The low recycling rate of inorganics is due to the mixed collection system, which reduces the quality of the recyclables. Furthermore, the waste picker and scrap dealer are not actively integrated in the school waste management system.
2) **Disposal:** Most of the inorganic waste is openly burnt at a designated site on the school premises. Furthermore, a significant part of organic waste from the kitchen and staff flats is dumped without resource recovery.

Action Plan

The results of the waste assessment were shared and discussed among all school stakeholders (i.e. students, teachers, administration and non-teaching staff) in a workshop (Photos 1 & 2). Different groups were formed to discuss waste management improvement scenarios. This fed into the development of an Action Plan that summarised the main options for improvement, which was then presented to the school authority. The main strategies presented in the Action Plan are as follows:

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Photo 2: Teachers group – Action Plan development workshop.

1) **Segregation:** Organising systematic segregation of the waste using a three-bin system (organic, paper and cardboard, and mixed recyclables) and segregated collection; implementation and monitoring of reduce/reuse strategies.
2) **Resource recovery:** Installing a site for sorting, storage and recyclable sales; potentially build upon the existing organic recycling system.
3) **Safe disposal:** Stopping open burning and putting in place a safe management system for non-recyclable and medical waste.

For each of these three strategies, several suitable options were presented by means of factsheets, containing technical and non-technical information. For the organic waste management component, factsheets on composting, vermicomposting, anaerobic digestion and animal feed were presented. For enhancing sales of recyclables, three potential buyers were identified. For safe disposal, information on how to build a manual sanitary landfill, as well as information on how to construct a small DeMonfort incinerator and autoclave for the medical waste fraction, was included.

Conclusion

Currently, the Action Plan is being reviewed and discussed by the school authority for implementation. From a waste management research perspective, these first phases of the ZW@S project at Budhanilkantha School highlighted the need to further investigate management options for specific waste fractions, e.g. disposable sanitary products (diapers and sanitary pads) and light plastics. Disposable diapers and sanitary pads are increasingly being used and their management as waste is particularly challenging due to their potential hazard, composition, moisture content, volume and/or cultural beliefs about them. Light plastics, such as food packaging, wrappers and plastic bags, are currently not recycled at large scale due to their heterogeneous composition. Both of these fractions are typically burnt or dumped at present. It is, therefore, on our agenda to find suitable and sustainable solutions on how to manage disposable sanitary products and light plastics to achieve a zero waste approach.

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