REPIC

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Final Report:

E-Waste Management in Kathmandu, Nepal

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Contents

Please note:

- Please include photos, easy to understand graphics, etc., with this report.
- The length of the main report (Chapters 1 to 7) should not exceed 12 - 15 pages max.
- Please attach additional interesting information about the project.
- The final report is published on the REPIC website and should not contain confidential information.
- Please send the completed final report directly to: info@repic.ch (REPIC Secretariat, c/o NET Nowak Energy & Technology Ltd., Waldweg 8, CH-1717 St. Ursen)

1. Summary

Why was this project implemented (Needs in the partner country)?

The 2011 Solid Waste Management Act is Nepal's only regulation on waste management, and it does not even mention e-waste. A lack of policies has meant that informal actors are free to burn wires to extract copper, extract precious metals from electronics and dump the remnants in landfills, which also means both workers and the population at large are unwittingly exposed to health hazards. According to the Department of Environment, Nepal discarded 18,000 metric tons of e-waste in 2017 alone. Furthermore, the Global E-waste monitor 2020 stated that Nepal produced 28 metric kilotons in 2019 and was growing at the rate of 21% in 5 years. A lack of clear legislative guidance has also meant that there is no oversight when e-waste crosses borders to India or no infrastructure to export hazardous waste like lithium-ion batteries to the few countries that properly manage them like Belgium or Japan. Most of the e-waste, however, ends up in landfills and is mined by hawkers who use open air burning to extract metals like copper. With this in mind, Doko and myclimate partnered up to tackle these challenges. The project aimed at establishing replicable e-waste management practices in Nepal by starting an e-waste recycling and refurbishing scheme, establishing a material recovering/refurbishing facility (MRF), and educating consumers about the hazards of e-waste and conscientious consumerism.

What was implemented (project's content)?

The project included **three work packages**:

1) Establishing a hazard safe facility to recycle and refurbish e-waste.
2) Awareness creation on recycling, repair and reuse by creating awareness campaigns, trainings and workshops for stakeholders and clients, social media campaigns.
3) Expanding Doko's e-waste services by establishing e-waste collection centres around the city and building out Doko's e-commerce presence to allow for an increased Culture of Repair and reuse. Developing ways in which circular economy impact can be assessed through the e-commerce platform traffic and items purchased thus informing potential expansion for following years.

How was the project carried out and what objectives have been achieved?

The overall goal of this project was to help Doko set up formal and safe e-waste management operations by way of infrastructure development as well as know-how for the staff and public. As a result, Doko established a 1,000 sq. ft E-lab equipped with various machines to help with e-waste dismantling, resource extraction, refurbishing and hazard control. The E-lab now processes roughly 300 tons of e-waste per year. Through this project Doko was also able to establish its e-waste pipeline by working with electronics brands like Philips and other major brands to establish e-waste collection centres as well as purchase a vehicle to pick up larger e-waste items like household appliances. This collaboration led to over 7 collection centres being established. Similarly, machinery was imported and set up to help with efficient e-waste management and refurbishment as well as to keep staff away from hazards. To further ensure their safety, a Health and Safety Standard Operations Procedures were also established.

Doko's pipeline was further developed through its awareness creation activities which entailed developing a Repair Lab, housed in the E-lab and open to the public. The Repair Lab is also the primary location for awareness raising workshops which were developed with the intent of educating various age groups about the hazards of e-waste, why and how they can be refurbished and how it can enable a local circular economy. These campaigns, however, were not limited to Doko's site. Over 300 community members, 20 government officials, and 100 development sector professionals participated on off site and some virtual (during the peak of COVID-19) workshops. Furthermore, a larger audience of over 50,000was reached through Doko's strong online presence and social media campaigns focused particularly on e-waste. This included blogs as well as posts on Facebook and Instagram.

These efforts have led to Doko establishing a dialogue on the Culture of Repair in schools, on social media and through its e-commerce activities. Doko has refurbished 277 items and sold 132 online alone. It also promoted its online e-commerce platform ("Tatwa") as well as used other popular e-commerce platforms to gauge potential for expansion of e-waste activities. Doko, in collaboration with myclimate also expanded its impact calculator to include e-waste impact in saving non-renewable resources. This calculator helps Doko generate its yearly impact certificates that it gives to clients for them to take stock of their environmental footprint.

As a result, Doko has achieved all three of its primary aforementioned objectives centred around developing a replicable model that can effectively deal with Nepal's growing e-waste challenge as well as reduce the growing amount of waste and save non-renewable resources.

What do you foresee as further actions to be undertaken?

This project has allowed Doko to establish a strong foundation to aim for expanding operations and handle more e-waste thus servicing many more. It has also allowed for Doko to create a national and growing platform to discuss e-waste as a growing environmental, social, and economic problem for Nepalese at large. The immediate actions to be taken is to solidify its activities by continuing to grow its pipeline, aiming to scale operations, and expanding awareness to involve government interaction. Even if the federal government may not have capacity to establish e-waste policies, local municipal governments are indeed interested, and therefore local attempts and ordinances can be influenced. Finally, the Culture of Repair can be grown by working with local schools and non-profits to reach audiences and consumers that otherwise would not have access to electronics. Ultimately, access to such devices indicates an access to opportunity, especially for children. To achieve these goals, the following actions can and will be undertaken moving forward:

- Expand awareness generation of the Culture of Repair through workshops and invitations to schools to participate at Doko's Repair Lab by collaborating with schools, smaller grants to improve upon the workshops, and train more trainers;
- Promote second-hand electronics markets by working with more electronics dealers like Philips and Samsung and national authorities like the National Telecommunications Authority;
- Continue to promote Tatwa and other e-commerce platforms to enable more second-hand usage;
- Collaborate with schools to develop computer labs using Doko refurbished computer labs;
- Establish and market a Doko certified warranty to guarantee and encourage trust in refurbished items;
- Establish a larger e-waste management facility outside of Kathmandu in the Terai to capture e-waste that moves to and from India.

2. Starting Point

Nepal lacks e-waste policies. Its waste management system is haphazardly managed by informal systems, hence there is a dire need to establish management mechanisms. There is no municipal or national level policy in this sector, which hinders private investment – a challenge many waste management companies including Doko are facing. The 2011 Solid Waste Management Act is Nepal's primary regulation and does not even mention e-waste. A lack of policies has meant that informal actors are free to burn wires to extract copper, extract precious metals from electronics and dump the remnants in landfills, which also means both workers and the population at large are unwittingly exposed to health hazards. According to the Department of Environment, Nepal discarded 18,000 metric tons of e-waste in 2017 alone, in 2019 already 28,000 tons according to Global E-waste monitor.

In 2017, Doko Recyclers started as a waste management company that focuses on recycling and up-cycling dry waste with the intent of providing waste management services the government does not provide and increasing environmental awareness around recycling and conscious consumerism. It collected almost 200 tons of dry waste including plastic, paper, glass, metals, and e-waste in 2018 alone. In 2018, Doko Recyclers formally registered as Nepal's first e-waste management company after indirectly collecting (upon the behest of conscientious clients and despite not having enough e-waste management abilities) approximately 70 tons of e-waste from companies and households between August 2017 and November 2018. The e-waste sector in Nepal faces several challenges: Lack of data on the amount and composition of e-waste being generated and handled by the informal sector, clear legislative guidance and policies as well as proper collection and management systems for electronic products present a large problem in Nepal and specifically in Kathmandu. This problem will further increase as the volume of electronic products in the market increases and will eventually enter the waste stream. There is a strong need for economically viable solutions to ensure structured collection and proper recycling of electronic waste in Kathmandu and beyond. This was the starting point of the REPIC project which commenced in May 2020 right at the start of the Covid pandemic.

3. Objectives

- Objective 1: Establish structures for hazard-safe recycling and refurbishing of e-waste
- Objective 2: Create awareness among different stakeholders for e-waste recycling, repair and reuse
- Objective 3: Expand economically viable solutions for e-waste management

4. Project Review

5.1 Project Implementation

How was the project carried out (approach, partner and project's main steps)?

Overall, project coordination and communication with REPIC was handled by foundation myclimate as the contract party of REPIC. Local project coordination and implementation of project activities was done by Doko Recyclers. Doko constructed and established facilities for recycling and refurbishing e-waste, hired and trained e-waste technicians on newly established e-waste handling and safety protocols, conducted workshops and trainings for awareness creation among different schools, government officials and other stakeholders. It further established e-waste collection centres in Kathmandu and developed and launched an e-waste e-commerce re-selling platform.

myclimate supported Doko in elaborating Standard Operational Procedures together with the assigned external expert EMPA, the Swiss Federal Laboratories for Materials Science and Technology, specifically the Critical Materials and Resource Efficiency team. myclimate also reviewed and further developed Doko's impact calculator by incorporating an e-waste impact calculator as well as conducted environmental impact assessments for 10 product categories of the e-commerce platform. The external

expert Karkhana Nepal, an education company with a unique approach to learning was assigned to support Doko in developing curricula for topic-specific workshops on e-waste recycling, repair and reuse.

The project was implemented in three phases from May 2020 to June 2022. Please see detailed list of project's main steps below:

Activities Phase I: Preparation & Construction (June 2020 – Feb 2021)

- Procurement of tools and machines that will support effective hazardous waste management like wire stripper, shredder, furnaces, and designating workspaces.
- Development of Standard Operating Procedures (SOP), training of newly hired e-waste technicians on the new SOPs
- Construction of an "E-lab", a facility for the safe handling e-waste for recycling and refurbishing.
- Construction of a "Repair-Lab", a basic work area designated for those who want to learn how to refurbish basic non-hazardous e-waste such as toasters or irons which will be used for Doko's outreach education.

Activities Phase II: Implementation & Awareness (March 2021 – Oct 2021)

- Establishment of e-waste collection centres and integration into Doko's collection process
- Elaboration and testing of curricula for awareness creation
- Awareness creation on e-waste recycling, repair and reuse for various stakeholder groups conducted and via social media

Activities Phase III: Outreach & Impact (Nov 2021 – April 2022)

- Further development of an e-commerce platform, i.e., an online shop with listed refurbished e-waste inventory for re-sale
- Development of an e-waste impact assessment calculator for
- Conducting an environmental impact assessment for 10 product categories of the e-commerce platform
- Analysis of e-waste business scale-up potential and lessons learned

Did the project's main objectives have to be modified during the course of the project? Describe any of the modifications made.

The project's main objectives have not been modified during the course of the project. However, the impact of the Covid-19 crisis on the project's operations has been quite extensive. Apart from that, the planned and already initiated relocation to a new operations site for which permits were not granted in the last moment, had an impact of the operations of Doko and lead to a postponement of milestones.

There was no change of the overall budget, all amendments of the budget and postponements of milestones were cost neutral.

1. **Project amendment January 2021**

The prolonged Covid-19 lock-downs in Nepal and reduced waste volumes from restaurants, hotels, schools etc. had a significant impact on the operations of Doko. Beginning of 2021 we handed in a project amendment proposal.

- Timely postponement of expenditures for shed construction (WP 1.1.) and work benches (1.3) as part of the installation into M2.
- Cost neutral changes of machinery purchases (WP 1.1., 2.1).

2. **Project amendment April/May 2021**

Day-to-day operations were severely affected by the Covid lockdowns. In Q1/Q2 2021 it became clear that the crisis at this point of time Doko also decided to move together with its partner company Biocomp Ltd., an organic waste management company to a joint new site in September 2021.

- Postponement of Milestones as follows: M1: Feb 2021 => June 2021; M2: June 2021 => Nov 2021; M3: Oct 2021 => Jan 20222; M4: April 2022 => Juni 2022
- Relocation-dependent milestones were postponed from M1 to M3.
- Reduction of M3 deliverable "200t of e-waste processed" to „150t of e-waste processed" as M4 deliverable.

- Cost neutral changes of machinery purchases, e.g. instead of purchasing a glass to sand converter the project team decided to invest the funds in two furnaces for smelting copper, brass and aluminium.

3. Project amendment January/February 2022

Beginning of 2022 it became clear that the planned relocation of Doko to the new site will not be possible anymore as permits were denied in the last minute. Hence, the relocation had to be cancelled and all related milestones which are dependent had to be postponed or amended.

- Selected M3 deliverables WP 1.2 and WP 1.3 were postponed to M4
- Use of unused travel budget (no trip to Nepal due to Covid) for a trip to e[co]work Delhi and to other e-waste sector participants in India for an exchange and learning from other experiences.

5.2 Achievements of Objectives and Results

Work Package 1: Establishment of hazard-safe facilities for recycling or refurbishing e-waste

1) Procurement of E-lab machines as listed in budget

Achieved: Procured 1 cable granulator, basic tools for sorting, weighting and storage, 1 wire stripper, 1 bulb eater, 1 universal shredder, 1 absorption table, and 10 working stations as planned. Machinery has been put into operation as they arrived and are stored in the newly completed E-lab. Annex 1 shows a detailed and updated table of machinery that has been ordered.

Results: The wire stripper which arrived for Phase I has been used to strip 15,250 kgs of wiring. Similarly, Doko procured a Mercury Bulb Eater through crowdfunding in Phase I and has processed over 7,200 bulbs separating and capturing noxious mercury gas in a filter and allowing for the crushed glass. The cable granulator, which arrived in November 2022 and only started operations with the new E-lab as it required proper voltage, and a safe working space has extracted 750 kgs copper from 3.7 tons of cable. Similarly, the Universal Shredder which arrived in September 2021 and has begun operations serving over 70 clients (ranging from the banking industry to other businesses that require confidential data destruction) and has already shredded 102.25 tons of confidential waste. Finally, the Absorption Table which arrived on November 16, 2021, was put into operation after the completion of the E-lab in March.

2) Construction of 1 E-lab and 1 Repair-lab including the setup of dismantling stations, storage areas, other related designated work areas

Achieved: 1,000 sq. ft E-lab and the Repair lab (housed in the E-lab) completed at the end of February 2022. Operations began during the first week of March 2022.

Results: With the construction and set-up of the e-lab and repair lab Doko implemented the E-waste management Standard Operations Procedures developed in Phase II of this project in collaboration with EMPA and myclimate. The E-lab houses all the machinery procured to manage e-waste through this project. It is separate from Doko's other recycling operations and is built to keep staff safe by separating and isolating as many hazards as possible (either using tools and machinery like the Bulb eater or ensuring air circulation). See Annex 2 for images of the E-lab and Repair-lab.

3) Hiring and training of 5 e-waste technicians

Achieved: 5 e-waste technicians were hired in the first phase of the project between May 2020 and June 2021. They were trained to become familiar with existing Doko e-waste management policies and procedures. The newly hired technicians were also helpful in applying and testing on the newly developed Standard Operating Procedures (SOPs), see below under 4).

Results: 5 e-waste technicians are fully trained and work on a full-time long-term basis for Doko. These technicians are also a part of Doko's E-lab and Repair lab training team guiding participants on the intricacies of e-waste repair. Their feedback was critical in developing the Repair Lab Workshop curricula.

4) Establishment of E-lab and e-waste safety handling procedure guidelines in the form of a handbook

Achieved: Safety handling procedure guidelines (SOPs) in the form of a handbook were developed with support by EMPA and myclimate.

Results: The SOPs, an extensive step-by-step guideline to safely sort, handle, process and store e-waste has been regularly used for the onboarding and regular follow-up training of Doko's e-waste technicians since its introduction in June 2021. The SOP guideline was shared internationally as a sample SOP for emerging e-waste markets in developing countries such as Nepal. GIZ and EMPA have both shared this SOP with its project partners. The SOP has been in full implementation since the

completion of the E-lab in February 2022 and readily available online to those who want to adopt. Finally, the SOP, while specific to Doko's needs is written in a general enough format that even manufacturing companies can adopt or take from as it is the first of its kind in Nepal and Doko believes that this resource being available can encourage employers to keep employee best interests in mind.

5) *Refurbishment of 25 items per month per work bench (5 work benches in year 1) after operational launch of Repair Lab.*

Achieved: In the 18 months of workbench operations Doko was able to refurbish 420 desktops, 553 laptops, 243 mobiles, 360 monitors, 272 network equipment, 19 projectors, 26 servers, 117 printers, 1,690 household items and 1,331other electronics.

Results: The workbenches have been fully utilized such that refurbishment numbers have grown significantly from year 1 to year 2 with the addition of 5 benches. For example, in Year 1 Doko refurbished: 92 desktops, 86 laptops and 45 monitors and in Year 2 382 desktops, 315 monitors and 467 laptops alone.

Picture 1: E-lab in use after completion of set up of all machinery and SoP training.

Work Package 2: Awareness creation on recycling, repair & reuse

1) *Development of curricula for various audiences such as schools and community members for the culture of repair and the proper use of the Repair-lab*

Achieved: Developed 1-, 3-, 6- and 8- day curricula for various audiences such as schools and community members at the Repair Lab and promoting a culture of repair.

Results: Doko collaborated with an education consultancy, Karkhana, to develop a 1-, 3-, 6- and 8- day experiential workshop cantered around developing a Culture of Repair while utilizing Doko's Repair lab. 2 pilot workshops were conducted with students and Doko staff and improvements were made based their feedback. While the intent was initially to develop only the 3- day workshop, the others were made upon request from clients. These workshops have become a popular Doko service with clients seeking the workshop out and thus increasing our school outreach numbers significantly. With all the workshops Doko has reached 699 students. The Repair lab trainings alone reached over 90 students. See Annex 2 for images of workshops.

2) *Creation of 5 work benches in year 1 (8 in year 2) workspaces at Repair-lab for schools and community members*

Achieved: In year 1 Doko established 5 workbenches, in Year 2 5 more were established bringing the total to 10 workbenches.

Results: Workbenches are regularly used for e-wate operations and workshops with schools and community members to repair. Since its launch in March 2022, Doko has worked with 5 schools and over 70 students in these workspaces. It has also utilized the workbenches in both Year 1 and 2 for regular e-waste activities such as refurbishing 5,031 items ranging from monitors to cell phones and household appliances.

3) *Conduct awareness training with 10 schools and 300 community members*

Achieved: Awareness training with 16 schools and 344 community members conducted.

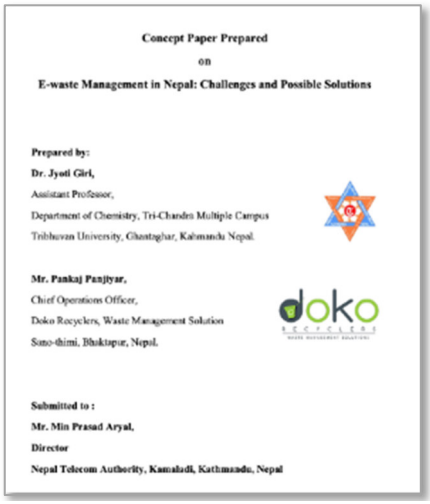
Results: Doko completed outreach to 16 schools surpassing its goal of 10 schools. 11 schools were government schools in Kathmandu valley reaching a lower-income bracket of students than Doko normally would reach. 3 schools are based in a village, Ri Gaun, 170 kms away from Kathmandu. The remaining schools were Kathmandu based schools that participated in the Repair Lab workshops after its completion. In total Doko reached 699 students and 344 community members. Through these workshops Doko also supported 7 of these schools with setting up student Eco-clubs (student-led environment school groups) and will continue to provide guidance as needed. Doko has also reached a larger audience through social media posts- 48,175 via Facebook, 20,5608 via Instagram, 2,463 via Twitter, and 312 via LinkedIn. See Annex 2 for images of outreach and References to links to some social media campaigns and blogs.

4) *Conduct 1 workshops with 20 government officials and related development professionals totalling at least 50 participants in which lessons learned and replication potential from the project and e-waste legislation is discussed.*

Achieved: Over the course of this project Doko met with over 20 government officials and over 100 development professionals to discuss the prospect of e-waste management legislation.

Results: Over the course of this project Doko has had several meetings with government officials ranging from the Ministry of Environment to local municipal governments and pseudo government entities like the National Telecommunications Authority (NTA), including Kathmandu's newly elected mayoral team. This has resulted in Doko providing input on a national e-waste strategy that NTA drafted for its use. It also means Doko reached more government officials and development professionals than anticipated even though multiple workshops (about 20) were conducted instead of just one workshop.

Picture 2: Multistakeholder meeting with government and development professionals



Concept Paper Prepared

on

E-waste Management in Nepal: Challenges and Possible Solutions

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Picture 3: National Telecommunications Authority White Paper co-authored with Doko

5) *Adoption of impact calculator and collection of data for impact reports, and potential sharing impacts with clients*

Achieved: Doko's impact calculator was expanded to include e-waste factors which will also aid in the same. It will allow Doko to expand its Impact Certificate features - an awareness tool which quantifies each client's environmental footprint - and a popular Doko communique for clients. myc evaluated Doko's current impact calculator that it developed in 2017 and used the skeleton to expand the calculator to factor in e-waste components and its hazard as well as expand impact indicators to include GHG saved.

Picture 4: Impact certificate to be updated with new metrics from new impact calculator

Results: Doko sends out Impact Certificates at the beginning of the calendar year summarizing the company's overall impact and issues certificates to clients specific to their impact. Doko also sends quarterly newsletters to its clients appraising them

on Doko's activities. Doko plans to announce the new impact calculator at the beginning of 2023 in its newsletter explaining the new changes with includes new metrics like GHG emissions and now including e-waste as well as changes like 'Trees Saved' to 'Timber Saved.'

WP 3: Expand of economically viable solutions for e-waste management

1) Establishment of 4 e-waste collection centres in Kathmandu

Achieved: Doko launched 4 collection centres in partnership with PHILIPS (3 centres) and an apartment complex (1 centre). It also ran a collection drive with Sabko Phone.

Results: As a result, Doko was able to establish a bigger partnership with a leading industrial group in Nepal, Chaudhary Group (CG) where 8 more collection sites in urban areas and have already been earmarked. Doko also recently signed a MoU with 3 Samsung subsidiaries to set up their Extended Producer Responsibility (EPR) by way of setting up collection hubs at their store locations. Finally, Samsung also established their own e-waste collection website (arkostore.com) where Doko will collect e-waste and refurbish for Samsung, but Samsung will sell as Samsung recertified products. Similarly, other manufacturing clients like Surya Nepal have also signed recent MoUs with Doko to begin collaboration soon.

Picture 5: PHILIPS show-room as a collection site

2) Handling of 300 tons of e-waste within a pilot phase of 1 year

Achieved: In its first year of operations Doko handled 120 tons of e-waste and second year it handled 257 tons bringing the total 377 tons in roughly 18 months.

Results: While Doko faced some challenges with setting up its E-lab (COVID-19 as well as having to relocate and restart the E-lab construction due to zoning and neighbour objections) it has managed to successfully continue handling e-waste. Now that the E-lab is completed and in full operation as of March 2022, it is on track to manage 500 tons of e-waste per year by 2025. With new MoUs with larger clients like Hims electronics (5 years) and manufacturing companies like Surya Nepal Doko estimates an incoming 75 tons in the remainder of this year alone. See Annex 3 for the e-waste inventory database.

3) Develop and launch E-waste e-commerce platform

Achieved: Doko has refurbished sold 124 items through e-commerce. Doko began listing refurbished electronic goods on its e-commerce platform "Tatwa" only in November 2021 after completing front and backend improvements to handle high volume traffic, capture data like visits and items viewed, allow for communication portals, and manage a point of sales system for checkout, etc.

Results: The majority of sales are in bulk through Doko's physical site as many clients such as schools and offices buy in bulk. However, with a steady increase of e-waste intake and a set pipeline through newly established MoUs Doko is on track to handle 500 tons of e-waste by 2025. This means Doko's stock to post online will also increase. Furthermore, the range of stock will also increase to listing larger household items like refrigerators and washing machines. Doko has seen an increase of requests of these types of items through direct correspondence. Tatwa can be accessed through the following link: https://www.tatwashop.com/ where all products are listed.

4) Conduct an environmental impact assessment for 10 product categories of the e-commerce platform

Achieved: Doko and myclimate have completed a Life Cycle Assessment of 10 major electronic devices that Doko comes in most contact with and refurbishes and sells frequently. LCAs are being conducted on: CPU, LED TV/Monitor, laptop, mobile, PCB/PWB (motherboards/mix circuit boards), refrigerator, washing machines, printer/cartridges, Li-ion batteries and lead acid batteries.

Results: As Nepal's first e-waste management company Doko strives to be an entity that others will look towards for data and guidance. The LCA assessments sets Doko on this path with knowhow on how to conduct LCAs and capture relevant data. See Annex 4 for myclimate's LCA methodology report teaching Doko how to conduct LCAs for future needs.

5) Assess and refine Doko's e-waste business model and safety protocols and guidelines for replication

Achieved: Doko conducted an analysis of its e-waste model by comparing its pre-project projections with end of project outcomes to identify points of improvement as well as expansion. It also took a recent visit to India where Doko staff meet with other e-waste management companies like e[co]work and their growth trajectory into consideration during this review.

Results: A key finding from this analysis is the need to develop EPR programs with electronics manufacturers and distributors to maintain a revenue stream as well as develop a local second-hand market. Their market reputation as distributors and manufacturers will help Doko gain more credibility as well as allow for the company to establish effective e-wase management processes that will benefit the public at large. Doko also realizes the need to expand its e-waste management model to other cities particularly in the Terai, region adjacent to the India border, where a significant amount of e-waste is trafficked to. Facilities in the area can capture them before they enter India as well as effectively monitor what is crossing the border. See Annex 5 for detailed summary of the analysis.

5.3 Multiplication / Replication Preparation

What preparatory work was carried out for the multiplication and replication within the project's framework?

- In May 2022, two Doko team leads visited India to meet with other waste management companies to best understand possible avenues for expansion. All companies featured different verticals that Doko could explore from ways to mechanize operations to developing backend software to manage better data collection, including e[co]work, a fellow REPIC grantee. (See Annex 5 for a summary of learnings from Doko's India visit in May and June 2022);
- Doko continues to apply to and has been awarded new grants to expand its awareness raising activities through the repair workshops, now marketed as Repair Revolution;
- Doko continues to build e-waste partnerships centred on EPR creation and intends to continue dialogues with local municipal governments to develop local ordinances. Later in the year, Doko will develop a strategy to market refurbished electronics specially to schools to build out computer labs.

Any further proposals you submitted for taking this groundwork up and developing it further?

Doko is currently actively searching for and applying to additional grants to expand operations. So far it has been awarded $16,000 from RRR Accelerator and is a sub-grantee on a $22,000 grant with Karkhana through Swarthmore College, USA to expand its repair workshops and better utilize the Repair Lab. There are other grants that have been identified and will be applied to over the course of the year, and in some cases applied to but awaiting decisions.

5.4 Impact / Sustainability

Which impacts were already noticeable up to the end of the project?

Sustainability indicators	Unit	Estimated values at project start	Upon completion of the REPIC Project
Ecological			
Installed renewable energy capacity	[kW]	n.a.	n.a.
Renewable energy produced	[kWh]/year	n.a.	n.a.
Amount of fossil fuel energy saved	[kWh]/year	n.a.	n.a.
Greenhouse gas reduction	[kg CO_2-eq]/year	57,357.0*	477,832.9
Newly collected and separated e-waste	[t]	300 p.a.	377
Newly refurbished waste after 1 year after operational launch of Repair Lab	[items]	Ø 200 per month	1,157
Newly refurbished waste after 5 years after operational launch of Repair Lab (estimated)	[items]	Ø 500 per month	3,874
Economic			
Energy costs (LCOE)	[Rp/kWh]	n.a.	n.a.
Triggered third-party funding/investments	[CHF]	n.a.	n.a.
Local private income generated	[CHF]	n.a.	n.a.
Social			
Number of beneficiaries	[Number]	420	1,186
Number of new jobs	[Number]	10	14
Indirect employment	[Number]	80	115
Participants in workshops	[Number]	300	715
Participants in MRF tours	[Number]	150	261
Trained personnel	[Number]	15	24
Other indicators			
Toxic Metals Diverted			
Lead	kg	1,148.79	7,104.9
Cadmium	kg	0.27	n.a.
Copper	kg	1,817.9	1,460.8
Palladium	kg	0.42	n.a.
Steel	kg	11,235.4	17,216.12
Aluminium	kg	842.1	2,052.06
Gold	kg	1.05	no mechanisms to identify these particular metal fractions
Platinum	kg	0.1	
Arsenic	kg	34.1	

6. Outlook / Further Actions

6.1 Multiplication / Replication

What are the next planned steps?

- In this project the economic viability of different solutions (ref to 5.2) were tested. As shown, the expansion of some solutions is capital-intensive, hence Doko will continue to seek grant (or other) funding to expand operations and e-waste sources and generate awareness. A preliminary search of possible sources suggests that there is more funding in awareness generation than there is in infrastructure creation, so efforts will mostly be directed towards this;
- Continue promoting EPR partnerships, especially outside of Kathmandu. Doko is particularly focused on the Terai region, which adjoins the India border where e-waste is often transferred without regulation thus causing environmental harm and taking away from the local economy. With locations and capacity closer to the border Doko will be able to monitor and capture e-waste exiting the country. This is particularly important because Nepal lacks regulatory entities and policies to properly transfer across the border ignoring the BASEL agreement along with other e-waste monitoring regulations. Doko hopes that its recent partnership with a Germany based company, Black Forest Solutions GmbH, will serve as a model to handle e-waste and its hazards. Doko will collect lithium-ion batteries and circuit boards for the company that has operations in India. India is a BASEL signatory. At the same time, the Ministry of Environment has committed to issuing a letter that establishes Doko as a regulatory entity that will help the ministry eventually set up proper protocol.

What is being done to promote multiplication / replication?

- Continued engagement will all key stakeholders (clients, public, government, waste management sector partners, local authorities, etc.) through social media engagements, repair workshops, off site awareness campaigns focused outside of Kathmandu;
- Grant applications to expand e-waste services, awareness generation and Tatwa;
- Continued efforts to promote Tatwa as a one stop shop for sustainability products including refurbished electronics;
- Knowledge exchange with other e-waste and waste management sector partners in Nepal and abroad. For example, Doko continues to interact with contemporaries like e[co]work, EMPA, etc., as well as give presentations on virtual forums like the Prevent Waste Alliance.

Which hurdles need to be overcome in order to have successful multiplication / replication?

- While Doko has made strides without guiding policies and encouraging local authorities to pass ordinances efforts will be limited unless the federal government establishes policies to regulate and even enable companies to begin businesses by enabling better business environments through loan programmes, tax breaks, or incentives for more companies to participate in this sector and allow existing ones like Doko to expand on a national scale. Waste management, be it e-waste or other forms is a highly capital-intensive sector that requires significant investment upfront thus requires government support;
- Refurbishing is a time intensive process which means Doko holds onto stock for longer than desired. This is partly because of a lack of technical capacity in relation to exiting stock. Additionally, many electronics become outdated at a fast rate like mobile phones and laptops. The turnaround needed to repair and sell as well as a market desire to use older products do not always align adding to stock;
- Competing with an unorganized sector also means that pricing can be competitive and unregulated. So being priced out or having to reduce prices to either clean out inventory or stay competitive does not necessarily translate to breaking even let alone profit;
- Awareness of e-waste as an environmental problem outside of Kathmandu and major urban areas are limited. So, awareness generation may occur at a slower rate than this project has managed to achieve;
- While Doko's internal capacity has increased as a result of this project, it is still not enough to support activities like Tatwa management and engagement with customers. This may require a small fulltime team to effectively grow and manage.

6.2 Impact / Sustainability

What are the sustainable effects (environmental, socio-economic aspects, CO_2 relevance, resource efficiency, etc.) expected during the multiplication phase, in the medium term?

The table under 5.4. gives an overview of impacts achieved during project implementation. One important achievement was the creation of save working spaces, hiring of 14 new staff members and training of in total 24 employees on e-waste management and safety measures. Awareness creation in

form of workshops and tours through the MRF was done with almost 1,000 people, mainly students from different schools. With Doko's new impact calculator reduced GHG emissions were calculated with 47,783.3 [kgCO2-eq]/year. This is on track with the initially estimated 300 tons per year, but with project revisions given challenges like COVID-19 and E-lab site location changes that goal was changed to 200 tons per year. Similarly, Doko rediverted 1,006,053.5 kWh of energy. This amount of energy can power over 500 households for a year in Nepal (assuming 150 kWh per month consumption). 27,577,747.8 litters of water were rediverted along with 93,170,353.4 litters of oil. Doko also surpassed its Year 1 and is on track to surpass its 5-year goal of items repaired. In year 1 Doko refurbished 1,157 items and is on track to refurbish 3,874 by Year 5. As a result, it has diverted roughly over 7,000 kgs of lead, 14,000 kgs copper, 17,216 kgs steel, and 2,000 kgs aluminium. In the medium term these numbers will continue to rise and most likely exceed year 5 goals sooner than anticipated as Doko has been signing on larger EPR clients.

7. Lessons Learned / Conclusions

Regarding establishing hazard-safe facilities for recycling or refurbishing e-waste: The two primary factors that can enable a successful circular economy and environmental protection are effective government support which includes both regulations and providing business support, and capital investment to establish infrastructure.

Regarding awareness creation on recycling, repair & reuse: Since e-waste is a very visible problem in urban areas and everyone interacts with multiple types of electronics daily awareness generation has been very well received by schools, offices, government, and development organisation who increasingly want to work on this problem. It is important to keep this momentum going and Doko expects that it will continue because engagement is the easiest way to participate in this movement as well utilize Doko as a resource or service.

Regarding expanding economically viable solutions for e-waste management: Since this is a highly unregulated sector with many unknown or non-established players, data capture is challenging as much as establishing a standard pricing structure is. This is perhaps a challenge that will take many years to tackle as Doko continues to establish itself as the market leader it can begin to set standards that can be replicated, such as the e-waste handling safety SoPs and collaborating with the federal government to establish and enforce standards.

Which recommendations can be made for similar projects, or within this context?

- Focus on continued awareness creation among all stakeholders. It is key for the adoption of best practices for proper handling of e-waste;
- Make stakeholders aware that it is not about electronic waste, but about resources that still can be used in a circular economy which in turn provides job creation, economic activity and saves environmental resources;
- High level engagement on the issues addressed in this project is key. Until buy-in is obtained from government, other authorities and e-waste sector participants, little tangible progress can be made;
- E-waste management involves taking on different types of sunk costs when it comes to negative value items like bulbs, optical fibres and polyurethane foam. These items cannot be avoided but these costs should be accounted for when starting e-waste management operations.

Interesting observations within the project's context: Which of your personal impressions would you like to share?

Doko took on a tremendous challenge by starting e-waste operations in an unregulated and unstructured market, but by doing so it ignited a public movement to manage e-waste. While many may have recognized e-waste as a growing environmental, social and economic challenge it was often avoided due to its technical nature. Now that the sector has been made more approachable, many are motivated to reduce and reuse their electronics or want to become better consumers because they want to conserve resources while others see the potential of a circular economy and the benefits it brings in economic growth and job creation. Others are motivated because it allows for more access to opportunities like education that they would not have otherwise received. Whatever their motivation as a consumer, producer or regulator – this initiative has momentum, and it is encouraging to see the level of immediate and continued engagement from a variety of stakeholders. However, irrespective of the level of progress that has been achieved, there will be premature cap to it without proper government involvement in creating and implementing policies as well as enabling a thriving business environment through initial funding support and offsetting negative value related sunk costs like optic fibre cables.

8. References

References list of publications, reports, etc.

1. *Website Doko:* https://dokorecyclers.com/
2. *Website link e-commerce platform:* *h*ttps://tatwashop.com/product/getProducts?productCategoryUniqueId=VloqzRlRhDk9xbh0
3. *Link to blog posts:* https://dokorecyclers.com/blog
4. *Articles/press coverage of the awareness workshops:* https://english.onlinekhabar.com/e-waste-in-kathmandu-doko-recyclers.html
5. *Social media posts:*
    a. What is e- waste: https://www.instagram.com/p/CUM3mutKF2P/
    b. Give your e-waste another life: https://www.instagram.com/p/CWLDTUdhRRu/
    c. Where does your e-waste go: https://www.instagram.com/p/CXLW4TOhsD7/
    d. Nepal's e-waste crisis: https://www.instagram.com/p/CZ6tq6QKaxU/
    e. Extended Producer Responsibility (EPR) for Brand Owners and Distributors in Nepal: https://www.instagram.com/p/CX-tVOAFk9u/

9. Annexes

Annex 1: List of Machinery for E-lab and Repair-lab

1.1. Procurement of e-waste recycling machinery and tools		Status
a	E-lab set up	Complete and in use
b	Cable granulator	Complete and in use
c	E-lab tools (Sorting, weighing, storage area etc.)	Tools')
d	Wire Stripper	Complete and in use
e	Bulb Eater (Mercury lamp crusher)	Complete and in use
f	Universal Shredder	Complete and in use
g	Absorption table	Complete and in use
h	10 working stations	Complete and in use

1.3 Create working spaces at Doko's repair lab for schools and		Status
a	Create working space at Doko's e-lab for schools and community members (Repair lab)	Complete with workbench and machinery setup

2.1 Additional Procurement of e-waste recycling machinery and		Status
a	Shed construction, new facility	Ongoing, Fencing Complete
b	Vacuum work bench (Cartridge Disposal)	Arrived and in use
c	Melting furnaces for brass, copper and aluminium	Arrived and in use

3.1 Establish (e-)waste collection points throughout Kathmand		Status
a	Setting up e-waste collection centers	Complete and in use

1.1.c Procurement of E-lab tools

Electrical Equipments (2 Sets)
VGA Machine
Bios Programmer
DC Power Supply
CRO 100 MH
Debug Card
RT 809 programmer
Regular Probe
CRO Probe
ENIT SIO Programmer
Ram Tester
cpu tester
battery tester
LCD/ LED TESTOR

Work Equipments (10 Sets)
Hot Air Gun
Multimeter Fluke
Solder Wire
Bit Cleaner
Tweezer
Jumper Wire
Dc solder wire
DC solder pump
Amtech Flux
Antistatic Table mat

PPE for Technicians Set (10 Sets)
Rubber clogs/Antistatic shoes
White Shirts
Black Pants
Gloves
Safety Goggles
Air Purifier
Anti-static Hand Bracelet

Repair equipments
Lens
Iiron
Heat obserbe Tape
Wire cutter
Glue
double Tape
Screw Driver

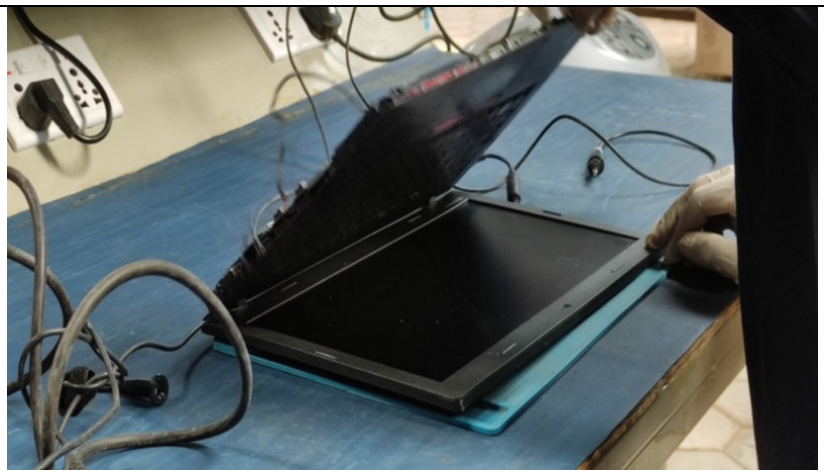
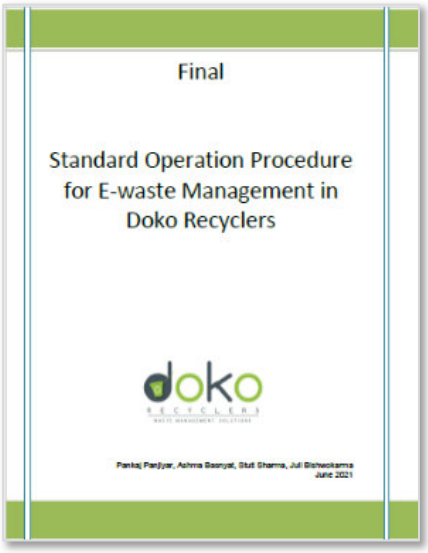
Storage
Caged Containers
Corrugated Boxes

Cleaning Solutions
Cleaning Solutions - Isopropyle Alcohol
Regular Cleaning Solutions
Cleaning Spray
Anti static cloth
Regular Cleaning Cloth

Annex 2: Photo Glossary

Work Package 1: Establishment of hazard-safe facilities for recycling or refurbishing e-waste

Repair lab workshop with students		
E-lab in use at a newly installed workbench with storage in the background		

Monitors to be refurbished	
Laptop being refurbished	
SOP guidelines	 Final Standard Operation Procedure for E-waste Management in Doko Recyclers doko RECYCLERS Pankaj Panjiyar, Ashma Basnyat, Stuti Sharma, Juli Bishwokarma June 2021

Work Package 2: Awareness creation on recycling, repair & reuse

Community outreach	
School outreach	

Work Package 3: Expand of economically viable solutions for e-waste management

E-waste haul to be sorted, refurbished, and dismantled		
E-waste collection vehicle		
		

Annex 4: Report on LCA Methodology

Recycling of E-waste: Life Cycle Assessment

Provided by: Foundation myclimate

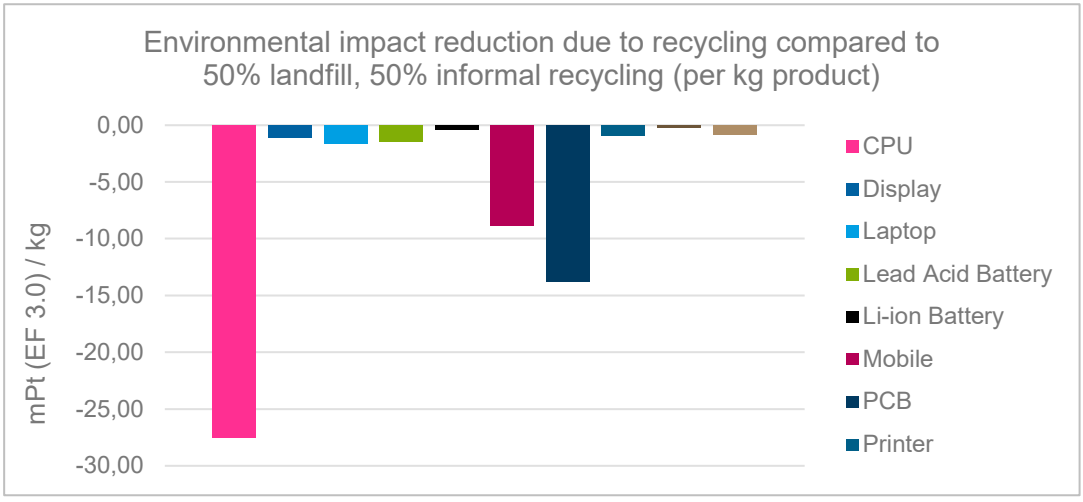
The collection and recycling of e-waste in the Kathmandu valley by doko recyclers is a valuable contribution to combating the growing amount of obsolete electronic products. Without proper and safe dismantling, these products would end up in a landfill or would be dismantled by the informal sector, where the recovery rate of the materials is lower and the negative impact on people and nature is much higher. To determine the positive effects of the e-waste recycling, myclimate and doko conducted a Life Cycle Assessment (LCA) for the 10 most common electronic products in the Kathmandu valley. The results are intended to help doko demonstrate the positive impact of recycling to their clients and thereby increase the awareness for a proper e-waste disposal.

Methodology

For the product LCA we distinguished between three different end-of-life scenarios: (1) (formal) recycling; (2) informal recycling; (3) landfill. For every scenario the emissions from the waste and recycling treatment were counted as positive emissions whereas the avoided emissions due to the recovered materials were counted as negative emissions. With this approach, it is possible to determine the positive impacts of the recycling process compared to the other end-of-life scenarios. For the reference scenario, it was assumed that 50% will end up in landfill and 50% will be recycled informally. In order to get a good overview of the total environmental impact, the impact category EF 3.0 was applied. This method combines 16 different midpoints (e.g. GWP, water use, ecotoxicity) in one weighted and aggregated single factor. In addition to the single score, the EF 3.0 midpoints water use and freshwater ecotoxicity as well the GWP (IPCC 2021) and the energy consumption (CED) were reported.

Results

Looking at the EF 3.0 single score, it can be seen that for every single product the recycling scenario performs better than the reference scenario (50% landfill, 50% informal recycling). In figure 1 the savings of the recycling scenario compared to the reference scenario are shown as negative values per 1 kg of each product. Especially the recycling of products with a high amount of aluminum and/or with a relatively high amount of gold avoids a lot of negative impact on the environment (CPU, PCB, Mobile).



For comparison:
- 1 mPt is roughly equivalent to transporting 1t over 85 km by lorry.
- 5 mPt is roughly equivalent to the production of 150 kg of carrots.

It should be noted that in figure 1 the savings are shown for 1 kg of a product. The products with high saving values (CPU, Mobile, PCB) are smaller and therefore much lighter than a printer, a washing machine or a freezer. The savings per product would look quite different, but since doko has the information on their e-waste collection in kg, the unit kg is used (doko can use their average product weight to calculate the savings specifically for the 10 products).

Conclusion

This Life Cycle Assessment shows that the recycling of electronic waste is the best end-of-life scenario for each product in terms of environmental impact. Based on the material composition the positive impact can be higher or lower. To have a more specific understanding of the savings, a closer look at the single midpoints is recommended.

Annex 5: Business model review and findings from India visit

Assessing Doko's e-waste management business model:

When this project began in June 2020 Doko put together a business plan with number projections and expectations. At the end of this project, these numbers have been updated with actuals. The following is a summary of the findings and lessons learned:

Assess and refine business model and refine strategy:

- Infrastructure wise we have gone ahead with the business case that was envisioned at the start of the project barring a few changes. We now realize that there is a need to get a few furnaces to make billets (ingots) of copper and other metals extracted in powder form from the Cable Granulator machine;
- Refurbishing of IT assets has been the key revenue driver as planned;
- EPR is not already a revenue generating vertical but we have made some progress and see the need to continue with advocacy and finding businesses who are aware and willing to participate despite e-waste disposal laws not being strictly enforced.

Workshop with government and e-waste sector to discuss lessons learned and replication:

- The scope of EPR has increased in the years but it is still at a nascent stage. While we have had multiple meetings with government officials in the Ministry of Health and Population, Ministry of Environment and Forestry there is more response and movement from local government authorities than federal. Apart from this we have also met with private entities and have managed to bring in top electronics suppliers like CG Digital, Samsung Nepal and HIM Electronics onboard our EPR services which has helped with revenue and building an e-waste stock to refurbish or dismantle;
- Working closely with the government of Nepal, Nepal Telecom Authority, in drafting e-waste policy. Expecting to be published by the end of 2022;
- Awareness and advocacy about e-waste management in collaboration with various stakeholders has created a positive impact and created a push force to start discussion about e-waste in a large arena and seems to have established the Repair Workshops both in the Repair Lab and off-site as a potential source of revenue. While we can only be sure after a few more quarters, enquiries and group size have both increased than from the past.

Summarize and publish lessons learned of REPIC project:

- The REPIC project has enabled us to get a sense of technology that is the key driver in terms of handling the complex grades of e-waste. At the moment we are still in the very initial stages;
- We realize the need and importance of bringing in the right machinery and setting up a dedicated infrastructure for handling e-waste. REPIC has enabled Doko to set up the first of its kind e-waste management setup. We realize the need to replicate this same setup with improvements in key geographies of Nepal to make it logistically feasible. We see this first project as a pilot and a model that is sustainable environmentally and economically. Currently, the waste management sector (municipal or private) neither has a dedicated infrastructure nor space provisions for handling e-waste;
- Not all machines will bring profitability but it is crucial to have a few machines for disposal even if they might not generate enough revenue for example, disposal of optical fibers or even mercury bulbs for which Doko crowdsourced to import a Bulb Eater;

- Over time, each region with an e-waste recycler would need provisions in the landfill sites for the safe disposal of non-recyclable end products generated from e-waste handlers and recyclers;
- Handling of various grades of cables and wires that cannot be easily stripped in a wire stripper are available in plenty - Cable granulator and Furnaces can be replicated as small-scale industries in various parts of the country for recovery of copper, aluminum and plastics and more importantly to divert cables from being burnt;
- In regards to transboundary movement of e-waste, few fractions are left out to be treated but have high potential of revenue generation, like mineral extraction from li-ion battery, PWB, LED screens etc. and therefore are areas to be explored;
- Mechanization and use of machinery is one of the key factors to scale up in the e-waste volume that can be handled. There are many other fractions of e-waste which need different setup of machines for scale up;
- Refurbishing of IT assets alone has the scope of a full-fledged business. Setting up technology for evaluation of IT assets, courier and collection system, refurbishing infrastructure and QC, tech to sell refurbished IT assets may serve as another revenue stream.

Lessons for Doko from India trip (May 2022):

1. Drivezy

- Stressed the importance of relentless leverage government connections wherever possible because the government needs to be involved and the only way to achieve that is to hand hold;
- Leveraging personal connections in related industries and multinational companies are also important to build pipelines and generate attention;
- Recommended that Doko create an Advisory Board, how & who:
    i. Bring important people in policy, finances, environmental advocacy, big businesses;
    ii. Bring them in as notional partners (they pay a small amount for some shares);
    iii. Bring in potential investors and give them roles like Fund Manager
- Never stop pitching to show that there is market space and potential to total market that can be tapped from waste management. Also show the potential market share in terms of tonnage, turnover, market value etc.

2. Saahas

A two decade old waste management company started as an NGO with local collection systems now operating in 5 cities of India with capacity of 100 Tons dry waste per day (total installed capacity in 5 cities) gaining expertise in municipal and community level waste management:

- Decentralized collection hub system with large central MRF;
- The Hub (Small Collection centers) are either operated by Saahas itself or by local communities under supervision of Saahas;
- Mechanization in the sorting system is most required to scale up and reduce the operation cost.
- Conveyor belt with semi automatic sorting system makes system efficient and profitable;
- Major revenue source comes from the EPR system. According to the mandate policy of the government of India, all industries using plastic as packaging material for their products have to recycle/dispose of the volume of plastic consumed annually. To meet this requirement, companies appoint waste management companies to collect plastic based waste on behalf of them and pay per kg charge who supports for collection/recycling and disposal. This fee charged

by waste management companies on a per tonnage basis to industries using plastic as packaging materials is a major source of revenue;

- Enabling the IT system starting from source to destination. The IT system helps in tracking movement of vehicles, volume of waste, category of waste etc.;
- Working in hand with municipal corporations, government bodies and supporting policy reform, implementation of EPR etc. Saahas is working as an implementing partner with Karnataka state government to set up 200 MRF around the states and support in operation, collection in PPP model;
- Creating a system for organization to slowly reduce solid waste aiming to achieve zero waste generation;.
- Promoting sustainability with various add-on upcycled products like boards from Tetra Pack and MLP;
- For effective solid waste management, end destination matters most for the large non recyclable fraction (40-50%). India has legislation for cement industries to use these fraction as alternate fuel (RDF) along with coal. This support them to safely manage almost 95% of solid waste collected.

3. HAAT Incinerators

- One of the oldest Incinerators manufacturing companies producing incinerators for various types of waste as per requirement. The incinerator ranges from Solid waste, medical waste, liquid hazardous chemicals etc. They also operate a very large capacity (6 ton/day) in Bangalore city for safe disposal of hazardous solid and liquid waste from different clients;
- The emission from this incinerator is monitored in real time by the Central Pollution Control Board of India. The tentative installation cost of a 4 -6 ton capacity incinerator (Integrated for all kinds of solid and liquid waste) is 4 - 5 cr INR. But it needs strong policy reforms from the government to ensure emission standards, mandatory clauses to safely dispose of hazardous waste.

4. Let's Recycle (NEPRA):

Started back in 2012 from basic waste collection and segregation setup in Ahmedabad, now operating in 4 cities of India with state of art MRF (with AI based sorting systems developed by Tomra, Germany and IRS, India). Total installed capacity is 700 tons per day.

- Technology intervention is key for waste management. With increase in volume of waste, the number of manual sorters required is directly proportional. Which is commercially not a viable option for large volumes of municipal solid waste. Mechanization in the sorting system increases the efficiency and capacity in multiple folds with minimal human intervention;
- If different grades of plastic can be sorted effectively, most of the plastics can be recycled and brought to a circular economy;
- Focus on RDF production and sending it into the cement industry. In Nepal, the biggest challenge of solid waste management is lack of end destination of non recyclables, low value recyclables, and unsegregated waste. Bringing these all waste fractions into place of RDF production and use in the cement industry will solve almost 90-95% of dry waste. To start with the capacity of 50-100 Ton per day, it will require around 10-15 Cr investment, land area 4-5 acre. Logistics is challenging due to low revenue stream but can be compensated with a fee from EPR;
- All the operation activities are controlled by an in-house developed IT system. This enables them to improvise in operational efficiency;
- Enrolling and supporting EPR is a key income generating vertical

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5. Ishitiva Robotics System (IRS):

India's first company to develop an AI based sorting system capable of sorting different grades of solid waste. The sorting system works in principle for AI based camera imaging and ejection by air jet. We got to observe first-hand experience of sorting different grades of plastic in the manufacturing unit of IRS.

- The sorting system of IRS is very relevant in operation for companies like Doko who wish to maximize the quality of sorting with scalability. With manual sorting, we have gained the reputation of providing quality scrap as raw material to industries but to increase the volume of

6. Alphatherm

One of the major companies manufacture different types of setup related to waste management like trommel, conveyor belt, shredder, incinerator etc. During a visit to this manufacturing plant, they explained about entire machinery requirements for landfill mining, municipal waste sorting system and RDF production line.

7. Visit to informal e-waste handling Hub in Delhi with e[co]work

Bhajanpura and Ghaziabad, also known as e-waste hubs in Delhi region. We got the opportunity to visit these locations in support of e[co]work.

The volume of e-waste handled is way beyond my imagination. The main irony was that most of the work is performed escaping the radar of government enforcement. There is a strict policy and law for e-waste management in India. Official license required a lot of formalities and infrastructures. This is the reason most of the e-waste handlers work illegally. They have created a vast network of e-waste collection from all India and also from Nepal. There are various small scale to large scale dismantling units in very narrow inside streets and hardly allow any visitors. They were also performing acid leaching for precious metal extraction in very unhealthy conditions. The surprising fact was that all of them have in-depth knowledge of grades of circuit boards, value that can be extracted from etc.