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Ghar Ghar Maa Swasthya

Report on Disposition of Expired Commodities and Packaging Materials

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Team Leader

Mahesh Nakarmi

Health Care Foundation Nepal

Health Care Waste Management Program

Table of Contents

Acknowledgement	ii
Table of Contents.....	iii
List of Figures	vi
1. Background.....	1
2. Contraceptive Retail Sales (CRS) Company.....	1
3. Project Justification.....	2
4. Project Implementation	2
4.1. Ghar Ghar Maa Swasthya	2
4.2. Health Care Foundation Nepal.....	3
5. Statement of Work	4
6. Disposition of Expired Commodities.....	4
7. Objectives of the work	4
8. Technical Team.....	5
9. Activities	8
9.1. Planning and Preparation	8
9.1.1. Pre-Planning Meeting	8
9.1.2. Field Office Set-up.....	8
9.1.3. Visit of Technical Team to Warehouse.....	9
9.1.4. Preparation of Work Place	10
9.1.5. Installation of Cutting Machine	12
9.1.6. Training.....	13
9.2. Implementation	14
9.2.1. Pre Processing of Disposal Commodities	14
9.2.1.1. Coding of Cartoon Boxes.....	14
9.2.1.2. Pre-Separation Weighing	15

9.2.1.3.	Dismantling the Packaging	15
9.2.2.	Processing for Disposal of Condoms	16
9.2.2.1.	Cutting of Condoms	16
9.2.2.2.	Separation of items from condom packaging.....	16
9.2.3.	Processing for disposal of contraceptive pills	17
9.2.3.1.	Separation of items from pills packaging.....	17
9.2.4.	Processing for Disposal of Contraceptive Injectables.....	18
9.2.4.1.	Separation of items from Sangini Injectables	18
9.2.4.2.	Needle Cutting	18
9.2.4.3.	Syringe Shredding.....	19
9.2.5.	Treatment of hazardous pharmaceutical waste generated from expired contraceptive pills and injectables.....	19
9.2.6.	Post Processing for Disposal of Commodities	23
9.2.6.1.	Packaging the items	23
9.2.6.2.	Weighing the items:	23
9.2.6.3.	Storage of the items:	24
9.2.6.4.	Dispatch for final disposal	24
9.2.6.4.1.	Recycling	25
9.2.6.4.2.	Landfill Site	25
9.2.6.4.3.	Waste Tracking	26
9.2.7.	Occupational Health and Safety.....	27
9.2.8.	Problems during Implementation.....	29
	Water scarcity	30
	Cross ventilation	30
	Light Problem	30
9.3.	Data Collection and Analysis.....	31
9.3.1.	Data Collection	31

9.3.2.	Data Analysis	31
9.3.2.3.	Quantity vs. Weight Comparison of Commodities	31
9.3.2.4.	Total weight of different items.....	35
9.3.2.5.	Waste Items Separated of all the commodities	36
9.3.2.5.1.	Male Condoms	36
9.3.2.5.2.	Oral Contraceptive Pills	37
9.3.2.5.3.	Sangini Injectables	38
9.3.2.5.4.	Risk and Non- Risk waste Category of Waste	38
9.3.2.5.5.	Waste disposed based on disposal methods	39
9.3.2.5.6.	Waste as per the WHO waste categories.....	39
10.	Cost recovery	40
11.	Environmental Benefits.....	40
12.	Guest Observer.....	42
13.	Project Monitoring.....	42
14.	Recommendation	43
15.	Conclusion	43
16.	Annex:.....	44
16.1.	Annex 1: Work Plan.....	45
16.2.	Annex 2: Detailed Disposal Plan of Male Condoms	46
16.3.	Annex 3: Detailed Disposal Plan of Sangini Injectables	47
16.4.	Annex 4: Detailed Disposal Plan of Oral Contraceptive Pills	48
16.5.	Annex 5: Standard Operating Procedures for the disposal of the male condoms	49
16.6.	Annex 6: Standard Operating Procedures for the disposal of Oral Contraceptive Pills.....	51
16.7.	Annex 7: Standard Operating Procedures for the disposal of Sangini Injectables.....	53
16.8.	Annex 8: Standard Operating Procedures for the Encapsulation.....	55
16.9.	Annex 9: Pre Separation Data recording Format	57
16.10.	Annex 10: Guest Book Records.....	58

List of Figures

<i>Figure 2 Field Office Corner</i>	8
<i>Figure 3 White Board with daily data</i>	8
<i>Figure 1: Pre-Planning Meeting</i>	8
<i>Figure 4 Storage of Commodities boxes</i>	9
<i>Figure 5 Storage of Commodities in boxes</i>	9
<i>Figure 6 Storage of Loose Commodities</i>	9
<i>Figure 7 Storage of Loose Commodities</i>	9
<i>Figure 8 Storage of Commodities in CRS head office</i>	9
<i>Figure 9 Storage of Commodities in CRS head office</i>	9
<i>Figure 10 Work Place Planning</i>	11
<i>Figure 11 Installation of digital weighing machine.</i>	12
<i>Figure 12 Fixing Banner</i>	12
<i>Figure 13 Designing work space for condom separation</i>	12
<i>Figure 14 Due to insufficient natural light, additional lights were fixed</i>	12
<i>Figure 15 Transporting the Cutting Machine</i>	12
<i>Figure 16 Installation of Cutting Machine</i>	12
<i>Figure 17 Cutting Machine for Operation</i>	13
<i>Figure 18 Pre-testing cutting machine by cutting condoms.</i>	13
<i>Figure 19 Presentation Session</i>	13
<i>Figure 20 Hand washing</i>	13
<i>Figure 21 Practical on separation</i>	14
<i>Figure 22 Demo on Lifting the heavy box</i>	14
<i>Figure 23 Trying practically by the participants</i>	14
<i>Figure 24 Training group photo</i>	14
<i>Figure 25 Coding the Box of Condoms</i>	14
<i>Figure 26 Code for tracing the items</i>	14
<i>Figure 27 Weighing the Condoms</i>	15
<i>Figure 28 Keeping record of weighing</i>	15
<i>Figure 29 Dismantling the Packaging of Condoms</i>	15
<i>Figure 30 Dispenser packages of Condoms near the cutting machines</i>	15
<i>Figure 31 Cutting the Dhaal brand</i>	16
<i>Figure 32 Cutting the Panther brand</i>	16
<i>Figure 33 Separators separating each item containing in the condom packaging</i>	16
<i>Figure 34: Separation of the Pills</i>	17
<i>Figure 36 Cutting each single needles first</i>	18
<i>Figure 37 Cutting the tips of the syringe</i>	18
<i>Figure 35: Separation of the Sangini Injectables</i>	18
<i>Figure 38 Feeding the syringes in shredder</i>	19
<i>Figure 39 Shredded syringes</i>	19
<i>Figure 40 Crushing of the pills</i>	21
<i>Figure 41 Diluting the crushed pills in methanol</i>	21
<i>Figure 42 Cutting the wire to put in the container prior to adding the paste of cement and gravel</i>	21
<i>Figure 43 Measuring the wire before putting in the container</i>	21

Figure 44 Adding cement guard in the paste of cement and gravel to prevent the leaks	22
Figure 45 Removal of the hollow pipe after adding of the paste of cement and gravel	22
Figure 46 :Capsule formed after removal of the cylindrical pipe in the container.	22
Figure 47: Adding the diluted pills into the capsule in the container.	22
Figure 48: Adding the thick paper and the net before sealing the container.	22
Figure 49: Finally sealed container with label before sending it to the landfill	22
Figure 50 Packaging the items	23
Figure 51 Compacting to accommodate more	23
Figure 52 Weighing in Post Separation Area	23
Figure 53 Recording the weight of each items	23
Figure 54: Storage Area of the packed materials after the separation	24
Figure 55: Storage area of the packed materials after the separation	24
Figure 56: Weighing the waste before sending to the recycling center	25
Figure 57: Waste being sent to the recycling center	25
Figure 58: Vehicle of municipality to transfer the waste to the landfill	25
Figure 59: Workers taking the waste out of the warehouse into the vehicle	25
Figure 60: Encapsulated waste being loaded in the municipal vehicle	25
Figure 61: Vehicle with waste to be land filled ready to leave the warehouse.	25
Figure 62: The cut paper being poured into the mixer with the chemicals	26
Figure 63: The final recycled product from cut thick papers	26
Figure 64: Waste being transferred in the transfer station, Teku	26
Figure 65: Waste being thrown in the transfer station prior to taking it to the land fill site.	26
Figure 66 Learning to wear PPE	28
Figure 67 PPE with dirty dust prevented	28
Figure 68 First Aid Box	28
Figure 69 Providing First Aid	28
Figure 71 Snake inside the ware house	29
Figure 72 Snake after being killed	29
Figure 70: A dead mice in the warehouse	29
Figure 73: Buckets placed below to collect the water leaking from the roof	30
Figure 74 Graphical Representation of different items	35
Figure 75 Graphical representation of post separation of Dhaal Condoms	36
Figure 76: Graphical representation of post separation of Number One Condoms	36
Figure 77 Graphical representation of post separation of Panther Condoms	36
Figure 78 Graphical Representation Nilocon pst separation items	37
Figure 79 Graphical Representation of of Sunaulo gulaf Post separation items	37
Figure 80: Compostion of Sangini Injectables after separation of the items	38
Figure 81: Total risk and non-risk waste generated after the separation	38
Figure 82: Graphical representation of different disposal technology adopted with weight of the waste	39
Figure 83: Graphical representation of the waste disposed according to the WHO catagories	39

Abbreviations

CP	Consumer Pack
CRS	Contraceptive Retails Sales
GGMS	Ghar Ghar Maa Swasthya
GoN	Government of Nepal
HCW	Healthcare Waste
HCWM	Health Care Waste Management
HECAF	Health Care Foundation Nepal
HIV	Human Immuno deficiency Virus
PPE	Personal Protective Equipments
WHO	World Health Organization
DP	Dispenser Pack
LP	Loose Pack
PO	Purchase Order

Disposition of Expired Commodities and Packaging Materials

1. Background

WHO defines Healthcare waste (HCW) as a by-product of healthcare that includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials generated from the health care institutions. Health care activities lead to the production of waste that may lead to adverse health effects. Most of this waste is not more dangerous than regular household waste. However some types of health care waste represent a higher risk to health. Poor management of HCW exposes healthcare workers, waste handlers and the community to infections, toxic effects and injuries.

The proposed project on disposition of expired commodities and packaging Materials also falls under health care waste category as it contains expired pharmaceutical and chemical items.

As per WHO, Pharmaceutical waste includes expired, unused, split and contaminated pharmaceutical products, drugs, vaccines etc. that are no longer required and need to be disposed of appropriately.

Pharmaceuticals are important part of maintaining human health but they can also pollute the environment In addition, pharmaceutical waste may also be hazardous because they exhibit certain characteristics such as ignitability, corrosion, reactivity and toxicity.

Pharmaceutical waste can be a potential cause for serious health risk to larger population and a threat to the environment if not disposed of properly. There are many instances of pharmaceutical waste entering the environment and causing hazards to wildlife and especially to the aquatic life, Orlando et al (2004)¹. These impacts finally reach the human too which has still been interest of many people's for study.

2. Contraceptive Retail Sales (CRS) Company

Nepal CRS Project officially began in July 1976. However, the Letter of Agreement was accepted in principle in 1978 by the Ministry of Finance, GON as Nepal CRS Project (Nepal FP/MCH Project) with financial support from Westinghouse Electric Inc, America. About CRS In 1983, the CRS/MCH project was converted into a private “social marketing” autonomous company known as Nepal Contraceptive Retail Sales (CRS) Company registered under the Company Act, 2021 BS in Nepal. Since then, CRS is managed by Nepalese staff

¹ Orlando EF, Kolok AS, Binzeik GA, Gates JL, Horton MK, Lambright CS, Gray LE, Jr., Soto AM, Guillette LJ, Jr. Endocrine-disrupting effects of cattle feedlot effluent on an aquatic sentinel species, the fathead minnow. Environ Health Perspect 2004;112: 353-8.

and governed by an independent Board of Directors. CRS is the only social marketing company working as a not-for-profit organization.

The program aims to assist GoN to expand the depth, reach, and impact of the private sector in social marketing, and provide low-cost maternal and child health, family planning, and HIV prevention products and services.

In the process of providing the service the expired commodities has been collected and stored in warehouse of CRS in Samakhushi. Approximately 10000 Kg of expired family planning commodities has been collected since 2001.

In the past, the expired family planning commodities Prior 2001, due to lack of awareness these type of waste commodities are being burned or disposed unsafely in municipal landfill.

3. Project Justification

In the past it was learned that these items were either open burned in river banks or sent to municipal landfill without any proper treatment. These unhealthy practices lead to risks to health due to degraded environmental conditions caused by either burning waste or disposing it in municipal landfill. Burning of waste could lead to the production of dioxins, furans or other toxics pollutants as emissions and/or in bottom fly ash.

The International Agency for Research on Cancer (IARC) classifies dioxins as a known human carcinogen". However, most of the evidence documenting the toxicity of dioxins and furans is based upon studies of populations that have been exposed to high concentrations of dioxins.

Considering above facts, if these commodities are not disposed of properly it can potentially cause harm to the environment as well as the community. In this context it is justified the decision on safe disposition of expired commodities.

4. Project Implementation

4.1.Ghar Ghar Maa Swasthya

USAID's Ghar Ghar Maa Swasthya project is being managed by FHI 360 a nonprofit human development organization dedicated to improving lives in lasting ways by advancing integrated, locally driven solutions is defying odds and working to improve access to quality family planning services in Nepal. In May 2010, USAID awarded CRS the Ghar Ghar Maa Swasthya(Healthy Homes) project. CRS implements the project in partnership with FHI 360. Ghar Ghar Maa Swasthya project seeks to graduate CRS to

become a viable private sector company and also to increase the availability and accessibility of health products in hard-to-reach rural areas.

The GGMS project seeks to improve the institutional sustainability of Nepal CRS Company and also to increase availability and accessibility of health products in hard-to-reach rural areas. The program will assist the Government of Nepal to expand the depth, reach and impact of the private sector in social marketing, by providing low cost supply of maternal and child health, family planning and HIV prevention products and services.

In this context, GGMS has shown concerned about the safe disposal of collected expired family planning products including Male condoms, Contraceptive pills and Sangini injectables, which is being collected and stored since 2001 and waiting for disposal. In this Context Ghar Ghar Maa Swasthya Project of FHI360 has requested for the proposal of Health Care Foundation Nepal, the pioneering institution working health care waste management in Nepal for safe and best disposal of these commodities

4.2. Health Care Foundation Nepal

Health Care Foundation Nepal (HECAF) was established in 1994 as a not-for-profit, non-governmental organization dedicated to providing a wide range of health care services broadly targeting both urban and rural populations. One of the main areas of HECAF is health care waste management. Since 1999, HECAF has been working in health care waste management. HECAF is providing services to various health care facilities health care waste management. HECAF is promoting environmentally friendly and based on 3R Principal.

In 2009, HECAF had got an opportunity to implement a project on safe disposal of expired products and reusable items stored in a Kathmandu warehouse. The contract was awarded by Academy for Educational Development under the Nepal Social Marketing and Franchise Project funded by USAID. HECAF has successfully implemented this task under the principle of 3R (Reduce Recycle and Reuse). At the end HECAF has managed and safely disposed 28.25 tons of waste. It has saved 10.28 million BTUs of energy.

Considering that successful project and having good track records, FHI360 Ghar Ghar Maa Swasthya (GGMS) has sent request for proposal to HECAF.

In the context of RFP submission, a team of Health Care Waste Management Specialist of HECAF visited the warehouse and conducted an assessment of the products stored to evaluate the condition of stored commodities and evaluate the risk and non-risk items of the commodities. It helped to develop the management strategy for handling, transport, and disposal of expired commodities and packaging materials.

Based on this, HECAF has submitted the proposal HECAF's proposal on disposition of commodities and packaging materials. The proposal was accepted by FHI360 Ghar Ghar Maa Swasthya (GGMS) Project and awarded the contract to HECAF. The contracted was signed on May 2012.

5. Statement of Work

GGMS has assigned HECAF to conduct the disposal of expired commodities and packaging materials following the guidelines developed by World Health Organization (WHO) in order to minimize environmental impact of the disposal.

6. Disposition of Expired Commodities

As per the contract, HECAF has given responsibility to dispose three types of commodities that is male condoms, oral conceptive pills and contraceptive injectable. The quantities of these commodities to be disposed are provided in the table below:

Item	Male Condoms			Oral Contraceptive Pills		Contraceptive Injection
	Dhaal	Panther	Number One	Nilocon White	Sunaulo Gulaf	Sangini
Consumer pack	193,768	93,980	135,802	1,471	2,747	5,466
Dispenser	12,110	4,699	5,658	123	153	456
Instruction Sheet	193,768	93,980		1,471	2,747	
Inner dispenser			5,658			
Syringe with needle						5,466

7. Objectives of the work

Based on the HCWM principle "Do no harm", the objectives of this project is as follows:

- To separate the given commodities into various risk and non risk items.
- To treat the risk items as per available environment friendly treatment technologies and convert it to non risk.
- To selecting best suitable 3R options.
- To analyze the total carbon footprint from the adoption of non-burn technology and recycling the recyclable items generated.

8. Technical Team

Team of different professionals; environmentalist, engineers and public health experts were brought together for the completion of the task. The technical team of HECAF for this project consists of the following member:

Mahesh Nakarmi:	Team Leader
Nimesh Dhakal:	Project Coordinator
Saraswoti Thakuri:	Occupational Health and Safety Professional
Shrawasti Karmacharya:	Environmental Professional
Prerana Dangol:	Supervisor
Sita Thapa:	Supervisor
Dina Rai:	Supervisor
Babita Karmacharya:	Supervisor
Kanchan Basnet:	First Aid Specialist
Rinzin Norbu Lama	Media Coordinator

Proposed Staff	Responsibility
Team Leader Mahesh Nakarmi	Provide leadership and direct the program
	Strategize and create solutions to project challenges and issues
	Assign responsibilities to staff members and supervise program staff
	Finalization of the report
Project Coordinator Nimesh Dhakal	Manage all daily project activities
	Work directly with the supervisors and the occupational health and environmental professional
	Supervise the activities of the supervisors and other staffs
	Compilation of the data from the occupational health and safety professional and the environmental professional
	Documentation of each activities
	Prepare and review reports
Occupational Health and Safety Professional Saraswoti Thakuri	Responsible for the safety of the staffs during the project
	Assist with all aspects of program implementation
	Monitoring of the staffs and their safety
	Assist report writing with the occupational health and safety aspects.
Environmental Professional Shrawasti Karmacharya	Responsible for the environmental safety project due to the project activities
	Assist with all aspects of program implementation
	Monitoring of the project process and identify the disposal methodology for the items

	Assist report writing with the environmental health aspects.
Supervisors Prerana Dangol Sita Thapa Dina Rai Babita Karmacharya	Oversee payroll of the laborers
	Monitor their each group of laboures respectively
	Take care of all record keeping, filing of the activities
	Document all the weight of each items
	Take care of all necessary details in support of program work
First Aid Specialist Kanchan Basnet	Provide First Aid Service to the injured staff, in case of any minor or Major accident
Media Coordinator Rinzin Lama	Take care of all video documentation

DISPOSITION OF COMMODITIES AND PACKAGING MATERIALS

May 02 – September 21, 2012

HECAF Technical Team Members



Er. Mahesh Nakarmi
Team Leader



Ms. Saraswoti Thakuri
Occupational Health
and Safety
Professional



*Ms. Shrawasti
Karmacharya*
Environmental
Professional



Mr. Nimesh Dhakal
Project Coordinator



Mr. Rinzin Norbu Lama
Media Coordinator



Ms. Kanchan Basnet
First Aid Specialist



Ms. Seeta Thapa
HCW Supervisor



Ms. Prerana Dangol
HCW Supervisor



Ms. Dina Rai
HCW Supervisor



Ms. Babita Karmacharya
HCW Supervisor

9. Activities

9.1. Planning and Preparation

9.1.1. Pre-Planning Meeting



Figure 1 Joint pre planning meeting at FHI 360

After signing the contract, prior to the implementation, a joint meeting was held on May 9, 2012 between FHI 360 Ghar Ghar maa Swastha (GGMS) Project, Contraceptive Retail Sales and Health Care Foundation Nepal. The meeting was held at the office of FHI 360 Ghar Ghar maa Swastha (GGMS) Project. HECAF presented the detailed disposal plan. The discussion was also held on the types of technologies to be adopted during disposal process. All the queries about the implementation of the project were clarified in the meeting. After the meeting the work plan has been finalized and approved for implementation (Refer Annex 1).

After signing the contract, prior to the implementation, a joint meeting was held on May 9, 2012 between FHI 360 Ghar Ghar maa Swastha (GGMS) Project, Contraceptive Retail Sales and Health Care Foundation Nepal. The meeting was held at the office of FHI 360 Ghar Ghar maa Swastha (GGMS) Project. HECAF presented the detailed disposal plan. The discussion was also held on the types of

technologies to be adopted during

9.1.2. Field Office Set-up

After planning, the field office was established in one corner of the warehouse. The office was setup by using used furniture provided by CRS. The office was used for meeting visiting guests, conduct project staff meeting, keep daily records and pay remuneration for labors. This office is helpful to supervise and monitor the working progress. Also an information corner was established with display of related books and reports and daily data was displayed in a whit board stand for dissemination of daily progress.



Figure 2 Field Office Corner

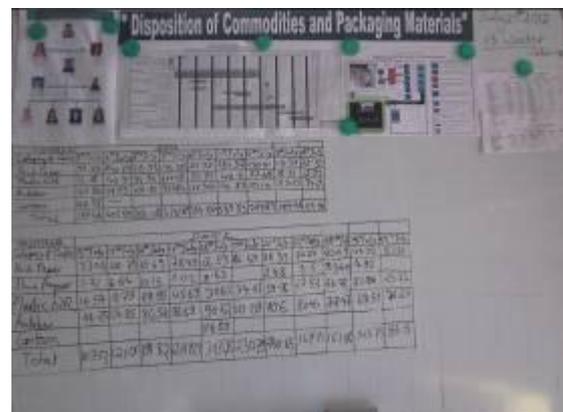


Figure 3 White Board with daily data

9.1.3. Visit of Technical Team to Warehouse

After setting up the field office the technical team visited the warehouse. All the commodities were stored randomly inside the warehouse. So some commodities were packed inside the proper box of same brand but most of the packaging was in wrong non CRS packaging boxes. This created confusion in keeping the data and added extra work. Also the commodities were in different conditions and forms. The condition of ware house is given below.



Figure 4 Storage of Commodities boxes



Figure 5 Storage of Commodities in boxes



Figure 6 Storage of Loose Commodities



Figure 7 Storage of Loose Commodities



Figure 8 Storage of Commodities in CRS head office



Figure 9 Storage of Commodities in CRS head office

9.1.4. Preparation of Work Place

As per WHO (2010)² definition of a healthy workplace is as follows:

A healthy workplace is one in which workers and managers collaborate to use a continual improvement process to protect and promote the health, safety and well-being of workers and the sustainability of the workplace by considering the following, based on identified needs:

- Health and safety concerns in the physical work environment;
- Health, safety and well-being concerns in the psychosocial work environment including organization of work and workplace culture;
- Personal health resources in the workplace; and
- Ways of participating in the community to improve the health of workers, their families and other members of the community.

Considering the condition of ware house, the working area was selected near the storage area. The overall conditions of the ware house were not physically and environmentally sound for using as work place. Since there was no ventilation system in the warehouse there raised various problems for the ventilation. Due to this there was lack of natural light inside the ware house. So the selection of proper working area inside the ware house was a challenging task. Nevertheless, the working area was selected near the storage area and the main door so that to get maximum natural light and ventilation.

After selection of area, the working area was cleared up and cleaned up. Then the workplace was divided into different area zones based upon the type of commodities to be disposed. So due to lack of space and volume of commodities, separate processing area was assigned for only two commodities condom and contraceptive pills. The volume of condom is very large so definitely it took larger area and remaining area was sufficient only for one commodity. So first that area was used only for processing contraceptive pills and then after its completion same area was used for processing Sangini Injectable.

While designing the work place, maximum efforts was given to make it healthy and safer as defined by WHO.

The work place plan and photos are given below:

² Burton.J, WHO (2010), “WHO Healthy Workplace Framework and Model: Background and Supporting Literature and Practices “ Pub: World Health Organization
Available at: http://www.who.int/occupational_health/healthy_workplace_framework.pdf

Disposition of Expired Commodities and Packaging Materials

Work Space Planning

Legend

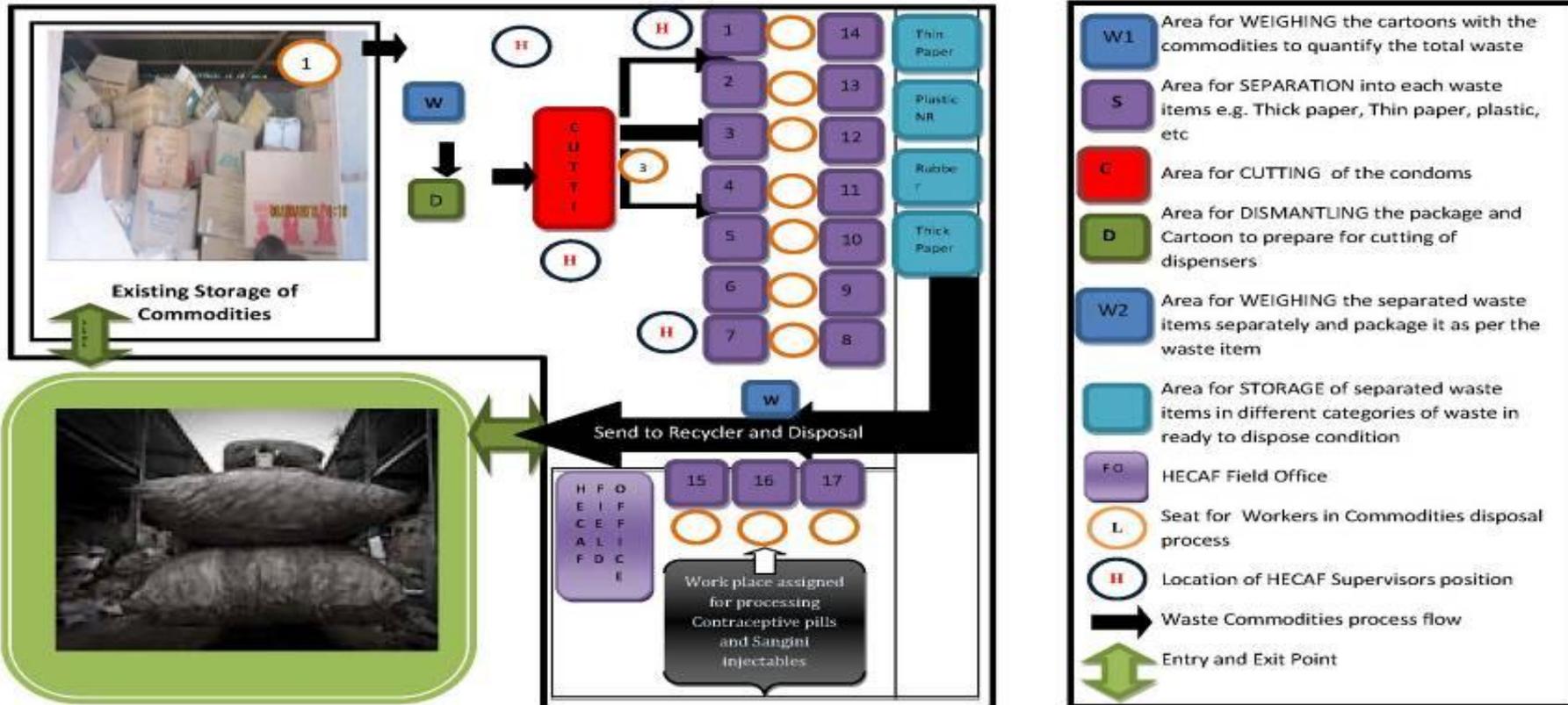


Figure 10 Work Place Planning



Figure 11 Installation of digital weighing machine.



Figure 12 Fixing Banner



Figure 13 Designing work space for condom separation



Figure 14 Due to insufficient natural light, additional lights were fixed

9.1.5. Installation of Cutting Machine

After division of areas, in cutting area a cutting machine was installed. This cutting machine is generally used in cutting papers in printing press. After testing of different types of cutting machines, the technical team found this machine the most suitable to cut condoms. So this machine was used after minor modifications.



Figure 15 Transporting the Cutting Machine



Figure 16 Installation of Cutting Machine

By its nature of operation, this machine is very heavy and it was difficult to transport from its original place of installation to the present location. So first it was dismantled

by a qualified professional technician with the help of number of additional manpower to lift it. Then it was transported and reinstall at our work place.



Figure 17 Cutting Machine for Operation



Figure 18 Pre-testing cutting machine by cutting condoms.

9.1.6. Training

After the planning, the staffs were recruited for handling, cutting and separation. All these staff were interviewed individually and selected on the basis of their interest only. After selection of staff half day training was organized to all staff before starting the job. The training trained on handling of heavy boxes, cutting of condoms, separation of commodities, destroying the syringes, use of personal protective equipments, occupational health and safety, hand hygiene and sanitation.

After the training from the next day the operation was started. The implementation was delayed due to political was conducted in lecture and practical sessions in Nepali language. The objective of the training was to disseminate their job description, to explain how to perform their job, to teach them on occupational safety and hand hygiene . The workers were disturbances caused by dismissal of constitution assembly which was not foreseen earlier. The implementation was carried out as per revised work plan. The first implementation was started with disposal of expired condoms due to its quantity.



Figure 19 Presentation Session



Figure 20 Hand washing



Figure 21 Practical on separation



Figure 22 Demo on Lifting the heavy box



Figure 23 Trying practically by the participants



Figure 24 Training group photo

9.2.Implementation

9.2.1. Pre Processing of Disposal Commodities

9.2.1.1. Coding of Cartoon Boxes

The disposal process first started with the coding of the boxes, Each boxes of condoms, pills and injectables were coded with initial of supervisor and then the serial numbers were provided. The objective of this coding was to help to trace the commodities. Coding was also useful to verify the weighing data and estimate the volume. After coding the box transferred to Pre separation weighing area.



Figure 25 Coding the Box of Condoms

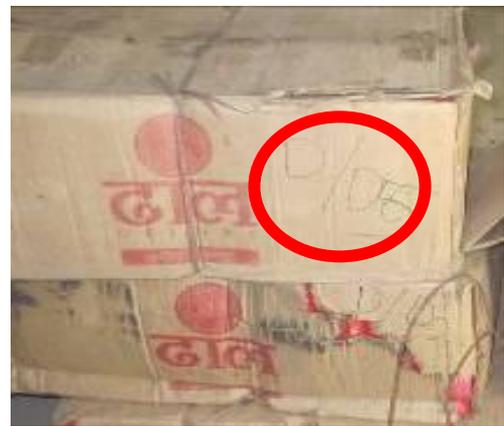


Figure 26 Code for tracing the items

9.2.1.2. Pre-Separation Weighing

After coding of boxes, each box was taken and the weight of the commodities was taken separately to quantify the volume and calculate the number of items of each commodity to verify the requested volume of items to be disposed. Each boxes weight was recorded with its respective code. All commodities as per its brand were quantified. This data was taken to track the recyclable and waste being generated during its disposal.



Figure 27 Weighing the Condoms



Figure 28 Keeping record of weighing

9.2.1.3. Dismantling the Packaging

After the weighing of each box of commodities the packaging boxes were dismantled. After dismantling in case of condoms, the dispenser packages were taken out and passed on to cutting area. All these dispenser packages were stacked near the cutting machine to make cutting process smooth. For pills and injectables the boxes were transferred to its separation area,



Figure 29 Dismantling the Packaging of Condoms



Figure 30 Dispenser packages of Condoms near the cutting machines

9.2.2. Processing for Disposal of Condoms

9.2.2.1. Cutting of Condoms

After the dismantling of the big packages, the dispensers were cut in the cutting machine to prevent the reuse of the expired condoms. The cutting machine was operated by electricity. The limitation to the cutting process was the 14 hours power cut a day. So the cutting was done whenever the electricity was available. So to meet the dead line of the project, the cutting operation was carried out during odd hours even at night shift.



Figure 31 Cutting the Dhaal brand



Figure 32 Cutting the Panther brand

9.2.2.2. Separation of items from condom packaging

After cutting of dispenser, it is passed to cutting area for separation of the items. Each dispenser package consists of thick paper, thin paper, rubber, and plastic. So different color containers were installed for each separator so that to facilitate easy separation.



Figure 33 Separators separating each item containing in the condom packaging

Then each separator separated cut packs of the condoms into different items as per the recyclable values as given below.

- Inner dispenser, outer dispenser, consumer packaging to thick paper container
- Instruction leaflet to thin paper
- Cut condom to rubber
- Condom plastic packaging to plastic

Among categories, each items have different recycling values. Only one item plastic packaging of the condom was non recyclable.

9.2.3. Processing for disposal of contraceptive pills

9.2.3.1. Separation of items from pills packaging

The pills were separated in two steps. In first step the oral contraceptive pills was separated into three items as follows:

1. Thick paper
2. Thin Paper
3. Medicine Foil with medicine



Figure 34: Separation of the Pills

In the second step the medicine foil with medicine foils passed into the next separation area to separate the pills from the foil. In those pills the ferrous fumarate and the ethyniyl estradiol and the norgesterol were separated from the medicine foil manually.

The pills are categorized under the risk waste category and it is most necessary to treat first before its disposal. So the treatment methodology of these pills were explained in next chapter

9.2.4. Processing for Disposal of Contraceptive Injectables

9.2.4.1. Separation of items from Sangini Injectables

The separation area of the sangini injectables was also separated into three different steps. First, the dispenser was separated into thick paper, thin paper, syringes and the vials. In second step vials were opened and the rubbers of the cover were kept separately and the medroxyprogesterone from the vials was safely poured into separate containers with proper label for risk



Figure 35: Separation of the Sangini Injectables

waste. Then the vials were collected in a separate container for washing. The aluminum from the rubber cap detached and collected separately. The third step was to cut needle and syringes and separate it.

9.2.4.2. Needle Cutting

More than 5,000 syringes with needles were collected after separation of sangini injectables. These were unused so there is no risk of infection contamination. So it is not necessary to treat but there was a risk of sharp injury so using needle cutters needles of each syringes were cut. Its needle and syringes were cut to prevent reuse of the syringes. The separated part of steel needles and plastics of syringes were sent for recycling.



Figure 36 Cutting each single needles first



Figure 37 Cutting the tips of the syringe

9.2.4.3. Syringe Shredding

After cutting the needles and tip of the syringes, prior to dispatch for recycling all the syringes were shredded together to ascertain that no syringes remains uncut for 100 % assurance to prevent any possibility of repackaging and return to outlets. The shredder was a locally designed shredded made of the cereals crushing machine.



Figure 38 Feeding the syringes in shredder



Figure 39 Shredded syringes

9.2.5. Treatment of hazardous pharmaceutical waste generated from expired contraceptive pills and injectables

After separation of items, the powder from the pills was collected in separate container and kept separately and safely. Ferrus fumarate and Ethyniyl estradiol and norgesterol were found in oral contraceptive pills. After studying its chemical properties it is found that Ethyniyl estradiol and norgesterol were highly risk pharmaceutical chemicals, which needs proper attention in its disposal to avoid harms to human and the environment.

Pharmaceutical waste can be a potential cause for serious health risk to larger population and a threat to the environment if not disposed of properly. There are many instances of pharmaceutical waste entering the environment and causing hazards to wildlife and especially to the aquatic life, Orlando et al (2004)³. These

³ Orlando EF, Kolok AS, Binzeik GA, Gates JL, Horton MK, Lambright CS, Gray LE, Jr., Soto AM, Guillette LJ, Jr. Endocrine-disrupting effects of cattle feedlot effluent on an aquatic sentinel species, the fathead minnow. Environ Health Perspect 2004;112: 353-8.

impacts finally reach the human too which has still been interest of many people's for study.

So after detailed study the team decided to use encapsulation method for its proper and safe treatment.

Disposal of health care waste in municipal landfills is less advisable if it is untreated than if it is pretreated. One option for pretreatment is encapsulation, which involves filling containers with waste, adding an immobilizing material and sealing the containers. The process uses either cubic boxes made of high density polyethylene or metallic drums, which are three-quarters filled with sharps and chemical or pharmaceutical residues. The containers or boxes are then filled up with a medium such as plastic foam, bituminous sand, cement mortar, or clay material. After the medium has dried, the containers are sealed and disposed of in landfill sites, WHO (1999).⁴

This is one of the technologies recommended by WHO for the management of chemical waste as an alternative to incineration.⁵

Encapsulation involves immobilizing the pharmaceuticals in a solid block within a plastic or steel drum. Drums should be cleaned prior to use and should not have contained explosive or hazardous materials previously. They are filled to 75% capacity with solid and semi-solid pharmaceuticals, and the remaining space is filled by pouring in a medium such as cement or cement/lime mixture, plastic foam or bituminous sand. For ease and speed of filling, the drum lids should be cut open and bent back. Care should be taken to avoid cuts to hands when placing pharmaceuticals in the drums. Once the drums are filled to 75% capacity, the mixture of lime, cement and water in the proportions 15:15:5 (by weight) is added and the drum filled to capacity. A larger quantity of water may be required sometimes to attain a satisfactory liquid consistency. Steel drum lids should then be bent back and sealed, ideally by seam or spot welding. The sealed drums should be placed at the base of a landfill and covered with fresh municipal solid waste. For ease of movement, the drums may be placed on pallets which can then be put on a pallet transporter.(WHO, 1999)⁶

Following pharmaceutical chemicals were generated during the disposal process for disposal of expired contraceptive pills and injectable.

⁴ Pruess,A.Giroult,E & Rushbrook, P. (1999) *Safe management of wastes from healthcare activities*. Publ: WHO, Geneva.

⁵ Pruess,A.Giroult,E & Rushbrook, P. (1999) *Safe management of wastes from healthcare activities*. Publ: WHO, Geneva pg no. 109

⁶ WHO , 1999, "Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies", Publ:World Health Organization, Geneva

Available at: http://www.who.int/water_sanitation_health/medicalwaste/unwantpharm.pdf

- Medroxyprogesterone from the sangini injectables
- Ferrous fumarate from the iron tablets / oral contraceptive pills
- Ethyniyl estradiol and norgesterol in the oral contraceptive pills

The detailed characteristics of each of the chemicals were studied in detailed and analyzed. Among the chemicals found ferrous fumarate was found to have no significant effect in the environment⁷ while the ethyniyl estradiol could cause potential health hazard when exposed to the environment⁸. Similarly the liquid medroxyprogesterone collected also was found as other chemical that could cause potential health hazard when exposed to the environment.⁹ These chemicals were encapsulated as per WHO recommended procedure as attached standard operation procedures The detailed SOP of the process of disposal of the pharmaceutical is given in the annex 5,6,7 and 8.



Figure 40 Crushing of the pills



Figure 41 Diluting the crushed pills in methanol



Figure 42 Cutting the wire to put in the container prior to adding the paste of



Figure 43 Measuring the wire before putting in the container

⁷ Material Safety Data Sheet , Pfizer

Available at : http://www.pfizer.com/files/products/material_safety_data/WC00038.pdf

⁸ Material Safety Data Sheet , Waynet

Available at: http://img.guidechem.com/msds/57-63-6_1289327265952.pdf

⁹ Material Safety Data Sheet, Science Lab

Available at : http://www.chemblink.com/MSDS/MSDSFiles/71-58-9_Science%20Lab.pdf

cement and gravel



Figure 44 Adding cement guard in the paste of cement and gravel to prevent the leaks



Figure 45 Removal of the hollow pipe after adding of the paste of cement and gravel



Figure 46 :Capsule formed after removal of the cylindrical pipe in the container.



Figure 47: Adding the diluted pills into the capsule in the container.



Figure 48: Adding the thick paper and the net before sealing the container.



Figure 49: Finally sealed container with label before sending it to the landfill

9.2.6. Post Processing for Disposal of Commodities

9.2.6.1. Packaging the items

After separation process, each items generated from each commodities were collected in separate sacs and temporarily stored till its final disposal in separate assigned location labeled as per category of items. These items were weighed separately and recorded in standard format.



Figure 50 Packaging the items



Figure 51 Compacting to accommodate more

9.2.6.2. Weighing the items:



Figure 52 Weighing in Post Separation Area



Figure 53 Recording the weight of each items

After packaging, daily each item was weighed and data was recorded in a standard format. It helped to quantify the volume of recyclable and the waste.

9.2.6.3. Storage of the items:



Figure 54: Storage Area of the packed materials after the separation

After packaging and weighing of each items, these items were temporarily stored in a separate assigned area for storage, which was properly labeled with the category of items. (e.g. Thin



paper, Thick paper, rubber etc.). These items were stored till it is dispatched to final disposal.

Figure 55: Storage area of the packed materials after the separation

9.2.6.4. Dispatch for final disposal

The different items being stored in respective storage area were either sent for recycling if it is recyclable or sent to landfill if it is non recyclable items. Most of the items e.g. paper, rubber etc. were recyclable except some plastics which is non recyclable. While identifying recyclability of items, properties of each item were studied in detail and considered its recycling value.

9.2.6.4.1. Recycling

All the recyclable materials generated after the separation and packaging were sent to the recycling centers. The thick paper and thin papers along with the vials, cover of the vials, syringes, needles are the categories of the waste generated from the sangini injectables. These recyclable categories were sold and sent to the recycling scrap centers.



Figure 56: Weighing the waste before sending to the recycling center



Figure 57: Waste being sent to the recycling center

9.2.6.4.2. Landfill Site

Each item was finally disposed off taking its properties into consideration. Based on this, non recyclable items were identified and sent to landfill through legal official process of Kathmandu Metropolitan City.



Figure 58: Vehicle of municipality to transfer the waste to the landfill



Figure 59: Workers taking the waste out of the warehouse into the vehicle



Figure 60: Encapsulated waste being loaded in the municipal vehicle



Figure 61: Vehicle with waste to be land filled ready to leave the warehouse.

9.2.6.4.3. Waste Tracking

In waste management waste tracking is very important. So for tracking purpose, gate pass was issued in every dispatched and gate pass was collected by the security prior leaving the premises. Both recyclable waste and non-recyclable waste were recorded. After dispatching the recyclable paper, it was tracked by following to the final destination the recycling factory by our team along with FHI/GGMS member. Other recyclables were not possible to track due to its less volume, location of the factory and distance to the factory. Similarly we also tracked the waste to land fill site. The waste was handed over to waste management section of Kathmandu Metropolitan City. The section sent the truck to the ware house and all the non-recyclable plastic waste including encapsulated waste were loaded and then dispatched to city waste transfer station at Teku. Then next day it was transferred to landfill site in big waste trucks. This was also tracked by our team along with FHI/GGMS representatives.



Figure 62: The cut paper being poured into the mixer with the chemicals



Figure 63: The final recycled product from cut thick papers



Figure 64: Waste being transferred in the transfer station, Teku



Figure 65: Waste being thrown in the transfer station prior to taking it to the land fill site.

9.2.7. Occupational Health and Safety

All workers should wear appropriate protective equipment including overalls and boots at all times, and gloves, masks and caps when appropriate. Masks should be worn when tablets or capsules are being crushed as part of the disposal technique and when there is a risk of powders being liberated. Particular care is required when handling antineoplastics (WHO, 1999).¹⁰

Occupational health and safety of the staff was given high priority during the whole working period. “Safety-first” was the main principle followed in the workplace. Any damage and accident for the workers is considered to be a big loss for the project so all possible measures were taken to prevent from the occupational, physical, psychological, biological, chemical and ergonomic hazards during working environment,. Proper use of personal protective equipment such as mask gloves and gown was demonstrated during the training . Following the WHO guideline, the staff were fully equipped with personal protective equipment (PPE).

Practical based training on occupational health and safety was provided as per the understanding level of the workers. Safe handling and lifting of heavy loads by maintaining posture was taught to the workers and demonstration also carried out at filed to prevent from ergonomic hazards. Safe handling of electrical appliances and safe handling of sharps and machinery was also taught. They were trained on minimizing the possible hazards in the working environment before starting actual work. Proper hand washing techniques was also demonstrated. Training was not only beneficial for their working environment but also useful in daily life.

Workers were screened visually and interviewed for any type of health problems before recruiting to job. Once they recruited their occupational safety were monitored regularly. HECAF has provided adequate protective measures to the workers. Work environment was designed scientifically and work division was carried out carefully so that accidents and hazards could be minimized.

Cutting machine was well designed with safety features that protect workers from any injury hazards. A first aid specialist with the trained other staff members were standby during working hour. They were equipped with standard first aid kits.

During whole working period fortunately there was only one incident happened with minor cut injury.

¹⁰ WHO , 1999, “Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies:”, Publ:World Health Organization, Geneva
Available at: http://www.who.int/water_sanitation_health/medicalwaste/unwantpharm.pdf



Figure 66 Learning to wear PPE



Figure 67 PPE with dirty dust prevented



Figure 68 First Aid Box



Figure 69 Providing First Aid

9.2.8. Problems during Implementation

During implementation the team faced various unexpected problems as described below.

Problems	Description
<p>Pest Problems</p>  <p>Figure 70: A dead mice in the warehouse</p>	<p>Due to poor condition of ware house, pest problem is common and it damaged the products.</p>
<p>Snake Hazards</p>  <p>Figure 71 Snake inside the ware house</p>	<p>Due to location and condition of ware house snake of unknown species was entered into the warehouse, which created panic among the working staff. Later one of the CRS staff had killed the snake to avoid panic among the staff.</p>
 <p>Figure 72 Snake after being killed</p>	

<p>Roof Leaking</p>  <p>Figure 73: Buckets placed below to collect the water leaking from the roof</p>	<p>The roof of the ware house was leaked in different locations. During heavy rain it leaked heavily which could damage the products</p>
<p>Water scarcity</p>	<p>During the working period, there was scarcity of water in toilets. It had created problems in hand washing. Later rain water was collected and rain water was reused for toilet purpose and hand washing.</p>
<p>Cross ventilation</p>	<p>The ware house does not have any openings in three side of the buildings, which created problems for cross ventilation. It caused hot environment work place inside the ware house. Later on request CRS has provided stand fans to make better working environment</p>
<p>Light Problem</p>	<p>Due to lack of openings natural light was not sufficient for visibility.</p>

9.3.Data Collection and Analysis

9.3.1. Data Collection

Each item was finally disposed off taking its properties into consideration. The recyclable waste was sent to the recycling center and the other non-recyclable waste was collected in the municipal container, from where they were taken to the landfill site. Different formats for recording the waste were designed. The formats were later analyzed using excel spreadsheets.

Table 1 Disposition of Commodities and Packaging Materials

Category	Product Brand						Total
	Dhaal	Number One	Panther	Sunaulo Gulaf	Nilocon White	Sangini	
Thick Paper	1594	1614.93	678.06	18.02	8.7	24.96	3938.665
Thin Paper	115	0.91	67.89	1.89	1.4	1.4	188.49
Plastic Packaging	764	268.15	321.81	4.60	3.4		1361.958
Rubber	2215	783.04	916.65				3914.69
Plastic R1						1.08	1.08
Syringe						12.71	12.71
Metal Cap						1.10	1.10
Red/Brown Pills				3.58	1.41		4.99
Yellow/White Pills				5.69	2.84		8.53
Glass Vials						22.22	22.22
Vial cap						1.16	1.16
Vial Rubber cap						3.01	3.01
Sharps Metal						0.50	0.50
Medroxyprogesterone						3.99	3.99
Needle tip						1.77	1.77
Cartoon							987
Total	4688	2667	1984	34	18	74	10452.00

9.3.2. Data Analysis

9.3.2.1. Quantity vs. Weight Comparison of Commodities

The table describes the comparison between pre processing weight and post processing weight of each commodity. The estimated weight prior to the processing is 9472.13 kg and the weight after the separation process is 9463.41 kg. This weight excludes the packaging materials. The number of DP and the CP provided in the PO was taken as the reference and the disposition process was carried out. Here the difference in the post and pre weight is the 8.724 kg; the error of this difference is 0.092%. One of the reasons of differences might be due to 100 gms error margin in the weighing machine.

**Ghar Ghar Maa Swasthya (GGMS) Project
Disposition of Commodities and Packaging Materials
Health Care Foundation Nepal/Health Care Waste Management Program**

Description	Dispenser Pack	Consumer Pack	Disposed Dispenser Pack	Piece /Pack	Disposed Consumer Pack	Unit weight of Dispenser (kg)	Total weight	Segregated By-products	Quantity of Segregated Items	Segregated %	Post Separation Weight (kg)	Control Difference (kg)	Difference (%)
DHAAL BRAND													
								Thick Paper	1593.54	34.00			
As per PO	12110	193768						Thin Paper	114.86	2.45			
Black			4600	12	55200	0.334	1536.4	Rubber	2215.104	47.26			
Red			8666	16	138656	0.364	3154.42	Plastic (NR)	763.64	16.29			
Total	12110	193768	13266		193856		4690.82	Total	4687.144	100.00	4687.14	3.680	0.078
NUMBER ONE BRAND													
								Thick Paper	1614.925	60.55			
As per PO	5658	135802						Thin Paper	0.910	0.03			
								Rubber	783.041	29.36			
								Plastic (NR)	268.148	10.05			
Total	5658	135802	5659	24	135816	0.472	2671	Total	2667.024	100.00	2667.024	4.024	0.151
PANTHER BRAND													
								Thick Paper	678.06	34.17			
As per PO	4699	93980						Thin Paper	67.89	3.42			
								Rubber	916.65	46.19			
								Plastic (NR)	321.81	16.22			

Total	4699	93980	4699	20	93980	0.423	1987.7	Total	1984.41	100.00	1984.41	3.267	0.164
ORAL CONTRACEPTIVE PILLS (Nilocon White)													
As per PO								Thick Paper	8.7	49.01			
	123	1471	123	12	1476	0.135	16.605	Thin Paper	1.4	7.89			
								Iron	1.41	7.94			
								Other Pills	2.84	16.00			
								Plastic(NR)	3.40	19.15			
Total	123	1471	123	12	1476	0.135	16.605		17.75	100.00	17.75	-1.15	-6.90
ORAL CONTRACEPTIVE PILLS (Sunaulo gulaf)													
As per PO								Thick Paper	18.02	53.35			
	153	2747	174	18	3132	0.195	33.93	Thin Paper	1.89	5.60			
								Iron	3.58	10.60			
								Other Pills	5.69	16.84			
								Plastic(NR)	4.6	13.62			
Total	153	2747	174	18	3132	0.195	33.93		33.780	100.00	33.78	0.15	0.442
SANGINI INJECTABLES													
As per PO								Thick Paper	24.96	34.05			
	456	5466	456	12	5472	0.158	72.048	Thin Paper	1.4	1.91			
								Plastic R1	1.08	1.47			
								Syringe	12.71	17.34			
								Vials	22.22	30.31			
								Vials Cap	1.16	1.58			
								Vial Rubber Cap	3.008	4.10			
								Sharp metal	0.5	0.68			

								Medroxypr ogesterone	3.99	5.44			
								Metal	0.5	0.68			
								Needle Tip	1.772	2.42			
Total	456	5466	456	12	5472	0.158	72.048		73.300	100.00	73.30	-1.252	-1.738
Grand Total							9472.1 3		9463.41		9463.41	8.724	0.092

Note:

1. 21 more dispenser pack was disposed than provided number of Oral Contraceptive Pills (Sunaulo Gulaf)
2. The weight of commodities calculated based on unit weight of the quantity mentioned in the PO.
3. Each type of processed items of all commodities was calculated based on real weight.
4. To justify the volume of work carried out a comparison was made between pre processed total weight of each type of commodities and weight of each type of processed items. The difference between these two weights is 0.092 %, which is negligible.

9.3.2.2. Total weight of different items

The total waste generated from the commodities was analyzed. The details of the waste items after the post separation scenario are given in the figure above. The thick paper was separated mostly from all the items and it was generated in largest quantity that is 3938.56 kg.

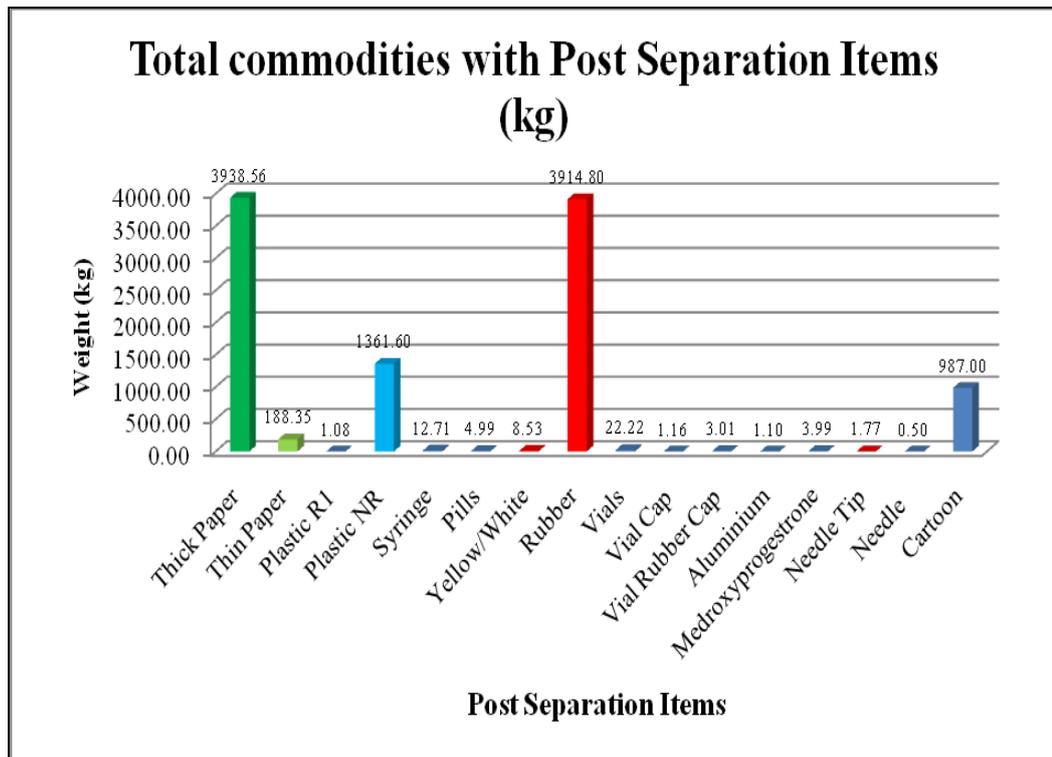


Figure 74 Graphical Representation of different post separation items

Secondly, total of 3914.80 kg of condom (rubber) was generated. Thirdly, 987 kg of cartoon was generated which was used as the packaging materials in most of the cases. It was followed by the non-recyclable plastic which was used as the condom cover. The lowest weight of item generated was the needle, 0.5 kg of sharps metal was generated.

9.3.2.3. Waste Items Separated of all the commodities

9.3.2.3.1. Male Condoms

Three different brands of male condoms were disposed. They were Dhaal, Number one and Panther. The different percentages of items generated after the separation of the items are given in the figure below:

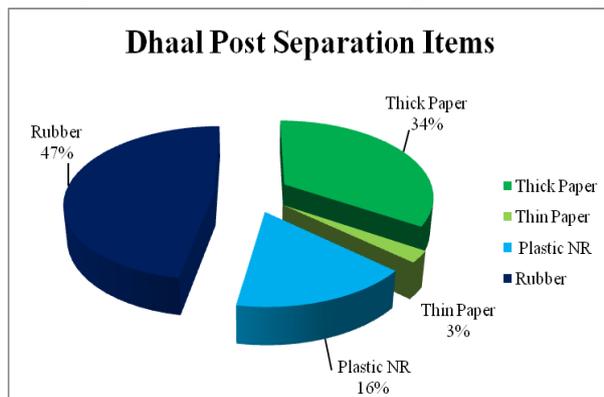


Figure 75 Graphical representation of post separation of Dhaal Condoms

The figure 75 shows the waste items generated after the separation of the total items of Dhaal brand. 47% of the total weight is the rubber which is the condom generated. The others are the Thick Paper 34% and 16% non-recyclable plastic.

The figure 76 shows the waste items generated after the separation of the total items requested. Here 61% of the waste generated is the thick paper. The inner dispenser used in the packaging of the consumer pack of Number

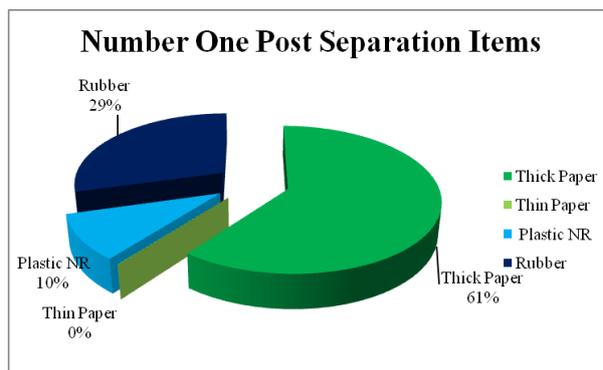


Figure 76: Graphical representation of post separation of Number One Condoms

One resulted in the great difference in the percentage of the waste generated. The other are 29% of rubber that is of condom and 10% non-recyclable plastic and none thin paper. The Number One did not have any information sheet in its packet.

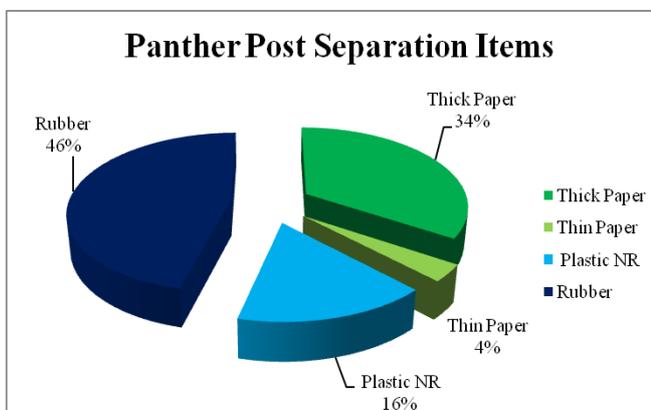
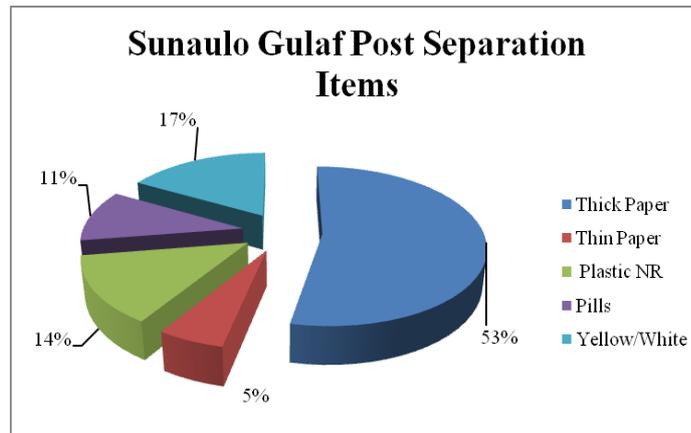


Figure 77 Graphical representation of post separation of Panther Condoms

The figure 77 shows the waste items generated by

Panther are quite similar with Dhaal. Among the waste generated 34% is the thick paper. The highest is 46% of the rubber which is condom and the others are 16% non-recyclable plastic. 4% of the waste generated was the thin paper which is the information leaflet in the consumer packs.

9.3.2.3.2. Oral Contraceptive Pills



The oral contraceptive Pills consisted of the pills and the paper and the medicine foil which was the non-recyclable plastic. The detail of the percentage of the waste generated is

Figure 78 Graphical Representation of of Sunaulo gulaf Post separation items given below:

The oral contraceptive pills consisted of two brands the Nilocon White and the Sunaulo Gulaf. 49% of the waste generated consisted of the Thick paper and then the non-recyclable plastics of the medicine foil 19%. The Pills consisted of 24% of the total waste

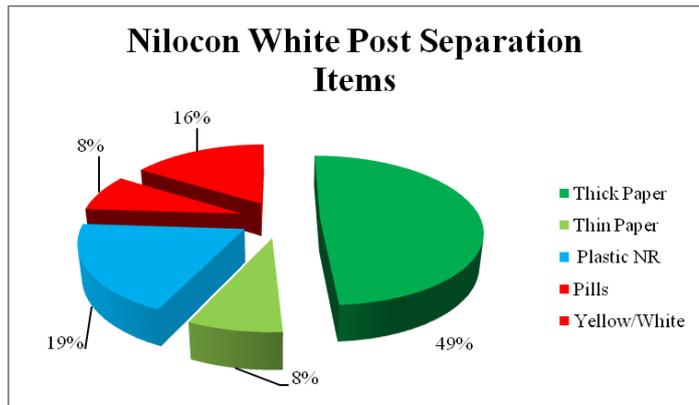


Figure 79 Graphical Representation Nilocon pst separation items

generated.53% of the waste generated is the Thick paper. The non-recyclable plastic is 14% of the total waste generated. The Pills consisted of 28% of the total waste generated.

9.3.2.3.3. Sangini Injectables

The sangini injectables consists of different material which needed to be treated differently. There were medroxyprogesterone , syringes with needles , paper and plastic. All the items with after the post separation scenario are given in the figure below:

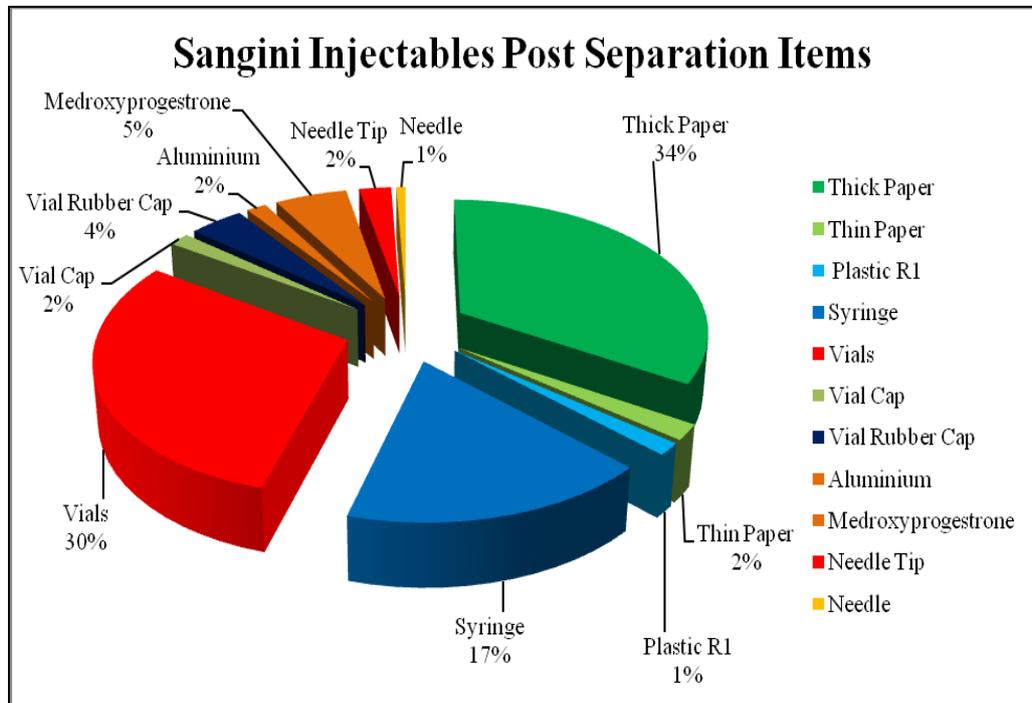


Figure 80: Composition of Sangini Injectables after separation of the items

Here the highest generating waste item is Thick Paper basically used as packaging material i.e., 34% of the total waste. The other is the vials or the glass which is 30% of the total waste generated. The cut needles are the ones which generated in the lowest amount that is 1% of the total waste.

9.3.2.3.4. Risk and Non-Risk waste Category of Waste

The total amount of the waste generated was separated into risk and the non-risk items. The details are given in the figure 81

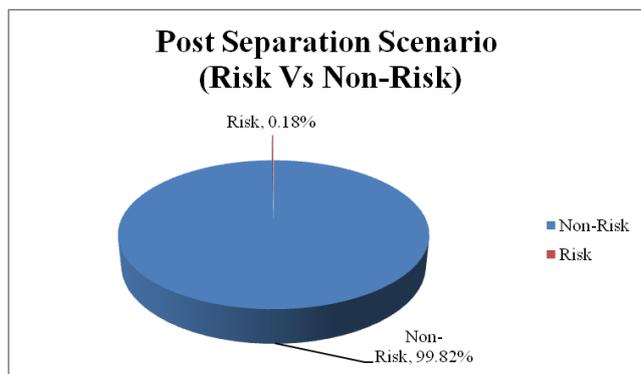
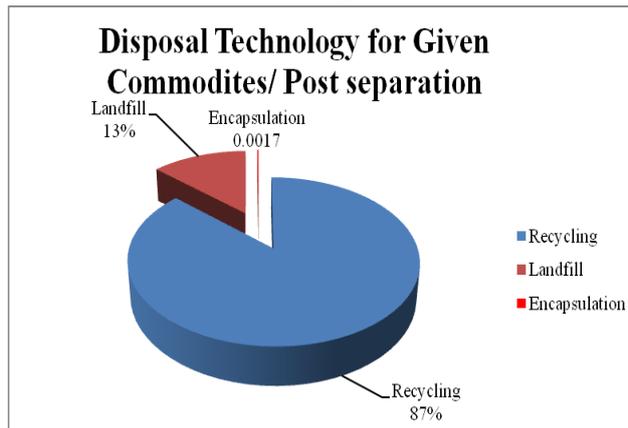


Figure 81: Total risk and non-risk waste generated after the separation

below. The total amount of the risk waste generated is negligible compared to the non-risk waste generated but this waste can cause potential hazards to the communities as well as the environment. The total amount of the non-risk waste generated is 99.82% of the total waste generated and the total amount of the risk waste generated is 0.18% of the total waste generated.

9.3.2.3.5. Waste disposed based on disposal methods

The different technologies are used for different items of waste as per their



recycling values. All the recyclable materials were sent to recycling and the non recyclable plastics were directly sent to the municipal landfill site. The potentially hazardous pills and the medroxyprogesterone were encapsulated and sent to the landfill. The percentages of the waste according to the disposal

Figure 82: Graphical representation of different disposal technology adopted with weight of the waste

or treatment options are given in the figure 82:

According to the waste disposal methodology adopted 86% of the waste generated was sent to recycling, 14% of the non-recyclable materials were sent to the landfill including the encapsulated potentially harmful chemicals.

9.3.2.3.6. Waste as per the WHO waste categories



WHO has its own categorization of the risk wastes (WHO 1999)¹¹. According to the categories the waste are generally categorized into risk and non-risk. The risk wastes are further categorized into

¹¹ Pruess, A. Giroult **Figure 83: Graphical representation of the waste disposed according to the WHO catagories**

different categories. The waste items generated in this project was analyzed as per the WHO waste categories. Almost 100% of the total waste generated is the general waste that is the non-risk waste. The only risk waste generated is the sharp 0.0002% and the Pharmaceuticals which is 0.0017% of the total waste generated.

10. Cost recovery

All the recyclable waste was sent to the recycling center. The amount of cost recovered from the recycling of the waste is given in the table below:

Table 2 Cost Recovery from the Recyclable Materials

Category	Total Weight	Unit Rate/Kg(NRs)	Total (NRs)
Thick Paper	3938.665	2	7877.33
Thin Paper	188.49	2	376.98
Rubber	3914.691	4	15658.764
Plastic R1	1.08	4	4.32
Syringe	12.71	10	127.1
Metal(Aluminum)	1.102	90	99.18
Vials	22.22	0.25	5.555
Vial cap	1.16	4	4.64
Vial Rubber cap	3.008	4	12.032
Sharps Metal	0.5	2	1
Needle tip	1.772	2	3.544
Cartoon	987	2	1974
Total	9464.866		26144.445

The total amount of cost recovered from the recycling of the waste is NRs. 26144.445.

11.Environmental Benefits

Most people are aware that source reduction, reuse, and recycling decreases reliance on landfills, incinerators, and waste-to-energy facilities. These waste reduction strategies are also critical for protecting the global environment. By reducing the need for "virgin" resources extracted from forests, oil reserves, and mines, we use less energy, reduce greenhouse gases, water pollution, and conserve natural resources.

Using less energy decreases greenhouse gas emissions because the majority of consumed energy in the United States relies on fossil fuels (i.e., gasoline, diesel, natural gas, and coal). Fossil fuels are the most significant source of carbon and other greenhouse gas emissions. Energy conservation also minimizes the need for energy development and production, which are also responsible for significant environmental impacts.

Source reduction, reuse, and recycling also keep materials out of landfills, incinerators and waste-to-energy facilities, where water and air contamination can result from leachate, air emissions, and ash residue.

By contrast, the steps required to supply recycled materials to industry (i.e., collection, processing, and transportation) uses less energy than the steps in supplying virgin materials (i.e., extraction, refining, processing, and transportation). The majority of the energy savings associated with the use of recycled content materials in manufacturing is the result of avoided processing, because recycled materials have already been processed at least once.

The Waste Reduction Model (WARM) was created by the U.S. Environmental Protection Agency (EPA) to help solid waste planners and organizations estimate greenhouse gas (GHG) emission reductions from several different waste management practices.

Waste Redcuton Model generates estimates of the environmental benefits , based on the tonnages of materials that were source reduced, reused, recycled, land filled, or incinerated (includes waste-to-energy). The Calculator is based on per short ton figures of the estimated energy use and emissions from several lifecycle analysis studies.

Total amount of 11.521 short tons of 10451.86 kg of waste was taken for segregation and from the amount 9070.48 kg was recyclable which were sent to recyclable.

- **Greenhouse gas emissions were reduced by the project**

This project source reduction, reuse, and recycling reduced greenhouse gas emissions by 23 metric tons of carbon equivalents (MTCE)¹² in a 2 months period. This is equivalent to approximately removing the emission from 4 vehicle generating greenhouse gas emissions, such as carbon dioxide (CO₂), methane (CH₄), nitrous oxides (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) annually.

- **This project source reduction, reuse, and recycling saved energy.**

This project source reduction, reuse, and recycling saved a total of 57 Million BTUs of energy. This is equivalent to 420 gallons of gasoline. This is equal to the amount of 953 cylinders of propane gas used for household purposes. Also this is the amount equals to 9 barrel for oil.

All data reported in this Fact Sheet was calculated by the Waste Reduction Model. For more detail about the specific environmental benefits attributable to source reduction, reuse, and recycling in go to <http://www.epa.gov/warm>

¹² Metric tons of carbon equivalent (MTCE) are a unit of measurement that expresses the heat-trapping effects of various greenhouse gas emissions. Another unit of measure sometimes used is metric tons of carbon dioxide equivalent (MTCO₂). Source: U.S. EPA (2006) User's Guide for WARM: Calculating Greenhouse Gas Emissions with the Waste Reduction Model. Available at:

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteWARMUsersGuide.html>.

12. Guest Observer

During the project period, several guest visitors visited to observe the disposal process. The visitors were warmly welcomed to the warehouse and distributed the disposable face mask to all the visitors to protect from dust. Then the visitors were taken to the guided tour to working area. One of HECAF project team had explained all the steps. After completion of the tour the participants were done the question and answer. Then the participants were requested to express their views in Guest Book. Some of the Samples of visitors were given below in the Annex.



Figure 84: Observation Visit by team of Health and Family Planning Division of USAID

13. Project Monitoring

During the project period, the project activities were regularly monitored by the team of FHI/ GGMS Project and CRS Management. During the monitoring several instruction were made to the project team which was taken into accounting into project implementation.



Figure 85: Monitoring by team of USAID and FHI 360 (GGMS)



Figure 86: Monitoring by team of GGMS Project



Figure 87: Monitoring by team of CRS



Figure 88: Monitoring by team of GGMS Project

14.Recommendation

Based on the work carried out during disposal process, following recommendation were made for CRS,

1. Reduce expiry of the products as much as possible by strict monitoring and data management
2. Return back policy should be formulated for expired and unsold items. Based on that policy standard operation procedure (SOP) should be developed and implemented.
3. These expired items returned from the outlets should be stored in separate storage area. These storage areas should be identified for permanent use.
4. At least quarterly disposal should be planned. It will help to keep storage area limited.
5. Keep ware house physically and environmentally sound by maintaining roof leakage, controlling pest.

15.Conclusion

On request of Ghar Ghar Ma Swastha Project of FHI 360, Health Care Foundation Nepal (HECAF) has implemented the disposal of the expired commodities and the packaging materials stored in the warehouse of CRS Company. The main objective of this project was to dispose the expired and unused commodities scientifically to avoid any adverse environmental health effects in the communities.

HECAF has disposed 10451.86 kg of waste commodities consisting of the male condoms, oral contraceptive Pills and contraceptive Sangini Injectables. Among the main principle was followed during disposal was Do No Harm. The methodology used was based on Reduce Reuse and Recycle principle.

Among of total of 10451.86 kg 87% of waste equivalent to 9070.48 kg were recycled. Remaining 13 % were sent to municipal landfill.

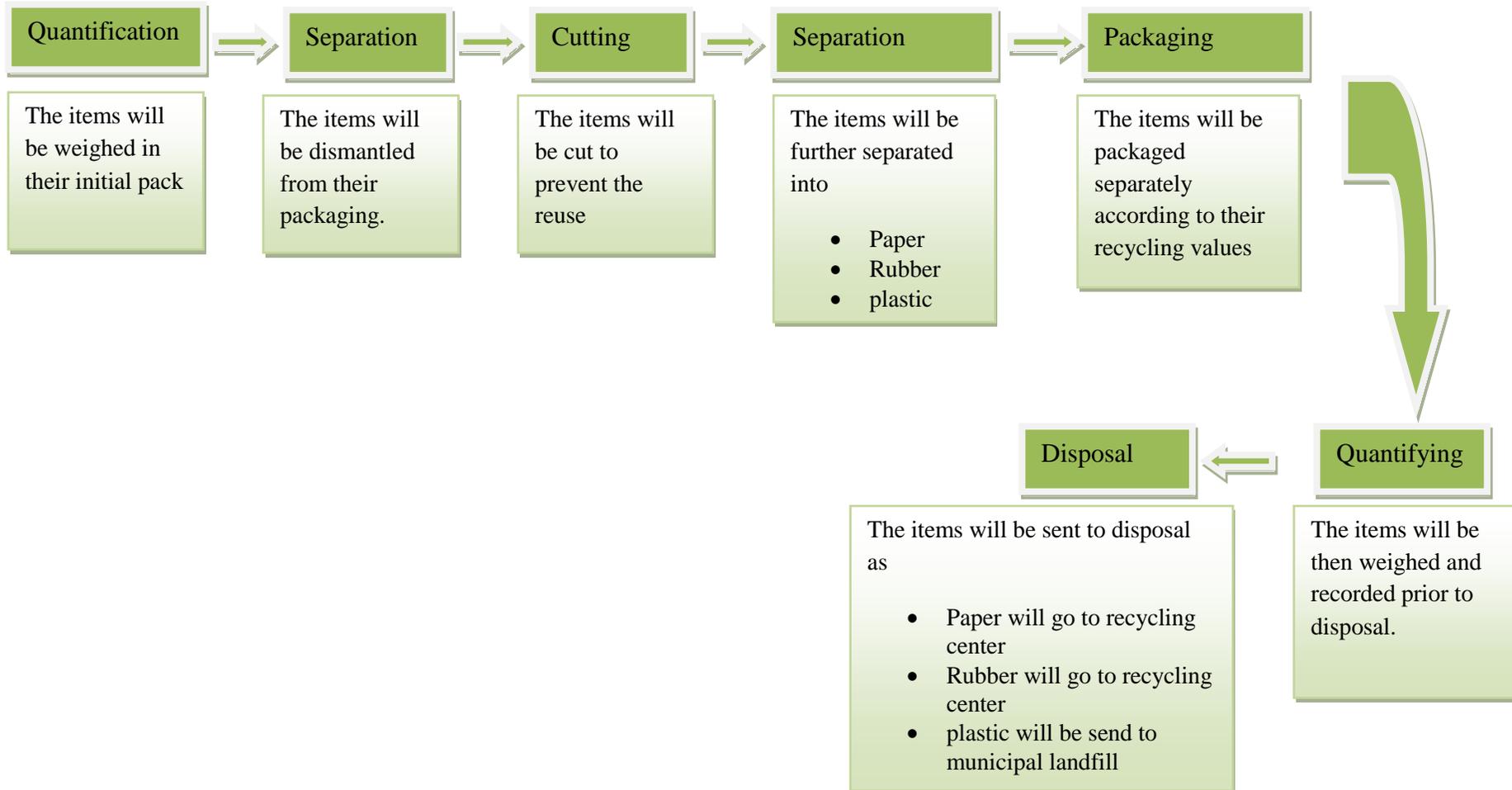
Comparing to the prior practice of burning these commodities, this disposal practice has saved the energy and considered as best environmental friendly. It really helps to save environment and improve the quality of living in the communities

16. Annex:

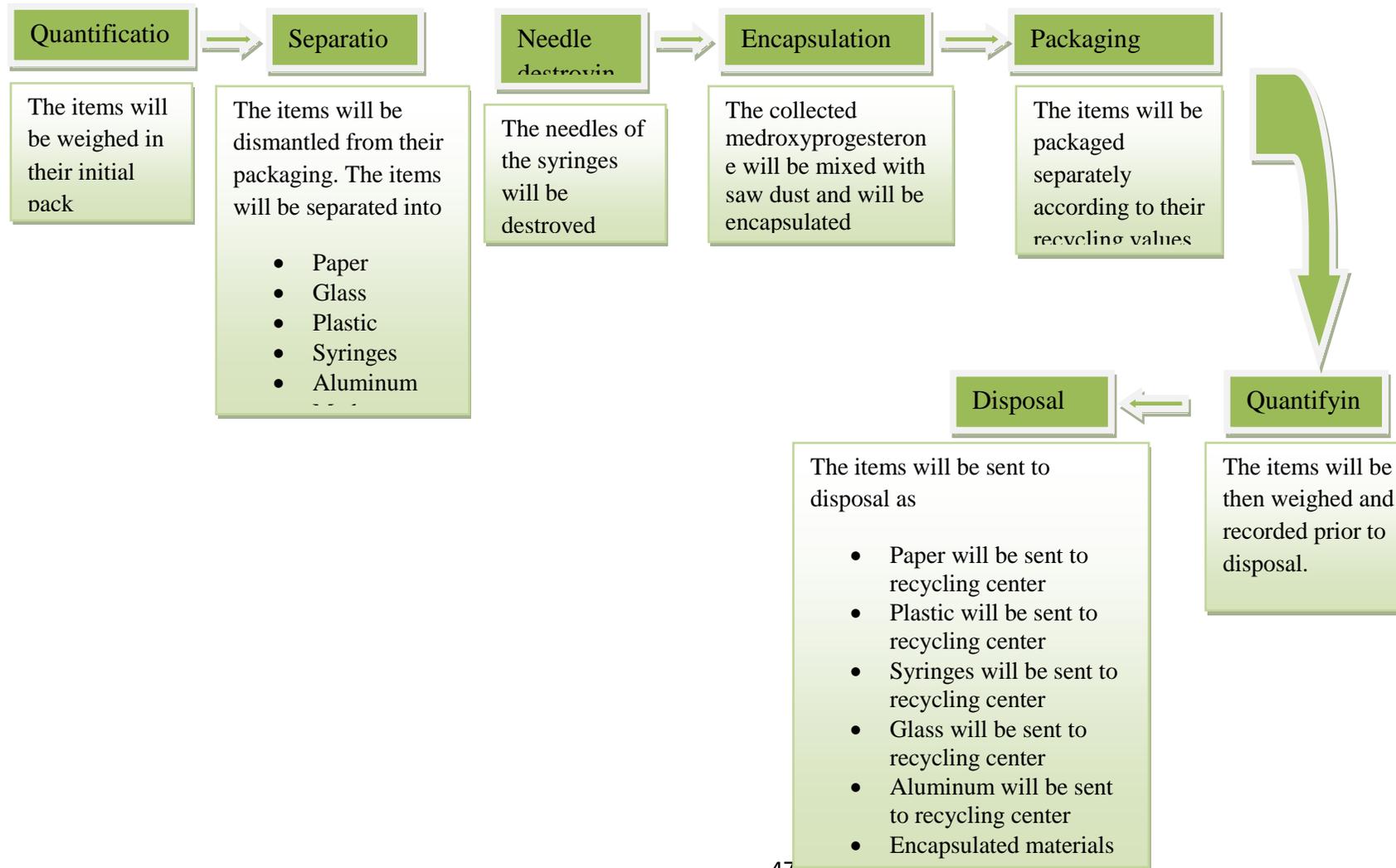
16.1. Annex 1: Work Plan

16.2. Annex 2: Detailed Disposal Plan of Male Condoms

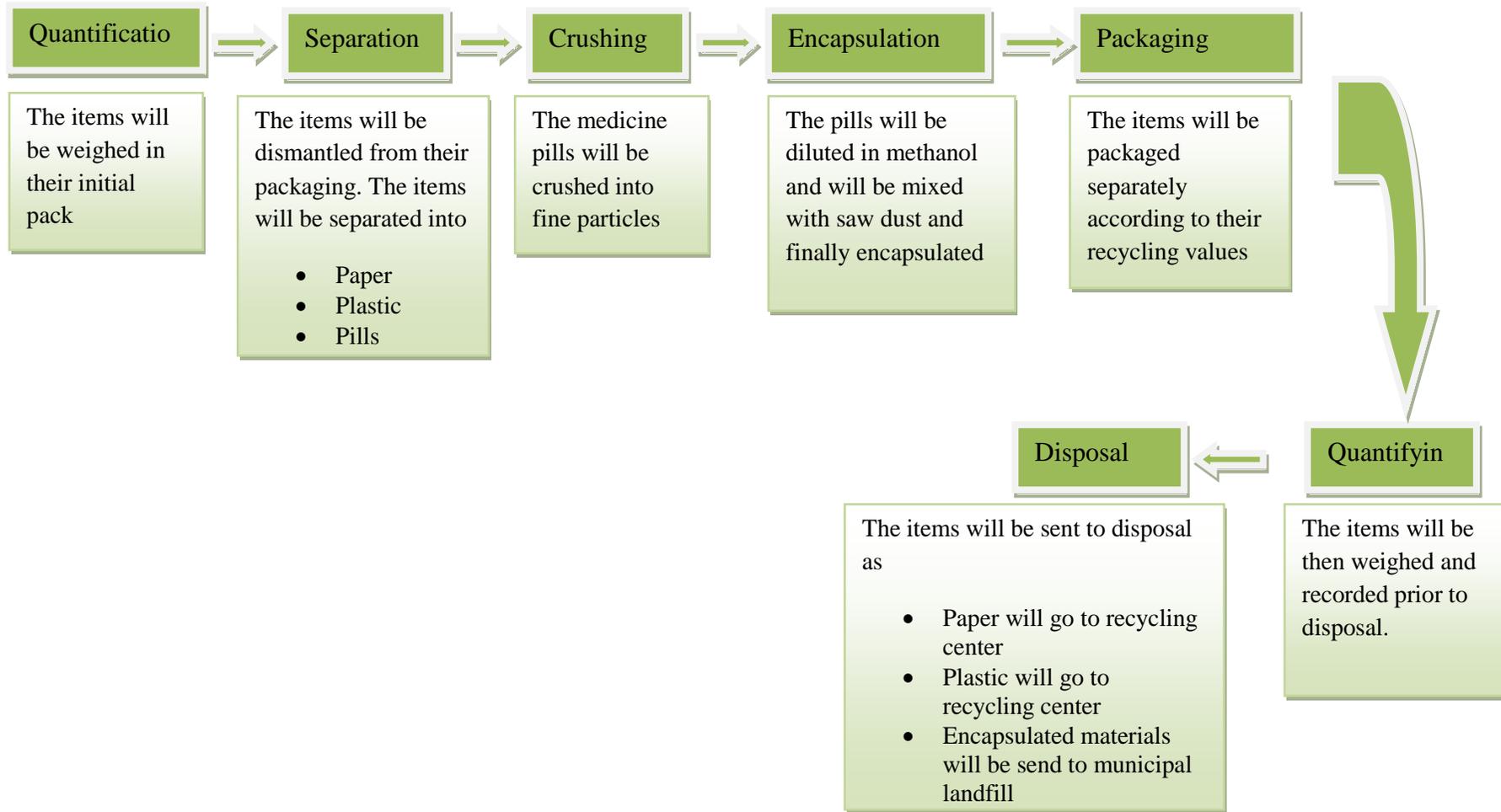
The detailed disposal plan of the items given in the Annex A of the RFP is listed in the table given below:



16.3. Annex 3: Detailed Disposal Plan of Sangini Injectables



16.4. Annex 4: Detailed Disposal Plan of Oral Contraceptive Pills



16.5. Annex 5: Standard Operating Procedures for the disposal of the male condoms

General Preparation

1. Change into the uniform separated for working
2. If another person did the last shift, check log for any comments or problems. Take any follow up action within your reach.
3. Put on necessary personal protective equipment (Full sleeve apron, cap, mask, gloves, etc.)

Note:

- Report the problems to the supervisor so that the problems can be solved by responsible person.
- Carefully handle the chemicals and machineries

Quantification

4. Sort and take out a carton/box of condom according to items from the existing storage area.
5. Check for the packaging of the carton.
6. Carefully place the carton/box on the weighing machine
7. Make sure that the weight of the carton is recorded properly.
8. Transfer the carton/box to the separation area.

Pre-separation

9. Remove/ dismantle the packaging material if present.
10. Uncover the carton/box.
11. Transfer the dispenser pack to the cutting area.

Cutting

12. Place the dispenser pack on the working table.
13. Carefully cut the dispenser pack by using the cutting machine, so that all of the consumer packs are also cut.
14. Transfer the cut dispenser packs and its contents to the separation area

Post-separation

15. Separate the consumer pack from the dispenser pack.
16. Separate the dispenser pack as thick paper.
17. Uncover the consumer pack.
18. Separate the consumer pack into thick paper, thin paper, plastics and rubber.
19. Send the entire separated item to the packaging area.

Packaging

20. Make sure that the weights of empty sacks are recorded before packaging.
21. Properly pack each waste item in separate sacks according to waste category and tag the sacks accordingly.

Quantifying

22. Weigh all of the sacks separately in the weighing machine.
23. Make sure that the weights are recorded on the record sheet.

Send all the recyclable waste for recycling and non-recyclable waste to the land fill site.

16.6. Annex 6: Standard Operating Procedures for the disposal of Oral Contraceptive Pills

General Preparation

1. Change into the uniform separated for working
2. If another person did the last shift, check log for any comments or problems. Take any follow up action if required.
3. Put on necessary personal protective equipment (Full sleeve apron, cap, mask, gloves, etc.)

Note:

- Report the problems to the supervisor so that the problems can be solved by responsible person.
- Carefully handle the chemicals and machineries

Quantification

4. Sort and take out a cartoon/box of oral contraceptive pills from the existing storage area.
5. Carefully place the cartoon/box on the weighing machine
6. Make sure that the weight of the cartoon is recorded properly
7. Transfer the cartoon/box to the separation area

Separation

8. Check for the packaging of the cartoon.
9. Remove the packaging material if present
10. Uncover/dismantle the cartoon/box.
11. Take out the consumer pack from dispenser pack
12. Separate the consumer pack into thick paper, thin paper and medicine foil.
13. Separate the medicine foil into plastic, ferrous tablets and contraceptive tablets.
14. Weigh the collected ferrous tablets and contraceptive tablets separately on weighing machine. Make sure the weights are recorded properly.
15. Send the weighed tablets for crushing/ grinding.

Crushing/ Grinding

16. Crush/ grind all the tablets in the grinding machine separately.
17. Collect the crushed powder in separate containers.

Encapsulation

18. Dissolve all the crushed powder of contraceptive pills in the methanol solution.
19. Add saw dust in the container and make paste
20. Take the container selected for encapsulation and fill it upto 3/4th with the prepared paste
21. Fill the remaining part of container with the medium of cement mortar
22. Let the medium dry completely
23. Again dissolve all the crushed powder of ferrous tablets in water

24. Add saw dust in the container and make the paste
25. Take the container selected for encapsulation and fill it upto 3/4th with the prepared paste
26. Fill the remaining part of container with the medium of cement mortar
27. Let the medium dry properly
28. Seal all of the container securely using cement and gravel
29. Send the encapsulated materials to landfill site.

Packaging

30. Make sure that the weights of empty sacks are recorded properly
31. Properly pack each waste item in separate sacks according to waste category.

Quantifying

32. Weigh all of the sacks separately in the weighing machine.
33. Make sure that the weights are recorded on the record sheet.
34. Send all the recyclable waste for recycling and non-recyclable for landfill site.

16.7. Annex 7: Standard Operating Procedures for the disposal of Sangini Injectables

General Preparation

1. Change into the uniform separated for working
2. If another person did the last shift, check log for any comments or problems. Take any follow up action within your reach.
3. Put on necessary personal protective equipment (Full sleeve apron, cap, mask, gloves, etc.)

Note:

- Report the problems to the supervisor so that the problems can be solved by responsible person.
- Carefully handle the chemicals and machineries

Quantification

4. Sort and take out a cartoon/box of Sangini Injectable from the storage area.
5. Carefully place the cartoon/box on the weighing machine
6. Make sure that the weight of the cartoon is recorded properly.
7. Transfer the cartoon/box to the separation area

Separation

8. Check for the packaging of the cartoon.
9. Remove the packaging material if present
10. Uncover/dismantle the cartoon/box.
11. Separate the consumer pack into thick paper, thin paper, plastic, syringes and vials.
12. Separate the vials into aluminum, rubber and medroxyprogesterone (liquid)
13. Collect the medroxyprogesterone (liquid) in a separate container.
14. Send the collected medroxyprogesterone (liquid) for encapsulation.
15. Send aluminum and rubber for packaging.

Needle Destroying

16. Remove the syringe cap from the syringe.
17. Destroy/ cut the needle using needle destroyer/cutter.
18. Place the syringe piston and barrel in a container and send it for packaging.
19. Keep the remaining residues of the needle in other container and send it for encapsulation/ recycling.

Encapsulation

20. Add saw dust in the container containing medroxyprogesterone (liquid) and make paste
21. Take the container selected for encapsulation and fill it upto 3/4th with the prepared paste
22. Fill the remaining part of container with the medium of cement mortar
23. Let the medium dry completely

24. Seal the container securely using cement and gravel

25. Send the encapsulated material to the land fill site

Packaging

26. Make sure that the weights of empty sacks are recorded properly.

27. Properly pack each waste item in separate sacks according to waste category.

Quantifying

28. Weigh all of the sacks separately in the weighing machine.

29. Make sure that the weights are recorded on the record sheet.

Send all the recyclable waste for recycling and non-recyclable waste to land fill site.

16.8. Annex 8: Standard Operating Procedures for the Encapsulation

Logistic Required:

- Personal Protective Equipments
- Container
- Hollow Pipe
- Cement
- Gravel
- Sand
- Net Cutter
- Binding Wire
- Welded Mess
- Water Proofing Compound
- Paper Cutter
- Trowel
- Pan (karai)

General Preparation

1. Change into the uniform separated for working
2. Put on necessary personal protective equipment (Full sleeve apron, cap, mask, gloves, etc.)
3. Check for the required logistic (cement, container, saw dust, gravel etc.)

Preparation of the container:

4. Measure the diameter and the depth of the container.
5. Cut the net/welded mess to fit exactly in the depth of the container.
6. Cut the net/welded mess such that it exactly circles the inner circumference.
7. Mix the cement , gravel and water in a ratio of 1.5:1.5:1 ratio
8. Add about four teaspoon of cement guard.
9. Now insert a hollow pipe in the container with diameter slightly less than the net circling the inner circumference.
10. Add the paste of cement, gravel and water into the container. Make sure that the paste is added out of the hollow pipe inserted.
11. Move the pipe round in few minutes interval.
12. Remove the pipe from the container very slowly.
13. Leave the container for about a day to dry.

These steps prepare a capsule like structure within the container.

Crushing

14. Take out the pills from the storage area.
15. Carefully crush the pills with the help of a crusher.
16. Record the weight of the pills.
17. Ensure that all the pills are crushed.
18. Carefully put all the crushed powder of the pills in one container.

Dilution

19. Carefully put the required solvent as per the weight of the solute
20. Stir the solution with a rod for few minutes.
21. Make sure all the powders are stirred properly.
22. Transfer the solution to the encapsulation area.

Encapsulation

23. Prepare the paste of cement and gravel.
24. Add the solution slowly to the capsule in the container. Ensure that the solution does not overflow.
25. Stir the solution while pouring into the container.
26. Cut the net/welded mess to fit exactly in the mouth of the container.
27. Place the net/welded mess in the container.
28. Add the paste of cement and gravel on the top.
29. Leave the container to dry.

Quantifying

30. Weigh the container after the paste of cement and gravel is dried.
31. Send all the waste for landfill.

16.10. Annex 10: Guest Book Records

Date	Name of Guest	Designation	Organization	Comments/Suggestions
	Anjeeta Shrestha, Moon Pradhan		FHI 360	The method of segregation is excellent. Great job well done.
15th July, 2012	Peter Oyloe, Hare Ram Bhattarai	Country Director Deputy CD	FHI 360	Fantastic job, you are making a difference here in Nepal!!
	Sola Stamm		USAID Health and Family Planning	This is a very fascinating and impressive project. It is very inspiring to see how almost everything has a second use, and how things can be valued even after expiration. It is also very impressive how this initiative is taken as a forefront project-a leading project for others to follow. Thank you so much for having us and for your work.
26th June 2012	Varun Prasad Shrestha	Former Secretary of Government of Nepal	Ministry of Population and Environment	Wonderful and impressive project undertaking from innovative context. Benefits in society by gaining knowledge through the process and checking damages in health care enormous in quantity and areas. In poor countries, always ideas are thrown out but rarely sustainability in terms of safety and secured wise are rarely incorporated and monitored. Besides misuse of these condoms, pills are smuggled for economic and from benefits. Thereby, ruining health-long term unorganized diseases, ultimately bringing unhealthy relations among all stakeholders. I wish further works in Awareness and women working in this project can be highlighted for population management, women empowerment causes. Best regards to team leader, all members and supporters of this endeavor.
15th July, 2012	Terrence Thompson	Senior Environmental Health Advisor	WHO Nepal	Thank you for the visit. The project is well planned, well organized and well implemented. Best wishes for successful completion of the project.