STUDIO SAJO

PBL South Asia - **Bhutan**
Project Document

Sustainable Global Technologies
Studio Course, 2020

Gaspard del Marmol, Mona Fritz,
Helmi Korhonen, Daniela Tapprest, Felicia Zhang

Aalto University | Royal University of Bhutan, JNEC Engineering College | PBL South Asia

Supporting the development of sustainable waste management in Samdrup Jongkhar, Bhutan.

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List of Abbreviations

AD: Anno Domini
AGI: Aalto Global Impact
BC: Before Christ
CBS: Central Bureau of Statistics
CSO: Civil Society Organization
EPFL: L'Ecole polytechnique fédérale de Lausanne
EU: European Union
FOEN: Federal Office for the Environment
GDP: Gross Domestic Product
GNH: Gross National Happiness
GNI: Gross National Income
HDI: Human Development Index
HDPE: High Density PolyEthylene
HSY: Helsinki Region Environmental Services Authority
JNEC: Jigme Namgyel Engineering College
NEC: National Environment Program
PBL: Problem Based Learning
PPP: Purchasing Power Parity
R&D: Research and Development
RUB: Royal University Bhutan
SDG: Sustainable Development Goals
SGT: Sustainable Global Technologies
SNV: Stichting Nederlandse Vrijwilligers
SJ: Samdrup Jongkhar
SJI: Samdrup Jongkhar Initiative
SWMRMC: Solid-Waste Management and Resource Mobilization
UN: United Nations
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
UN-HABITAT: United Nations Human Settlements Programme
UNICEF: United Nations Children Emergency Fund
USD: U.S. Dollar
WHO: World Health Organisation
WWF: World Wildlife Foundation

“Where we live must be clean, safe, organised, and beautiful, for national integrity, national pride, and for our bright future. This too is nation building.”

– His Majesty, The King of Bhutan, April 2015

1.0 Executive Summary

1.1 In a Nutshell

Studio SaJo is part of Problem Based Learning South Asia. We embarked on this six month journey in January 2020 and will be on a field trip in Bhutan during two weeks of March. Bhutan is a small landlocked country north of India which has shown impressive socio-economic development over the past decades. However, its development path has been accompanied by a shift from biodegradable to inorganic waste as well as a tremendous increase in the amount of waste. The mismanagement of solid waste has resulted in pollution, and current practices are mainly open dumping and burning.

The project aims at enhancing Sustainable Development Goal 6: Clean water and sanitation by reducing pollution through an improvement of waste management practices. We are working together with the Royal University of Bhutan in Samdrup Jongkhar and the Samdrup Jongkhar landfill to improve waste management practices. We aim at working closely with the community and engage various stakeholders such as Samdrup Jongkhar Thromde (municipal corporation) and the Samdrup Jongkhar Initiative (CSO). Our main deliverables will be workshops, a co-designed waste management approach and a final manual with recommendations. We hope to work closely with the student team in Bhutan and center all our work around the local needs.

As part of the Sustainable Global Technologies studio course, Studio SaJo is organised by Aalto's School of Engineering. Studio SaJo is a project under PBL South Asia and therefore co-funded by the Erasmus+ Programme of the European Union.

The Team

1.2 A Little Bit About Us...

Gaspard Del Marmol

Gaspard is Belgian and is currently studying design in the Creative Sustainability master's program. Having a background in Industrial Design, he can provide a balance between the technical and the creative aspects of the project.

Mona Fritz

Mona is German and studies in the Creative Sustainability master's program (business track). She has a background in sustainable business models and development studies, with which she hopes to be able to contribute to the team.

Matias Heino

Matias is a doctoral researcher at the Water and Development Research Group in Aalto University. During his free time, he plays floorball and enjoys listening to rap music. He is the mentor of the project.

Helmi Korhonen

Helmi is Finnish and studies in the design track of the Creative Sustainability master's program. She is interested in the intersections between environmental and social innovation, design and entrepreneurship. She is also the designated photographer for the project.

Daniela Tapprest

Dani is a half Finnish half French student on her first year in the Creative Sustainability master's program, business track. She has a background in International Business and sustainability studies, and is interested in working with development and climate change mitigation in the future.

Félicia Zhang

Félicia studies Environmental Sciences and Engineering and is currently on an exchange in Aalto university from EPFL (Switzerland). For this team she hopes to provide the technical knowledge they will need.

2.0 Operational Environment

2.1. Bhutan - Country brief

> "Bhutan is no ordinary place. It is the last great Himalayan kingdom, where traditional Buddhist culture carefully embraces global developments."
>
> - **Lonely Planet**

Bhutan is a deeply Buddhist land blending the ancient and modern world. The country has been inhabited since 2000 BC according to most estimates. Buddhism was introduced around the 2nd century AD, although its appearance is often associated with the coming of Rinpoché, a honorary Tibetan buddhist master, in the 8th century AD (Mayhew & Brown, 2017). Bhutan has long been an unknown and mysterious country of the Himalayas. Before the 1970s, only few visitors had been able to enter in the country: the first were two Jesuit Portuguese in the 1600s, followed by some British envoys in the 18th, 19th and beginning of 20th century, then followed by a handful of photographers and journalists in the 50's. Bhutan is among the few countries that avoided the Western colonialist wave in the 19th century (Pommaret, 2001).

The Bhutanese pride themselves on a sustainable approach to tourism in line with the Gross National Happiness Philosophy. Through its sustainable approach, Bhutan has environmental protection policies that makes it the only country in the world that is carbon negative. More than 70% of the country is filled with forests that host wonderful wildlife (Mayhew & Brown, 2017).

The Kingdom of Bhutan, ruled by King Jigme Khesar Namgyel Wangchuck, is a Constitutional Monarchy that is based upon Buddhist philosophy. The country aims to promote and protest the present and future well-being of the people of Bhutan, and details the structure of the political system so that it provides peace and stability

while also strengthening Bhutan's security. The prime minister Lotay Tshering is the head of the government and heads the executive cabinet, also known as the council of ministers, who controls the executive powers (GlobalEdge).

Population:
741.919

GDP per capita:
2.612 US$

Area:
38.394 km2
(Finland: 338,424 km2)

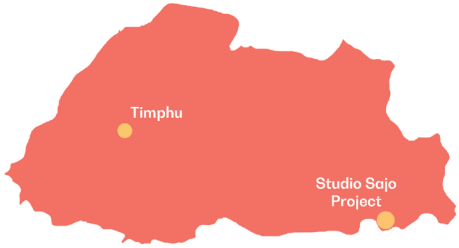
Belief system
75 % Buddhist,
25 % Hindu

Density:
18 people/km2
(Finland: 19 people/km2)

Neighbouring countries:
China and India

Figure 1: Location of Bhutan, South Asia

Figure 2: Map of Bhutan



Samdrup Jongkhar (**Studio SaJo project location**)

The town Samdrup Jongkhar holds the distinct honour of being the oldest town in Bhutan. Located in the bhutanese district that holds the same name (Samdrup Jongkhar Thromde) this border town is a bustling little settlement packed to the brim with shopkeepers and hawkers from across the border. It has been developing rapidly over the recent years.

The district of Samdrup Jongkhar is situated in the south-eastern region of the country and shares borders with the Indian state of Assam (big influence of the Indian region). It is by far the largest urban centre in eastern Bhutan. It lies at elevations ranging from 200 to 3.500 m. (Tourism Council of Bhutan n.d.)

Despite its development, Samdrup Jongkhar is one of the poorest and most remote of the twenty dzongkhags (Bhutanese districts) of Bhutan, with food security and rural to urban migration as issues of concern. While, subsistence agriculture is the main practice in the district (around 83% of the population), farmers are facing increasing difficulty in meeting their household needs with the growth of the cash economy and increasing development (Allison, 2019).

Today, Samdrup Jongkhar town is connected to Trashigang town (located in the eastern region of Bhutan) by a road completed in the 1960s. This allows them to benefit from trade, especially through trade across the Indian border. Samdrup Jongkhar used to be the main trading centre for the Bhutanese and it is still a convenient exit town for tourists who have arranged to visit the neighbouring Indian state of Assam. (Tourism Council of Bhutan n.d.)

2.1. State of Needs and Development

With a Gross Domestic Product (GDP) growth rate of 7,5 % p.a. since the 1980s, Bhutan has experienced magnificent economic progress. With a Gross National Income (GNI) $3.080 p.c. (2018) it is classified as low middle income country (The World Bank Group 2019b; n.d.a). According to the World Bank Group, only 1,5 % of the country's population lived on less than $ 1,90 a day in 2017 (2011 PPP) (The World Bank Group n.d.e.) and 12 % at less than $ 3,20 a day (The World Bank Group n.d.e).

Bhutan has not only shown progress in the economic sphere, but also in other dimensions of human development. In the Human Development Index (HDI) dimension health, measured as life expectancy at birth, it overtook its peers of the lower middle income category in 2003.

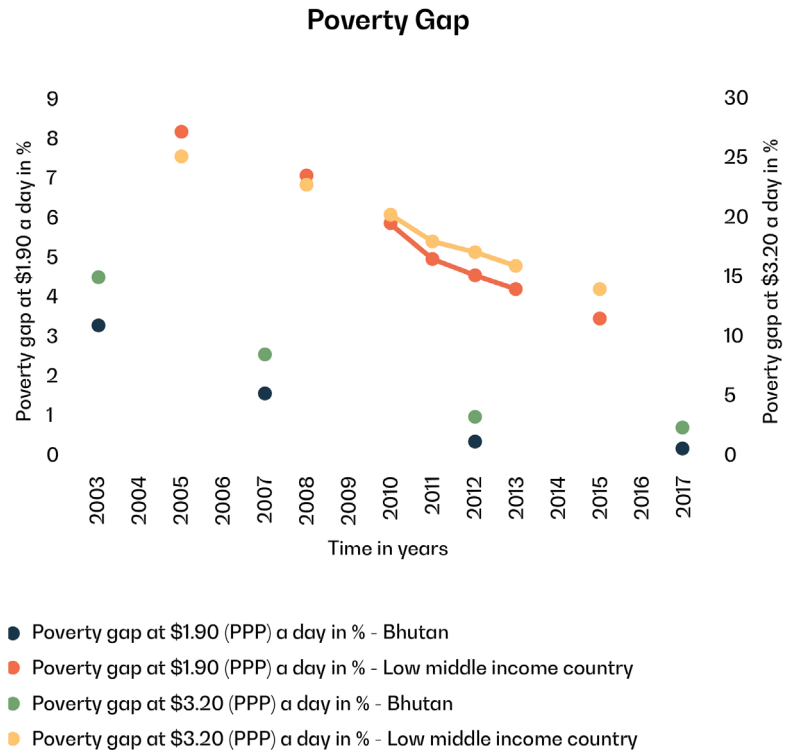


Figure 3: Poverty Gap

In 2017, life expectancy at birth was 71,129 years compared to 69,323 years as the average of lower middle income countries (Finland's life expectancy at birth in 2017: 81,6) (The World Bank Group n.d.b; UNDP, n.d.a). From 1998 to 2018 the expected years of schooling almost doubled, from 6,3 to 12,1 years, surpassing Bangladesh (11,2 years) and almost catching up to India (12,3 years). Mean years of schooling began to rise in 2011, but are still at only 3,1 years (2018) (Bangladesh: 6,1 years; India: 6,5 years). The named indicators of health, education and standard of living are combined in Bhutan's HDI of 0,617 (2018) compared to 0,512 in 2005; and 0,647 in India (2018) and 0,614 in Bangladesh (2018). (UNDP, n.d.a.)

In addition to GDP and HDI one additional indicator of well-being is inquired here: Gross National Happiness (GNH) index. Bhutan is well-known for its unusual practice of scrutinizing all its policies with regard to their effects on its citizens happiness (GNH Centre Bhutan 2019a). The most recent survey conducted in the country is from 2015 and states that 8,4 % of the Bhutanese are deeply happy; 35 % are extensively happy; 47,9 % are narrowly happy; and 8,8 % are unhappy. The GNH index shows an improvement compared to the last survey in 2010 from 0,743 to 0,756 (Centre for Bhutan Studies & GNH Research 2016). According to the Centre for Bhutan Studies & GNH Research (2016) the citizens happiness was driven by different factors and not specific to a single geographic, demographic, linguistic or occupational group.

Nevertheless, some trends have been identified: (1) Women tend to be less happy than men; (2) Rural residents tend to be less happy than urban residents; and (3) Less educated people are less happy. The advancement over the last five years was attributed to improved livelihoods, better service access and better health. In addition, cultural festivals experienced an increase in participation, while psychological well-being declined. (Centre for Bhutan Studies & GNH Research 2016.)

Expected years of schooling:
F: 12,2 years / M: 12,0 years

Mean years of schooling:
F: 2,1 years / M: 4,2 years

Life expectancy:
F: 71.8 years / M: 71.1 years

GDP growth rate: 7.5 %
GNI: $3.080 p.c.

Challenges and Priorities of Development

The secret of Bhutan's development seems to be its abundance of water sources which has allowed the development of a strong public hydropower sector and together with a solid fiscal and monetary policy economic growth to take place. The country's progress in health and education was also financed by fiscal revenues that accrued in the hydropower sector. India is an important (economic) partner of the country, as 80 % of its imports are from India "and the Bhutanese Ngultrum is pegged to the Indian Rupee". Bhutan's economy shows stability, nearly universal access to electricity. (The World Bank Group 2019b.) Access to basic water services has reached 98 % in 2015 (WHO and UNICEF 2017).

While economic growth is expected to remain strong at five to six percent and poverty is expected to be declining, Bhutan also faces some challenges. The strong hydropower sector has strongly contributed to development it rarely provides employment. (The World Bank Group 2019b.) It has also crowded out the private sector (The World Bank Group 2019a). The sector mostly contributing to employment (54 %) is agriculture, but unfortunately employment in this sector shows correlation with poverty (The World Bank Group 2019b). Unemployment is a major problem concerning the educated youth (The World Bank Group 2019a; 2019b). Lage current account deficits, high public debts (The World Bank Group 2019b) and low tax collection are further challenges. The underdevelopment of the private sector is caused by the lack of skills, the small size of Bhutan's domestic market, limited access to international markets and low competition. (The World Bank Group 2019a.)

A recent report by The World Bank Group (2019a) proposes to develop the private sector by further investments in human capital such as tertiary education and health; physical capital such as infrastructure and institutions for example regulating the business environment. In addition, The World Bank Group (2019b) suggests to develop the tourism sector further.

Bhutan's 12th Five Year Plan was compiled under the topic "Just, Harmonious and Sustainable Society through enhanced Decentralisation" (p. 26). Development priorities are therefore structured around three topics: justice, harmony and sustainability. Priorities to develop a just society include the issues poverty and inequality, employment, health, education,democracy and decentralisation, corruption, institutions and services, and gender equality. Sustainability of Bhutan's society shall be ensured regarding economic, social and environmental dimensions. Finally, harmony includes development priorities regarding the preservation of the country's culture, traditions, ecosystems and climate resilience. The topic of Studio SaJo, waste management (and prevention), is one of Bhutan's national priorities. This topic is elaborated in the following section. (GNH Commission, 2019)

[1] Atlas method, current US $
[2] The World Bank Group classifies lower middle income countries as those with an GNI per capita between $1.026 and $3.995 (The World Bank Group, 2020). Other lower middle income countries in the region include India, Bangladesh, Myanmar, and Pakistan (The World Bank Group, 2020).
[3] The poverty gap concept reflects depth as well as incidence of poverty as percentage of a respective poverty line.
[4] The HDI is calculated as an geometric mean between indexes of three different dimensions: health measured as life expectancy at birth; education measured as a combination of expected and mean years of schooling; and quality of life measured as GNI p.c. (UNDP, n.d.b).
[5] For further information on the GNH index and its relevance for this project: see Annex A.
[6] The categories are defined as follows: deeply happy: sufficiently happy in 77 - 100 % of the domains; extensively happy:sufficiently happy in 66 - 76 % of the domains; narrowly happy: sufficiently happy in 50 - 56 % of the domains; and unhappy: sufficiently happy in 0 - 50 & of the domains (Centre for Bhutan Studies & GNH Research 2016).

2.3 Waste

The problem of waste is a rather modern problem in Bhutan. Historically, most of the waste in particular in rural areas was biodegradable which could and was returned to the nature (Allison 2008; 2019). Goods used in households were designed to be durable and made from organic material, and cultural values resulted in practices of re-use and items having several trajectories. Karma and rebirth, concepts of Vajrayana Buddhism were central to these practices. (Allison 2019.) In Vajrayana Buddhism "karma, or fortune, accumulated during a lifetime would influence one's rebirth in the next lifetime" and similarly different items such as plastic bags and bottles had multiple lifes (Allison 2019, p. 514).

In 1991, when India liberalised its economy, manufactured goods swamped Bhutan's markets (Allison 2019). "[P]rocessed packaged food, international fashions, and electronic gadget" meant new materials for which the traditional disposal system was not adequate (ibid., p. 513). Not only has the type of solid waste shifted from biodegradable to non-biodegradable, but also the amount has almost doubled from 2014 to 2018 to about 500 g per day and person (Gyelmo 2018). The composition of solid waste is displayed below. Households, municipalities and the government were overwhelmed (Allison 2019). By the early 2000s Bhutan's environment was threatened by the disposal of household waste in rivers and forests (Allison 2019). Particular difficult for the country's waste management are disposable diapers, and electronic and hazardous waste (Gyelmo 2018) and in general waste is an issue particularly in urban areas (UNEP 2002 cited in Phuntsho et al., 2010).

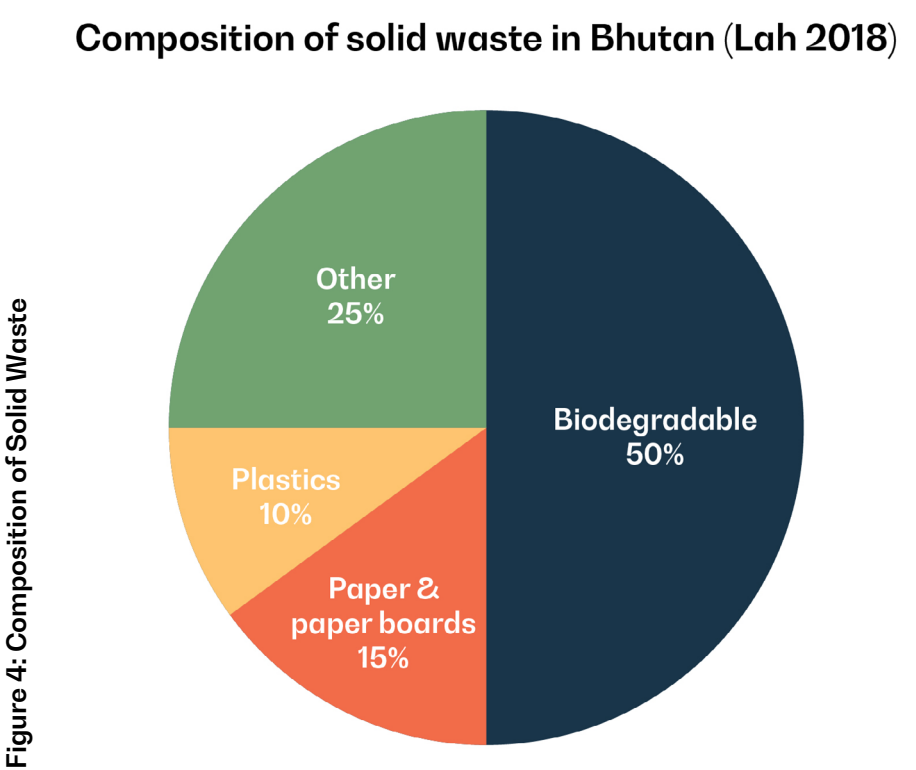


Figure 4: Composition of Solid Waste

Changes of solid waste segregation were introduced, but illegal dumping remains an issue (Lah 2018) and the required capacities are not available. Littering as well as infiltration from waste disposal sites have results in the deterioration of Bhutan's water quality and with a rising population and further urbanisation the problem is expected to become worse.(Gyelmo 2018) Technological improvements such as the use of garbage collection trucks in some areas have been implemented but the lack of addressing "ritual, symbolic, and spiritual aspects of waste," hindered a successful introduction of modern waste management practices (Allison 2014, p. 423).

2.4 Landfill Approaches

Bhutan:
Currently, the lack of formalised waste disposal is destroying the precious natural environment of Bhutan. Even open dumpings and open burnings are threatening the sustainable development of the country (National Environment Commission 2019). In Samdrup Jongkhar town and Dewathang area, waste is collected from residential and core areas and ends up in a landfill located at Motanga, 3km away from the town. Constructed in 2012, the landfill is 20.000 feet^2 (1.860m^2) and receives around 5 tons of waste per day.

This disposal highlights the issues Bhutan is facing with waste management. Indeed, no proper sorting is done between biodegradable and non-biodegradable waste that goes in the landfill without proper sorting. As a consequence, the landfill which was built to suffice ten years, has already reached its brim six years after its construction. Another complication brought up by the disposal is its leachate that pollutes the adjoining water courses and groundwater resources, making them unusable for drinking purposes. Therefore, the goal of this PBL project is to enhance the reduction of waste while improving its management.

Another important element to be analysed is the construction of a new scientific landfill by Thromde administration. It is located next to the current landfill and is now 35% built. This facility will be an improvement compared to the previous one as it meets the requirements of a proper scientific landfill. Indeed, it has a compacted clay lining followed by a High Density PolyEthylene (HDPE) geomembrane to prevent leachate from contaminating the groundwater. In addition, a sand-protective layer and leachate collection with 20-40mm aggregates are planned.

Finland:
The National Waste Plan to 2023 written in 2018 mentions the restriction of landfilling organic waste. The current landfills should be sufficient for the future as it is planned to have only 5% of all municipal waste going to landfills. Note that this would be a great improvement compared to the National Waste Plan of 2008 that planned to have 20% of all municipal waste going to landfills. (Ministry of the Environment 2018) It is now the incineration of waste that takes over and allows increased energy recovery (Piipo 2013).

Switzerland:
Switzerland is one of the most advanced countries in terms of waste management. Nowadays, only the residues that are not suitable for material or energy recycling are deposited in authorised landfills. Still, they have strict regulations regarding landfills and if the waste does not fulfill them, it will be treated in another appropriate way. They have five different types of landfills that each treats a special category of waste: excavation and quarrying material where the presence of pollution can be excluded; mineral waste; inorganic waste and waste containing metals mineral; incineration residues; and organic waste. (FOEN 2020)

Nepal:
Solid waste management in Nepal is considered by most residents as the most important environmental problem in urban areas (WaterAid 2008). While most municipalities are dumping waste in rivers or other public spaces, three engineered landfills are currently in use and one of them is managed by a community based group which involves the locals, the municipality and the local chamber of commerce. This one, located in Tribhuwan Nagar, has facilities to sort the waste and leachate is collected and treated. (WaterAid 2008). Nepal is a good example to show how the local community enhanced a better waste management on a small scale, preserving the surrounding environment.

2.5 Waste Management Policy

The National Waste Management Strategy issued by the National Environmental Commission (NEC) in 2019 implies that the government of Bhutan is taking its waste problem seriously. The goal of the strategy is to "continuously move/promote towards 'Zero Waste Bhutan by 2030' in partnership with the public, industry, civil society organizations, and government authorities at local and sectoral levels, municipalities, and with potential development partners." The goals are divided into ambitious short term (2019-2023) and medium to long-term (2023-2030) targets. First they want to disallow infectious and hazardous waste disposal in the landfill while reducing illegal dumping to zero. Then, they wish to explore sustainable disposal options and improve their technology in the recycling sector. (National Environmental Commission 2019, 15–19.)

When it comes to the regulations that are currently in place, the waste management is based on an act that was formulated in 2009. The act promotes a principle of "3 Rs" (Reduce, Reuse, Recycle) that is specified accordingly: a) Avoid, eliminate, or substitute the use of products or unnecessary packaging that generate waste. b) Reduce the generation of waste from the manufacture and use of products. c) Reuse products and packaging materials. d) Recycle material from waste for production of new and useful products. e) Recover material from waste for energy production and other uses. f) Treat and dispose waste to reduce and eliminate harms to the environment. g) Treat and dispose waste to avoid harm to human health. The act concerns everyone in the country, and all violations are punished through a "Polluter Pays" principle. (National Council of Bhutan 2009, 10–11.)

The Regulation based on the act from 2009 was adopted in 2012, and a revision to the regulation with amendments was formulated in 2016. The regulation establishes various agencies and monitoring authorities for an effective implementation. NEC is the monitoring body under this regulation which coordinates and monitors the overall performance of implementing. Moreover, the Royal Bhutan Police assists the implementing agencies in achieving full compliance.

Other organisations that regulate and manage waste include:

> Municipal authorities take care of waste collection systems in urban areas either directly or through private waste management entities.
>
> E-waste is regulated through the Department of Information Technology and Telecom, but the recycling of it is heavily dependent on scrap dealers markets.
>
> The Department of Industry monitors the industrial wastes while the actual waste reduction and management are the responsibility of respective industries. There is an industrial landfill in Pasakha, but there is no industrial landfill site in other regions and illegal dumping occurs. (National Environmental Commission 2019, 8–10.)

Although the responsible authorities for waste management are clearly specified/ identified by law, the waste management measures have not been effectively implemented. This is due to various factors, such as: limited personnel, small budget, insufficient financial drivers for recycling, problems in collaboration between different agents (often policies of different ministries are not in line with each other) and lack of awareness of the public. (National Environmental Commission 2019, 10–12.)

For further information, see Annex B.

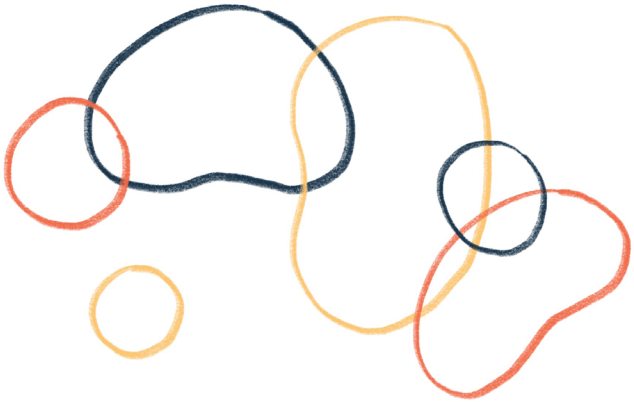
2.6 Connections to Other Projects

Especially because Aalto's PBL network has never taken part in a project in Bhutan before, it was important to find out about possible project connections at the site. For one, international development actors like the United Nations and SNV Netherlands Development Organisation have been present in Bhutan for years, with projects ranging from environment and climate change to water, sanitation and hygiene. (UNDP n.d.c., SNV n.d.) All in all these actors, even if not completely plausible connections within the scope of our project, are proof of a local and international need and dedication towards a better waste management system in Bhutan. To see so many of them embellished with the King's or Queen's seal of approval must mean that it is a top priority also for the Bhutanese government.

In the following, insights from the review of the documents of different projects are elaborated.

In 2018 the World Wildlife Fund has carried out the project Voices of Women Working with Waste in the municipality of Thimphu. The report includes the results of interviews with two women working in different parts of the city with waste. One of the women did not earn a salary for her work as waste segregator but was provided with a one bedroom house to live in with her family of seven. Her husband worked as a driver of a collection truck and their main income was accounted for by scrap dealing. The second interviewed women was the head of an organisation that advocates for an improvement of waste management practices. In the report it was described that the municipality has trained some women in composting. (WWF, 2018)

Valuable insights from this projects were that women seem to be more dedicated to the segregation of waste, and that people do not take waste segregation very seriously which results in a high share of waste being landfilled. The project also showed that taking responsibility of waste segregation can empower women and they may develop eagerness to make their community the cleanest: "I always call-out people who litter in the streets, whether they like it or not!" (WWF, 2018)



The Wuppertal Institute, UN HABITAT and UN Environment have carried out what they called project scoping regarding waste in Thimphu in 2018. The project provided us with some general insights that are included in State and needs of development. (Lah, 2018) It also describes that in Thimphu the collection of waste was piloted as well as the utilisation of surveillance in response to illegal dumping (Ghalley, 2017). Furthermore, various challenges the country faces regarding the implementation of solid waste management are identified. These include financial challenges such as the viability of projects and access to credits; technological challenges such as the lack of local knowledge, standardised procedures and R&D efforts; as well as challenges of the regulatory and policy environment concerning enforcement, a lack of regulation for by-products and outputs of waste management; a lack of understanding of the importance of waste management in terms of climate change and the benefits (economic & social) of waste management. Bhutan also lacks people with the capacity to develop appropriate regulation, monitoring systems and technology while facing a lack of coordination between the involved institutions. The countries landscape makes it difficult to find suitable spots for waste management plants and small local quantities of waste make financial viability a challenge. The project report also describes the particular challenge we want to address in this project: missing awareness of the importance of separating and managing waste in the population. Different measures are suggested such as awareness raising through "mass media like radio, workshops, conferences, school level competitions and outdoor displays in the municipalities and towns at other places of general gathering" (p.14) and the introduction of polluter pays principles. (Lah, 2018)

A UNDP project of 2012 in Thimphu showed that waste collection and transportation was by far the most expensive part of waste management and that despite major investments the service is not homogenous in "frequency and type of waste collection service provided" (p.3). Neither does it reach the entire area, also due to poor roads. Waste collection is expensive because the segregation and the collection of recyclables takes place in the truck. The staff substituted their income by scrap dealing. The report also notes complaints of citizens due to long waiting times for the collection. According to the UNDP a segregation of biodegradable waste and paper at source would reduce the transported and disposed volume by three quarters. The UNDP also points to the importance of the informal sector as well as emerging recycling businesses that are involved for example with glass, paper, plastics, metals, and plastics. They might collect door-to-door (but this seems to be too expensive) or from the landfills. In the latter case problems regarding the exclusive right to collect recyclables from landfills appeared. (UNDP, 2012)

In particular interest for us is the Samdrup Jongkhar Initiative (SJI). SJI promotes a zero-waste strategy in Samdrup Jonkhar for example by establishing zero-waste communities and a craft group; building facilities to allow waste segregation; providing information material; raising awareness; and holding clean-up events (SJI, 2018b.)

Allison 2019 describes that SJI focuses on a holistic approach to reduce waste by taking into account all aspects of rural livelihoods, honouring cultural traditions and traditional environmental knowledge. The initiative does not only look at waste, but takes into account the different dimensions of which GNH is made up off. Buddhist values have also been included for example by reusing seemingly useless items giving them a new life. "The Bhutanese villagers have confronted the by-products of their newly-consumerist society and have found methods to transform and transmute previously rejected materials into useful items" (p.15). SJI makes sure that different ages are included in their projects and that individuals are supported by their community in the attempt to reduce waste and not left alone with the responsibility. Allison (2019) points also out the importance of local values in ensuring the long term sustainability of environmental projects and habitual practices in a day-to-day basis. (Allison, 2019)

"From my experience, I have observed that women have a natural instinct to take care of the environment because of our time spent looking after our own home. Through cooking and gardening, we always come in contact with all kinds of waste and from those experiences we have educated ourselves on what kinds of waste are degradable and what is not and how waste thrown outside can even contaminate the water."

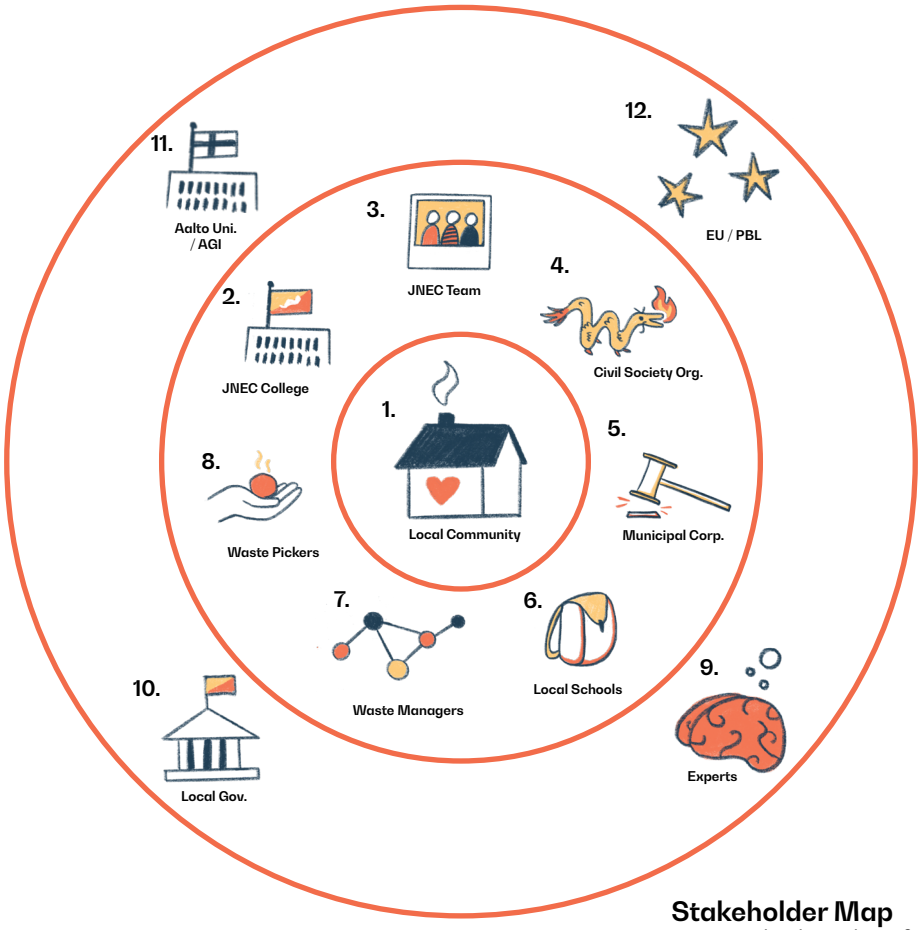
- **WWF, 2018**

SJI has also collaborated with a national NGO called Clean Bhutan to train women and boys from Samdrup Jongkhar and Dewathang to weave baskets from tetrapac and plastic waste, which would otherwise be dumped in a landfill (Clean Bhutan Facebook Page 2020). Clean Bhutan is an initiative with a vision to make Bhutan a zero waste society by 2030 in line with the National Environmental Commission's targets (2019, 15–19.). They aim to reduce greenhouse gas emissions from landfills and prevent river pollution from waste by encouraging Bhutanese people to adapt to a sustainable consumption lifestyle. (Clean Bhutan n.d. a.) They have had six bigger projects since 2015 from which at least two of them are relevant in the context of waste management and raising awareness: 1) "Waste management system for Trashiyangtse community" (2016-2018) in partnership with UNDP and 2) "Empowering women & Youth through Waste Entrepreneurship" (2017-18) that was funded by the EU and had as its target to educate Thimphu city women from Royal Bhutan Police, Royal Bhutan Army and youth. (Clean Bhutan n.d. b) Other activities and projects of Clean Bhutan include over 100 clean-up campaigns and advocacy programs in 20 Dzongkhags, educating communities on how to upcycle waste that would end up in landfills (such as glass bottles and school uniforms) into products and how to make compost from biowaste (Clean Bhutan 2017; Clean Bhutan n.d. c).

Finally, an initiative called the Zero Waste Hour also deserves a brief mention. It's part of the National Environment Commission's campaign "My waste, my responsibility", and initiated by Bhutan Trust Fund for Environmental Conservation in June 2019. The initiative requires all offices, institutions, organisations, and individuals to clean their surrounding areas for at least one hour on the second day of every month. Its target is to help people get a sense of social responsibility towards waste and reduce the illegal dumping of waste in open areas. (Daily Bhutan 2019.)

3.0 Project Scope

3.1 Stakeholders



Stakeholder Map
inner circle: direct beneficiaries
middle circle: secondary beneficiaries
outermost circle: tertiary beneficiaries

Figure 5: Stakeholder Map

1. Local communities

With the local community we mean the people living or working in the residential areas of Samdrup Jongkhar town and Dewathang area. The administrative division (Thromde) of Samdrup Jongkhar has a population of approximately 10 500 people (Samdrup Jongkhar Thromde 2019) and Dewathang, consisting of 20 villages, has 2600 people (Samdrup Jongkhar Dzongkhag 2020a). These people are the ones generating the waste, but also directly affected negatively from bad waste management. Since they are at the heart of our project, we call them the users of the product or service we deliver. We will aim to co-design the new waste management together with them through workshops, interviews and feedback.

2. Jigme Namgyel Engineering College (JNEC)

We are partnering in this project with JNEC, an engineering college located in Dewathang, 18 km from Samdrup Jongkhar town. It was founded in 1973 as an independent school called the Royal Bhutan Politechnic, but became later part of the Royal University of Bhutan together with 7 other colleges. The college was renamed in 2015 to JNEC to honor the father of the first king of Bhutan who had a victory against the British colonization in the area where the college is located. (Jigme Namgyel Engineering College 2019.)

The college hosts today 779 students in 6 departments: civil engineering and surveying; electronics and communication engineering; electrical engineering; humanities and management; information technology and; mechanical engineering. The college's vision is to be a "a premier Institute of applied engineering, management and technology towards developing highly competent and innovative technical personnel infused with the values of Gross National Happiness". (Jigme Namgyel Engineering College 2020)

3. Student team from JNEC

We are working in collaboration in this project with a team of five Bhutanese students from JNEC. The team consists of four students, all studying civil engineering: Laxmi Sharma, Lobzang Chopel, Namgay Wangmo, Nima Dorji and Karma Choden. The teacher in charge of the project and the team is Phurba Tamang. The students are working on how much degradable and non degradable waste is generated in the municipality of Samdrup Jongkhar, how it is managed in the landfill and how much pollution the landfill is causing.

4. Samdrup Jongkhar Iniative (Civil Society Organization)

The Samdrup Jongkhar Initiative (SJI) is a community-based Civil Society Organisation (CSO). It was founded in 2010 and aims to put the Gross National Happiness Development philosophy into action on the ground and grassroot level. They have many ongoing projects, for example in education, organic agriculture and youth engagement. The project that is closely related to ours is called Zero Waste. Through this project SJI has for example organized training sessions, formed craft groups and built recycling stations. Since the CSO is closely in contact with the local community, they will be an important source of information and collaboration partner for us. (Samdrup Jongkhar Initiative 2018a; 2018b) Our contact person in SJI is Mr. Cheku Dorji, Programme Director.

5. Samdrup Jongkhar Thromde (Municipal Corporation)

Samdrup Jongkhar Thromde area extends from Samdrup Jongkhar main gate until Dewathang town (Samdrup Jongkhar Thromde 2019). A Thromde (a municipality) is the lowest level of administration in Bhutan. They are divided into A and B classes based on population, development, and economy. Samdrup Jongkhar Thromde is a class A municipality, meaning that it is more developed than Class B Thromdes and can elect its own board (Tshogde) that consists of seven to ten members. They are empowered to regulate advertising, enforce public health and safety rules, and to levy taxes on land and property. (GNH Commission 2007.)

6. Local Schools

We think it is important to involve some local schools of Samdrup Jongkhar into the project, since educating children about waste management could enhance the adoption of new waste management practices in the community especially in the long term. There are two schools in the Dewathang area and one school in Samdrup Jongkhar town, but we do not know yet which schools we will beworking with or the contact people there. We are planning on meeting teachers of one or two of the schools and co-creating with them a prototype of a workshop or game for the students about the importance of segregating waste. After testing the prototype we will develop it further into an end product that the teachers can use in class with their students.

7. Waste management employees and managers

Key stakeholders of the project will be the managers and employees of the local waste management system. These include those employed by the old and new landfill itself, but depending on the current and future system also those employed in the wider waste management system such as the waste collection service. The results of our project have the potential to alter the work of these people significantly. So far we have unfortunately not been able to gain further information on who is involved along the waste management chain. We will need to get into contact with local experts to enhance our understanding of the current situation and possible impacts of this project on these very important stakeholders.

8. Waste pickers/ organisation and scrap dealers

The business of scrap dealers is mainly restricted to the Southern border region with India (our project region) where geographical conditions are more favourable and urbanisation allows for a market large enough. Nevertheless, scrap dealers do sometimes collect waste from rural areas, rent a vehicle and sell it in India. The presence of scrap dealers allows waste pickers to supplement their income with waste picking while maintaining another income source. Many of these waste pickers belong to the municipality where they are employed in the collection of garbage. It is this access to household waste that makes waste picking a worthwhile activity. Occasionally, Indians cross the border to pick waste in Samdrup Jongkhar. It has been reported that while waste pickers are seldom despised, awareness and support of their work is lacking. Furthermore, scrap dealers could benefit from training on budgeting, developing a business and writing proposals as well as from access to financing. Such support of scrap dealers would then also trickle down to waste pickers. Waste workers could also be supported by providing infrastructure, sanitation facilities and the establishment of waste segregation at source. (Stevenson 2016.) We need to include the waste pickers and scrap dealers in our project since we don't want to promote waste management practices that would put them out of their jobs.

9. Experts

To gain further knowledge and insights on the topic we are consulting several experts. These include for example Johanna Laaksonen, an expert on waste management and landfill approaches in Finland. To gain further insights on practices and approaches in Finland, we visited eco-industrial centre Ämmässuo, the biggest waste management centre in the Nordics known for its advanced technology. The guide we had there was Suvi Runsten, Managing Director at Environmental Consulting EcoChange Ltd. We also met with Chirstoph Gareis, the Operational Manager for Biowaste Treatment and Elsa Rintala, an Environmental expert from the Recycling Centre. In addition to experts from Finland we are approaching experts from and on Bhutan. This includes contacting the Bhutan desk in the foreign ministry as well as experts from local CSOs, municipalities and the local landfill.

10. Local government of Samdrup Jongkhar Dzongkhag

Bhutan is divided into 20 districts called 'Dzongkhags'. Each Dzongkhag has its own local government that consists of local people between the age of 25 to 65 elected as members. (GNH Commission 2007) Administratively, the Dzongkhag is divided into two 'Dungkhags' (sub-districts) and sub-divided further into 11 'Gewogs' (groupings of villages) (Samdrup Jongkhar Dzongkhag 2020b). Samdrup Jongkhar Thromde is under the administration of the Dzongkhag, so we will probably be more in contact with the Thromde since it is more involved with the community.

11. Aalto University (School of Engineering) / Aalto Global Impact (AGI)

The Sustainable Global Technologies Studio is offered and funded by the School of Engineering of Aalto University. It is part of the Water and Environmental Engineering Master's Programme but open to all Master's students at Aalto University. The Sustainable Global Technologies Programme is coordinated and lectured by Matleena Muhonen. The academic leader of the SGT Programme is Prof. Olli Varis who is also responsible for the SGT Studio.

This project is a Problem Based Learning (PBL) South Asia project. PBL South Asia is facilitated by Aalto Global Impact. In particular, the project specialist Avinash Dhital and the senior manager Riina Subra support our endeavours.

12. European Union / Problem Based Learning

Problem-based learning (PBL) South Asia is a partnership of ten universities located in the Netherlands, Lithuania, Finland, India, Nepal and Bhutan that is co-funded by Erasmus+ Programme of the European Union (Aalto Global Impact n.d.b). PBL South Asia was launched in 2018 and will continue until 2012 (Aalto Global Impact n.d.a). It aims at strengthening the capacity of these partners; integrating "themes of sustainable development, social responsibility and human rights into educational practices"; and embedding the PBL approach in teaching at the Royal University of Bhutan. PBL furthermore is an attempt to combine best practices from all of the partners. (Aalto Global Impact n.d.a.)

3.2 Beneficiaries

Direct Beneficiaries

Primary beneficiaries are those people or groups of people that benefit from the project right away. We consider them to be the following:

The student group from JNEC and their teacher:
The five students that we work with (mentioned in the stakeholders section) will learn from our working methods and problem based learning especially during the field trip. Hopefully their teacher Phurba Tamang will also gain insights on how group work can be organised in a less hierarchical manner that we have understood to be quite common in Bhutan.

The environmental officers of Samdrup Jongkhar Thromde: They will be able to use the recommendations we give about waste management for improving it. They may also gain perspectives from us on how to involve and educate the citizens about waste segregation. The contact person we have there, as mentioned in the stakeholders section, is Ms. Sonam Choden. They are taking part into the project through providing us with information about the current waste management practices.

Teachers from the local school(s):
We will be giving the teachers of the local school(s) ideas on how to educate students about waste management. Concretely this means a workshop or game we create together that they can use in their teaching.

Secondary Beneficiaries

With secondary beneficiaries we mean the people or groups of people who will benefit from the project later, in the medium and long term: We expect them to be:

The local community of Samdrup Jongkhar:
Better waste practices will ensure a more safe and environmentally friendly waste management for the local community of SJ. More precisely, when for example less bio waste ends up in the landfill, the groundwater and rivers will not get polluted, which impacts the health of the locals positively (as opposed that they would be using polluted water). Later these practices could also spread in other Thromdes in Bhutan.

Future JNEC students and teachers:
The methods of problem-based learning will be learned, grasped and implemented, hopefully also through future PBL projects.

Waste management employees:
Will have an easier time collecting and processing waste since it has been segregated properly.

3.2 Objectives and Activities

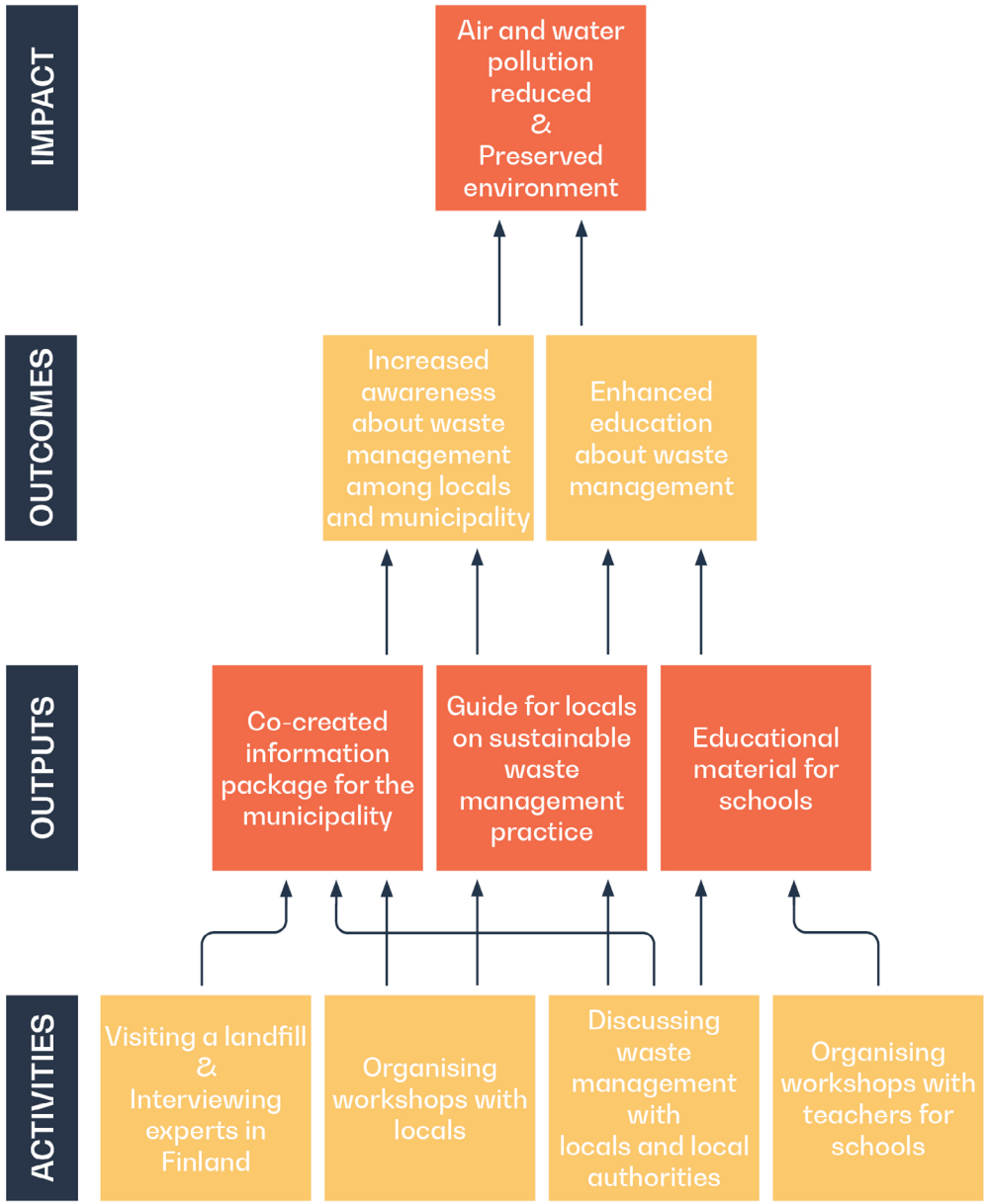


Figure 6: Objectives and Activities

Impact
In the modern world in which the amount of waste is frighteningly increasing, waste management has a crucial role in preserving the environment. Indeed, in some countries where the infrastructures are not sufficient to receive all the rubbish and the waste, thus mismanagement of waste can have important consequences on the environmental contamination.

Firstly, air pollution can result from a bad disposal of rubbish and waste. Rotting garbage produces harmful gases which when mixed with the air can alter the health of the population. Moreover, the soil and the groundwater can be highly contaminated by leachate, an environmentally harmful liquid that is produced when water goes through solid materials.

The problem of waste management is one of the most pressing environmental challenges in the municipality of Samdrup Jongkhar. Therefore, the main impact of the project is to reduce the air and water pollution to preserve the environment in the area.

Outcomes
In order to achieve the protection of the environment and the reduction of air and water pollution in the area of Samdrup Jongkhar, we decided to focus on increasing awareness about waste management among locals and the municipality. We want to work on the upstream part of waste management. Increasing the awareness among locals and the municipality can facilitate the waste management before the collection of waste and before those reach the landfill.

Secondly, as we want to work upstream of the waste management process, we decided to target the schools in the area of Samdrup Jongkhar to enhance the education about waste management. In the continuity of raising awareness, we believe that education is a core element and integrating the importance of waste management in the educational learning will help future generations to be more resilient when facing that challenge and to allow the impact above to thrive.

Outputs
To achieve the increase of awareness and education about waste management, three main outputs were distinguished. First, it is planned to co-create an information package for the municipality. The aim of this package is to inform the authorities about the data collected from the locals and from the SJI. The format of this document is still to be decided.

In addition to the guide for the locals, educational material for schools will be created. The main goal of this output is to teach children about waste management practices using methods that are adapted to their age. As mentioned in the outcomes part, it is a way to ensure the continuity of the rise of awareness on waste management in Bhutan as they are the future generation that will have to deal with the consequences.

Then, we would like to establish a guide intended for the locals on the waste management practices in Samdrup Jongkhar. Thanks to the various meetings planned throughout the field trip, a better understanding of the Bhutanese system should be built. The aim of the SaJo project is thus to ease the share of this knowledge and make it more accessible to the locals.

In addition to the guide for the locals, educational material for schools will be created. The main goal of this output is to teach children about waste management practices using methods that are adapted to their age. As mentioned in the outcomes part, it is a way to ensure the continuity of the rise of awareness on waste management in Bhutan as they are the future generation that will have to deal with the consequences.

Activities

To gain preliminary knowledge about waste management in Finland, we visited Ämmässuo, the biggest waste management centre in the Nordic countries. We also had a discussion with an expert from Helsinki Region Environmental Services Authority who explained in detail how to sort the waste in Finland. Based on the information collected, an appropriate presentation of waste management in Finland will be created to present the Finnish system to the Bhutanese.

One activity to engage with the local community is to organise workshops for them. It is linked to two outputs: informing them about problems brought by waste and how they can be handled but also inform the municipality of the citizen's knowledge and needs regarding waste management. However, one issue is how to reach and gather the local community.

After having contacted the municipality of Samdrup Jonghkar and the SJI, meetings with them were set up for our field trip. Discussing waste management with them is important to co-create the information package for the municipality but also to create the educational material for the local schools.

In order to enhance the education about waste management, it is planned to organise workshops with the teachers for schools. The targeted educational institutions are located in Dewathang area and the workshops are planned to be done during the second week of our field trip. The participants will be children and teenagers from primary and middle school and the goals is to co-organise the sessions with their teachers, even relate them to what they are currently studying if possible.

Sustainable Impact

As sustainability is integrated in the project scope and implementation from the beginning, different dimensions (social, economic, environmental and institutional) are taken into consideration throughout the process. The main focus is on environmental sustainability as the objective is related to the increase of awareness of waste management.

Looking at the Sustainable Development Goals (SDGs) of the Agenda 2030 by the United Nations, the project is highly connected to Sustainable Development Goal 6: "CLEAN WATER AND SANITATION" (United Nations (UN) n.d.a). More specific, it is target 6.3. which will be advanced: "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials [...]" (United Nations (UN) n.d.b). The project is clearly related to other SDGs and shall be acknowledged:

- SDG 3 – Good Health & Wellbeing
- SDG 11 – Sustainable Cities and Communities
- SDG 12 – Sustainable Consumption & Production
- SDG 13 – Climate Action
- SDG 14 – Life Below Water
- SDG 15 – Life on Land
- SDG 17 – Partnerships for the Goals

3.3 Implementation Timetable

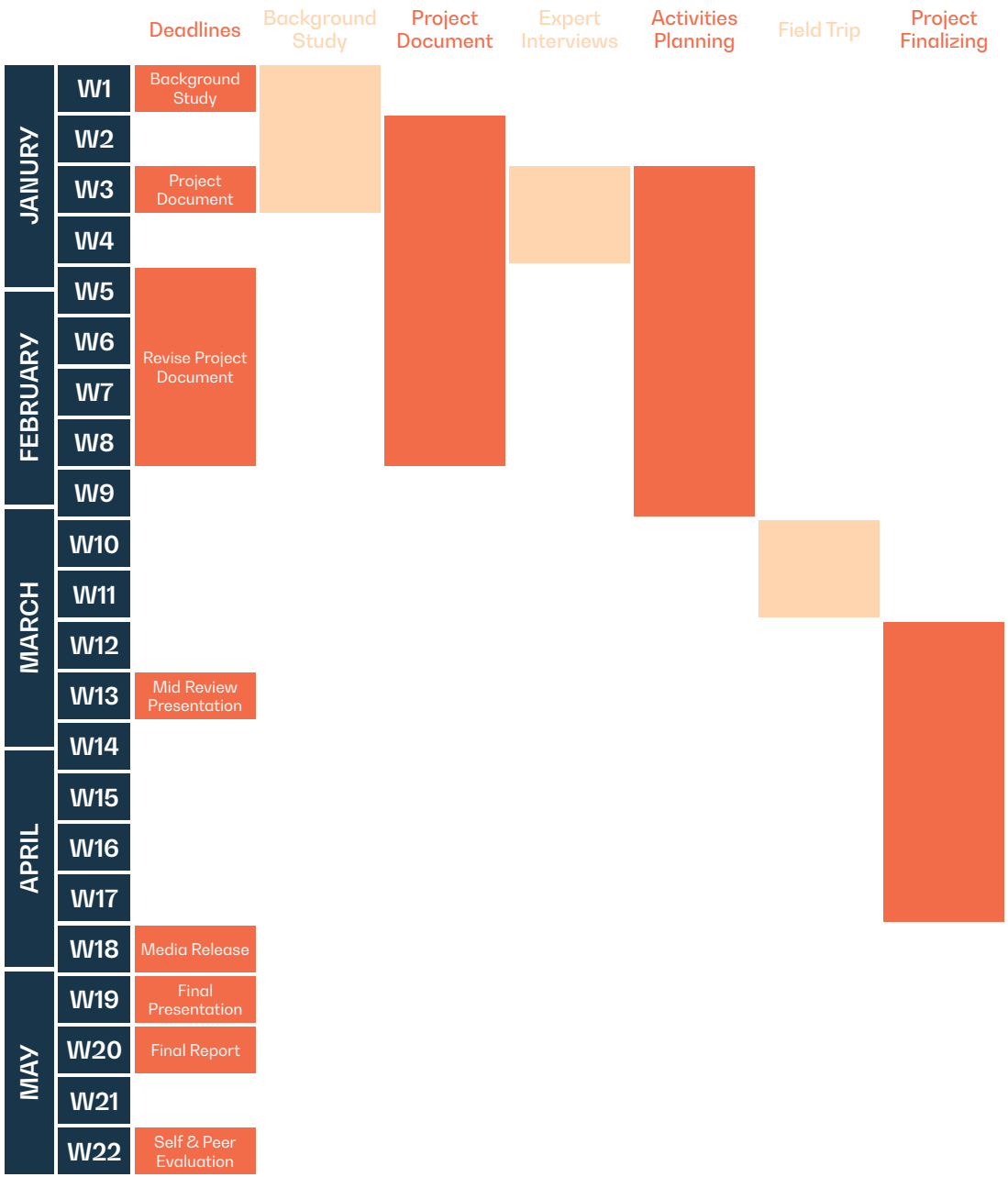
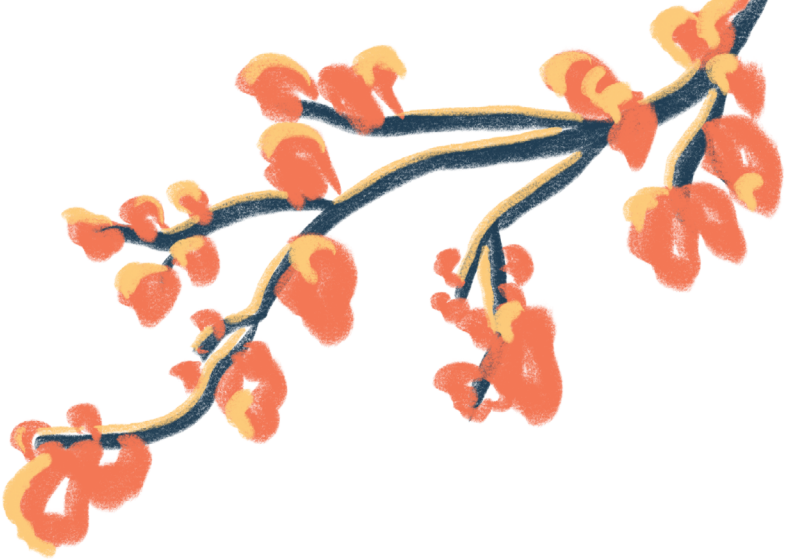


Figure 7: Implementation Timetable

4.4 Sustainability

Different dimensions of sustainability need to be considered in this project. (Environmental) sustainability regarding the project impact and the project objectives have already been assessed in Objectives and activities. In this section the focus is on other dimensions of sustainability more related to the implementation of the project: institutional, social and cultural, financial and technical sustainability.

Institutionally, we try to ensure sustainability by enabling participation and ownership of the users via workshops and co-creation. By conducting workshops with teachers and thereby co-creating teaching material on the topic of waste segregation we ensure that the produced teaching material is seen as relevant and important by the teachers. Thereby, the teachers are more likely to use the material after our departure. As the material will be prototyped and tested in Bhutan with the students, we ensure that the students needs and interests are at the center and that they enjoy using the material, which most likely will be some kind of game.



The workshops we plan to conduct with the locals aim at building awareness among them as well as collecting their ideas of sustainable waste management, i.e. How do they imagine a sustainable waste management system? The outcomes of these workshops will then be handed over to the responsible authorities of the municipality. After the end of the project we hope that the Technical University JNEC in Bhutan together with the municipality and maybe the Samdrup Jongkhar Initiative will continue to take care of it. While we do not know whether students from Aalto University will be able to continue in Bhutan next year, students from other universities of the PBL partnership might. As waste management is a national priority, we are optimistic on the continuation of our efforts. Nevertheless, we are aware that we cannot ensure the implementation of the ideas of the locals. We need to communicate this clearly during the workshops to make sure no false hopes are built up. Furthermore, we aim at building capacity on behalf of the municipality and the university by exchanging knowledge and approaches on waste management.

Regarding social and cultural sustainability, we aim to ensure that the project addresses local needs. According to our background study and the communication with the Technical University JNEC, waste management practices are an important issue in the region. By talking to and working with different institutions (university, municipality, CSO) as well as locals and school kids and by prototyping we want to ensure social and cultural sustainability of the project outputs and outcomes. Furthermore, we will try to ensure the compatibility of our own behaviour as well as the recommendations that might result from the project with Bhutan's culture and religion.

At this point we assume that the municipality is responsible for waste management and its financing. We will need to gain further information on who finances waste management today and in the future and possibly need to consider whether income is, can or should be generated. Regarding the collaboration with the schools, financial dependence will not be created as the output of Studio Sajo will not require continuous investment. Instead, we aim at co-creating teaching material and approaches which can be used over a long-period of time. We hope that one of our outputs will be a board game to be used in school for the education on waste segregation. We would produce a final version after our return to Helsinki and sent a version to the appropriate schools. We hope PBL South Asia will be willing to finance this. We do not plan to engage in the transfer of technology during the project, therefore there are no aspects of technological sustainability to be considered at this point in time.

4.0 Project Plans

4.1 Resources

	Before the field trip	During the field trip	After the field trip
Human	**Project team:** - 5 Aalto students - 1 mentor - 1 supervising teacher **Experts in Finland:** - Johanna Laaksonen - Suvi Runsten - Elsa Rintala - Christoph Gareis	**Project team:** - 5 Aalto students - 5 JNEC students - 2 mentor - 2 supervising teacher **Local Community:** - Teachers - Students - Locals participating in workshops **Local Experts**: - Municipality - JNEC - SJI - Drivers - Guesthouse staff	**Project team:** - 5 Aalto students - 1 mentor - 1 supervising teacher **Experts**
Materials	**Workshop materials:** - poster papers - sticky notes - pens	**Workshop materials:** - poster papers - sticky notes - pens - materials to prototype games **Gifts for JNEC:** - Nepali books	**Materials for the final version of the game** **Printed information material**
Equipment	- Laptops - Camera	- Laptops - Camera - Presentation equipment	- Laptops - Camera - Presentation equipment
Facilities	Aalto meeting and working space	- JNEC meeting and working space - Hotel and guesthouse - Workshop space possibly in JNEC and target schools	Aalto meeting and working space
Financial	- Visa and vaccination costs - Travel insurances - Visit to Ämmässuo Eco-industrial Centre	- Plane tickets - Accommodation - Local travel costs - Materials - Meal costs	- Possible website hosting - Printing information materials - Possibly producing a board game

Figure 8: Project Resources

On the previous page, the estimated resources are displayed in figure 8.We have considered human resources, materials, equipment, facilities and financial resources. These are subdivided according to the time of occurence into: before, during and after the field trip. Financial costs are furthermore elaborated in the next chapter.

4.2 Budget

Type of cost	Per person (€)	Total for 7 people (€)
Plane tickets	820	5.740
Accommodation	750	5.250
Vaccinations	45*	316*
Visas	55	385
Local travel	330	2309
Travel insurances	Unknown	Unknown
Visits to waste management centers in Finland	43	300
Materials needed for workshops	3	20
Unexpected costs	57	400
Subtotal	2.103	14.720
Meals	140	980
Unexpected personal costs	71*	500*
Total	2.314	16.200

Figure 9: Project Budget

** Costs that do not consist of every member of the group travelling*

The budget is aimed to predict the costs of the project for 7 people: the five students, their mentor Matias and the supervising teacher Matleena Muhonen. The budget plan consists of two parts: firstly the costs covered by PBL South Asia project at the Aalto University, and secondly the costs that are left for us to pay individually. The matrix is also divided in the costs per person and the total costs as a group. However, the final costs will be known after they are realised, as there might be unexpectant expenses that we cannot take into account yet.

The first part of the matrix starts with plane tickets and accomodation, and includes numbers that are based on preliminary estimates stated in the Aalto University travel plan from January. The travel plan also had a budget of 430€ per person (3010 € in total) for vaccinations, visas and local travel expenses. We now know that the vaccinations for the whole group ended up costing 316 €, including Typhoid (for Daniela, Gaspard and Mona, 37 € for each), Cholera (Daniela, 70 €) and Japanese Encephalitis (Mona, 135 €). The vaccinations were based on doctors' recommendations for each individual. Visa costs were 35 € for the Bhutanese visa and 20 € for the Indian visa. This would leave 2309 euros for the local travel.

We have also been assigned a budget of 300 euros to spend for the visits to waste management centers in Finland, and so far have spent 170€ for renting a bus to visit Ämmässuo Eco-industrial centre. Moreover, we estimate that the only materials that we need to organise the workshops are paper, post-its and pens, so the costs will probably not be more than 20€. We are budgeting 400€ for unexpected costs, for example that we would have to stay in a hotel for an extra night.

These expenses add up to 14 770 € in total, meaning 2110 € per person. Aalto University also provides us with travel insurances, but we do not currently know how much that costs for the university.

The expenses not covered by Aalto University or PBL South Asia include the food that we consume during the trip and unexpected personal costs. According to the Lonely Planet travel guidebook (Mayhew & Brown 2017, 19), a restaurant meal in Thimphu costs between USD 5–15, which is approximately 4,5–13,5 € (XE 2020). Based on this, if we have three meals a day, an average cost for food per day would be 27 €. However, the cost of food will most likely be lower in Samdrup Jongkhar than in the capital, and we will not be eating every meal in restaurants but rather in the school cafeteria. Riina Subra, PBL coordinator for Aalto Global Impact who has been there estimated that we will probably spend around 10 € daily on food. That would add up to 140 € per person and 980 € in total for the 14 days we are there.

Unexpected costs per individual could include missing a flight. That could add up to 500 € for that individual. We will include that in the total costs for seven people as it is not very likely that we all miss our flight.

The cost for the whole preparation for the field trip and the trip itself totals in 16 250 € for seven people and 2321 € per person. Costs that we haven't taken into account are the manuals or brochures about waste management that we may design for the local people. At this point it is very complicated to calculate how much they would be as we don't know if they would be printed in Bhutan or Finland and how many copies we would make.

4.3 Communications and Reporting Plan

Personal Communications

On the individual level, all team members have been encouraged to keep note of their own learning throughout the course. The team will be adding personal findings and reflections to a deliverable learning diary at least monthly, in addition to which, more personal ways of documenting the process are welcomed. During the field trip, everyone will be keeping a daily diary. This is not only important for making sense of our own thoughts, but is a great way of recording our growth, which can be revisited for personal and team-wide reflection once the project is completed.

Internal Communications

Already early on in the course, internal communication channels were established. Currently, team members have an instant messaging group on Whatsapp together with their mentors to stay up to date and engaged on a more casual level. A team chat merging the Bhutanese students at JNEC and the Aalto student team was also created to help get the students acquainted beforehand. Most project assignments are stored in the cloud for easy access, and Aalto students usually work interactively and collaboratively no matter their location through this virtual connection.

Team members have also been given special roles regarding one-on-one communications with key experts or stakeholders. When emailing a specific person, it is typically just one specific member who works as the connection between - not everyone simultaneously.

External Communications

More public forms of communications and reporting are to also take place. These forms of communicating require the most thought and effort from the team, as they will form the public lense through which the project is viewed through.

An Instagram account under the handle **@studiosajo** has been established. It is the project's most prominent digital presence and an accessible look into its highlights and progression. As well as being a relevant page for university actors, like departments, and programs, to follow - it's a simple way to get friends and family aware and engaged with the project. It works as a sort of visual archive once the project is completed, and a tool for fostering online interaction and growing publicity. A twitter handle under the same name is also in the works.

Project reports and documents are an efficient way to communicate about the project in more depth, especially for school officials and funders. Like this current one, they will typically be divided into subsections, which allows the team to share responsibility and focus on their own expertise areas. The structure provided by project reports will provide a working backbone for any presentations the team needs to make - especially when the entire project brief, background and plans need to be understood by the audience.

We are also planning on giving some sort of documented memorabilia / material to workshop goers as thanks for participating. We will also share with them the details as to where they can find the study and pictures created through their inputs and help.

Planned to be released sometime in late April, the project's media release will be targeted at the public eye, to raise awareness about Aalto's multidisciplinary learning approach, the PBL framework and Studio SaJo itself. Just in time for the final presentation and report, it may attract a few more interested audience members. Like seen in past years, in these last stages, it may also develop into a final showcase of sorts; a book release, photography exhibit or a creative-documentation of other sorts.

4.4 Risk Analysis and Risk Management Plan

	Risk	Probability (1-3)	Severity (1-3)	Score (PxS)	Action to prevent/ manage risk
INTERNAL	Be overwhelmed	2	2	4	Take time for ourself and have some hind-sight on the situation
	Bad atmosphere in the team	1	3	3	Try to communicate, be comprehensive and open while keeping a positive state of mind
	Lack of participa-tion from locals or Bhutan team	1	3	3	Improve our way of communicating, try to understand their moti-vations and adapt our actions to them
EXTERNAL Finland	Landfill visits are impossible	1	2	2	Compensate the lack of technical knowledge with research
EXTERNAL Travel	Strikes in Assam block us from entering Bhutan	1	3	3	Have the phone nu-mber of an university in Guwahati, look for hotels near the airport
EXTERNAL Bhutan	Someone gets sick	2	3	6	Research about travel sickness, bring the ne-cessery medications
	Get attacked by an elephant	1	3	3	Researc closest health facilities, avoid
	Culture shock	2	2	4	Do reasearch and keep an open mind
	Gap between what they expect from us and what we planned to do	1	2	2	Clear communication before hand and have a backup subject

Figure 10: Risk Analysis and Risk Management Plan

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Image Sources:

Annex A

Gross National Happiness and the Environment

Gross National Happiness and Environment
According to the GNH Centre Bhutan (2019b) GNH rests on four pillars: good governance; an economy that values social contributions and leisure; cultural resilience; and conservation of nature. Based on these four pillars, nine domains (see illustration), "38 sub-indexes, 72 indicators and 151 variables" were developed. The domains include: living standards; education; health; environment; community vitality; time use; psychological well-being; good governance; and cultural resilience and promotion. (GNH Centre Bhutan 2019c.)

GNH is undoubtedly related to the impact of our project, as one of its nine domains is environment. In addition to GNH, the environmental values present in the country are related to economic and religious values (Brooks 2011). Bhutan's government has tried to introduce environmental values in a top-to-bottom approach coupling them to Buddhism while elaborating their economic necessity. While the study conducted by Brooks (2011) has shown greater importance of economic development compared to religion for the emergence of environmental values, this might be caused by the more affluent citizens having better access to governmental campaigns and religious teachings. Whether the present environmental values are the result of mainly economic or religious reasoning remains to be determined. (Brooks 2011.)

Annex B

Links to the strategy, the act and regulations

The National Waste Management Strategy (2019):
http://www.nec.gov.bt/wp-content/uploads/2019/10/NWMS-ENGLISH-VERSION_opt.pdf

Waste Prevention and Management (Amendment) Regulation (2016):
http://extwprlegs1.fao.org/docs/pdf/bhu175025.pdf

Waste Prevention and Management Regulation (2012):
http://www.biodiv.be/bhutan/convention/cbd_national/legislation/waste_prevention_management_regulation.pdf/download/en/1/Waste_Prevention_Management_Regulation.pdf?action=view

The Waste Management and prevention Act (2009):
https://www.nationalcouncil.bt/assets/uploads/docs/acts/2017/Waste_Prevention_and_Management_Act_2009_English.pdf