BIO4HUMAN

D5.1 Data collection from partners: state-of-the art and innovative solution

Annex 1: Reference scenario Life cycle Inventories

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Kits

Table 1. Data modelling for the Food basket

Food basket Items modelling					
Item	**Material**	**Quantity**	**Material dataset**	**Process dataset**	**Packaging dimensions**
Wheat flour	Wheat Flour	60 kg	Wheat flour {RoW}| wheat grain processing, dry milling | Cut-off, U	-	**Primary** : PE liner for 60 kg **Secondary** : PP woven for 60 kg **Tertiary :** Tape + Wooden pallets
Local rice	Non-Basmati rice	29 kg	Rice, non-basmati {IN-RoW-CN}| rice production, non-basmati | Cut-off, U	-	**Primary :** PE liner for 40 kg **Secondary :** PP woven for 40 kg **Tertiary :** Wooden pallets
Vegetable oil	Soybean 50% and Palm oil 50%	2*3 L	**Soybean oil:** Vegetable oil, refined {GLO}| soybean oil, refined, to generic market for vegetable oil, refined | Cut-off, U **Palm oil:** Vegetable oil, refined {GLO}| palm oil, refined, to generic market for vegetable oil, refined | Cut-off, U	-	**Primary :** 2 * 3L HDPE jerrycans **Secondary :** Carton boxes for 2*3 L + Tape **Tertiary :** Wooden pallets
Pulses	Lentil 33% , Red kidney bean 16.5% , Navy bean 16.5% , Pea 33%	14 kg	**Red bean:** Red kidney bean {RoW}| red kidney bean production | Cut-off, U **Navy bean:** Navy bean {RoW}| navy bean production | Cut-off, U **Lentil:** Lentil {RoW}| lentil production | Cut-off, U **Pea:** Protein pea {RoW}| protein pea production | Cut-off, U	-	**Primary** : PE liner for 15 kg **Secondary :** PP woven bag for 15 kg **Tertiary:** Tape + Wooden pallets
Salt	Sea Salt	1 kg	Salt {GLO}| salt production from seawater, evaporation pond | Cut-off, U	-	**Primary** : PE liner for 4.5 kg **Secondary :** PP woven bag for 4.5 kg **Tertiary :** Tape + Wooden pallets
Sugar	Sugar beet 50% and sugar cane sugar 50%	6 kg	**Sugar beet sugar:** Sugar, from sugar beet {RoW}| beet sugar production | Cut-off, U **Sugarcane sugar:** Sugar, from sugarcane {RoW}| sugarcane processing, traditional annexed plant | Cut-off, U	-	**Primary :** PE liner for 6 kg **Secondary :** PP woven bag for 6 kg **Tertiary :** Tape + Wooden pallets

RUTF (REM)	Peanut 30%, Palm oil 20%, Sugar 30%, Dry milk powder 20%	92 g / person / day * 30 day / month * (7 person / family) = 19 kg	**Peanut:** Peanut {RoW}| peanut production | Cut-off, U **Oil:** Vegetable oil, refined {GLO}| palm oil, refined, to generic market for vegetable oil, refined | Cut-off, U **Sugar:** Sugar, from sugarcane {RoW}| sugarcane processing, traditional annexed plant | Cut-off, U **Milk powder:** Cow milk {RoW}| milk production, from cow | Cut-off, U	**Milk evap:** Evaporation of milk {RoW}| milk evaporation | Cut-off, U **Spray drying:** Spray-drying of milk {RoW}| milk spray-drying | Cut-off, U	**Primary:** 210 Metallized sachets **Secondary :** 150*100 Carton boxes + Tape **Tertiary :** Wooden pallets

Table 2.Packaging modelling for Food basket

Food basket Packaging Inventory						
Packaging	**Type of packaging**	**.Material**	**Dimension (example)**	**Quantity (Weight)**	**Material dataset**	**Process dataset**
PE Liner	Primary	High-density Polyethylene	10-15 kg: W: 40cm L: 55 cm	39 g/u	Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
PP Bag	Secondary	Polypropylene	10-15 kg:W: 40cm L: 55 cm	37 g/u	Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
Cardboard boxes	Secondary	Cardboard	2* 3L boxes: 30*20*10cm 700g/m2	Area * density = (2*30*20 +2*30*10+ 2*20*10)* 0.07g/cm2 = 0.154kg	Corrugated board box {RoW}| corrugated board box production | Cut-off, U	-

Metallized sachets[1]	Primary	PET/ METPET/ PE (23%, 23%, 54%)	10cm * 15cm * 2cm Capacity of 92g of RUTF	~5 g/u	**PET:** Polyethylene terephthalate, granulate, amorphous {RoW}| polyethylene terephthalate production, granulate, amorphous | Cut-off, U **PE:** Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U **METPET:** 0.5% Aluminium, primary, ingot {RoW}| market for aluminium, primary, ingot | Cut-off, U + 99.5% Polyethylene terephthalate, granulate, amorphous {RoW}| polyethylene terephthalate production, granulate, amorphous | Cut-off, U	Extrusion, co-extrusion {RoW}| extrusion, co-extrusion of plastic sheets | Cut-off, U **METPET** Selective coat, copper sheet, physical vapour deposition {RoW}| selective coating, copper sheet, physical vapour deposition | Cut-off, U **Shaping** Electricity, medium voltage {GLO}| market group for electricity, medium voltage I ad| Cut-off, U**Error! Bookmark not defined.**
Tape	Tertiary	PVC film 50%, rubber adhesive 10%, Plasticizers 26%, CaCO3, 14%	Box 30*20*10cm Thickness: 65 micrometres Width : 5cm 2 bands do the whole tour Density : 1.35g/cm3	Object perimeter on both sides * width * thickness * density = (30*2 + 10*2 + 20*2 + 10*2) * 5 * 65E-03 * 1,35 = 61.425g	**PVC film :** Polyvinylidenchloride, granulate {RoW}| market for polyvinylidenchloride, granulate | Cut-off, U **Rubber resin :** Synthetic rubber {GLO}| market for synthetic rubber | Cut-off, U **Plasticizers :** Chemical, organic {GLO}| market for chemical, organic | Cut-off, U **CaCO3 :** Calcium carbonate, precipitated {RoW}| market for	**PVC Film :** Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U **Rubber adhesive :** Acrylic binder, with water, in 54% solution state {RoW}| market for acrylic binder, with water, in 54%

[1] https://www.unicef.org/supply/media/18021/file/S0000240-RUTF-specification.pdf

					calcium carbonate, precipitated | Cut-off, U	solution state | Cut-off, U **Extrusion-coating PVC+adhesive**[Error! Bookmark not defined.] Heat, central or small-scale, natural gas {RER}| market group for heat, central or small-scale, natural gas | Cut-off, U Electricity, medium voltage {RER}| market group for electricity, medium voltage | Cut-off, U
Wooden Pallet	Tertiary	Wooden pallets			EUR-flat pallet {RoW}| EUR-flat pallet production | Cut-off, U	-

Table 3. Data modelling for the Agriculture Kit

Agriculture Kit Items Inventory					
Item	**Material**	**Quantity**	**Material dataset**	**Process dataset**	**Packaging dimensions**
Crop seeds	Maize seeds	10kg	Maize seed, organic, at farm {GLO}| market for maize seed, organic, at farm | Cut-off, U	-	**Primary** : PE liner for 10kg bag **Secondary** : PP Bag 10kg **Tertiary** : Tape + wooden pallet Asia Pallet
Vegetable seeds	7 types of vegetables : Asparagus, Carrot, Onion, potato, Pea, Tomato	200g of each	**Carrot :** Carrot seed, for sowing {GLO}| market for carrot seed, for sowing | Cut-off, S **Tomato :** Tomato seedling, for planting {GLO}| market for tomato seedling, for planting | Cut-off, U **Onion :** Onion seedling, for planting {GLO}| market for onion seedling, for planting | Cut-off, U **Asparagus :** Asparagus seedling, for planting {GLO}| market for asparagus seedling, for planting | Cut-off, U **Potato :** Potato seed, at farm {GLO}| market for potato seed, at farm | Cut-off, U **Pea :** Pea seed, for sowing {GLO}| market for pea seed, for sowing | Cut-off, U	-	**Primary** : 7 PE liner for 200g bag **Secondary** : 7 PP Bag 200g **Tertiary** : Carboard boxes 20*15*8cm + Tape + wooden pallet Asia Pallet
Hoe	Carbon forged steel for head, wood for handle	1,4kg for the head, 1kg for the handle	**Head:** Steel, low-alloyed {RoW}| steel production, electric, low-alloyed | Cut-off, U **Handle:** Sawnwood, hardwood, dried (u=10%), planed {RER}| market for sawnwood, hardwood, dried (u=10%), planed | Cut-off, U	-	**Primary** : - **Secondary** : Cardboard for head (25*20*5cm) + for handle (140*5*5 cm) **Tertiary** : Tape + wooden pallet Asia Pallet

Rake	Carbon forged steel for head, wood for handle	0,4kg for head, 1kg for handle	**Head:** Steel, low-alloyed {RoW}| steel production, electric, low-alloyed | Cut-off, U **Handle:** Sawnwood, hardwood, dried (u=10%), planed {RER}| market for sawnwood, hardwood, dried (u=10%), planed | Cut-off, U	-	**Primary** : - **Secondary** : cardboard box for head (25*20*5cm) + for handle (140*5*5 cm) **Tertiary** : Tape + wooden pallet Asia Pallet
Spools of twine	Nylo 6.6	0.5kg per spool	Nylon 6-6 {RoW}| nylon 6-6 production | Cut-off, U	-	**Primary** : - **Secondary** : cardboard box (10*10*10cm) **Tertiary** : Tape + wooden pallet Asia Pallet
Filament	Nylon 6.6	0.2kg	Nylon 6-6 {RoW}| nylon 6-6 production | Cut-off, U	-	**Primary** : - **Secondary** : cardboard box (10*10*10cm) **Tertiary** : Tape + wooden pallet Asia Pallet
Box of hook	hook in Carbon steel, box in PP	0.2kg	**Box :** Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U **Hook :** Steel, low-alloyed {RoW}| steel production, electric, low-alloyed | Cut-off, U	**Box :** Injection moulding {RoW}| injection moulding | Cut-off, U	**Primary** : - **Secondary** : cardboard box (10*10*10cm) **Tertiary** : Tape + wooden pallet Asia Pallet
Fertiliser	Diammonium phosphate - widely used phosphorus fertilizer. Urea is a nitrogen fertiliser	10kg, 50% DAP, 50% Urea	**DAP** : Inorganic phosphorus fertiliser, as P2O5 {RoW}| market for inorganic phosphorus fertiliser, as P2O5 | Cut-off, U **Urea** : Inorganic nitrogen fertiliser, as N {RoW}| market for inorganic nitrogen fertiliser, as N | Cut-off, U	-	**Primary** : PE liner for 10kg bag **Secondary** : PP Bag 10kg **Tertiary** : Tape + wooden pallet Asia Pallet

Table 4. Packaging modelling for Agriculture Kit

Agriculture Kit Packaging Inventory						
Packaging	**Type of packaging**	**Material**	**Dimensions (example)**	**Quantity**	**Material dataset**	**Process dataset**
PE liner	Primary	HDPE	10kg bag = 40*55*50cm 80 microns thickness	Thickness * Area * density PE = 80* 10E-4cm* (2*40*55 +2*55*50+ 2*50*40)* 0.950g/cm3 = 0.105kg	Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
PP Bag	Secondary	PP	10kg bag = 40*55*50cm 100 microns thickness	Thickness * Area * density PE = 100* 10E-4cm* (2*40*55 +2*55*50+ 2*50*40)* 0.910g/cm3 = 0.126kg	Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
Cardboard boxes	Secondary or tertiary	Cardboard	Box 30*20*10cm 700g/m2	Area * density = (2*30*20 +2*30*10+ 2*20*10)* 0.07g/cm2 = 0.154kg	Corrugated board box {RoW}| corrugated board box production | Cut-off, U	-
Tape	Tertiary	PVC film 50%, rubber adhesive 10%, Plasticizers 26%, CaCO3, 14%	Box 30*20*10cm Thickness: 65 micrometer Width : 5cm 2 bands do the whole teur Density : 1.35g/cm3	Object perimeter on both sides * width * thickness * density = (30*2 + 10*2 + 20*2 + 10*2) * 5 * 65E-03 * 1,35 = 61.425g	**PVC film :** Polyvinylidenchloride, granulate {RoW}| market for polyvinylidenchloride, granulate | Cut-off, U **Rubber resin :** Synthetic rubber {GLO}| market for synthetic rubber | Cut-off, U **Plasticizers :** Chemical, organic {GLO}| market for	**PVC Film :** Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U **Rubber adhesive :** Acrylic binder, with water, in 54% solution state {RoW}| market for acrylic binder, with water, in 54% solution state | Cut-off, U

					chemical, organic | Cut-off, U **CaCO3 :** Calcium carbonate, precipitated {RoW}| market for calcium carbonate, precipitated | Cut-off, U	**Extrusion-coating PVC+adhesive**[Error! Bookmark not defined.] Heat, central or small-scale, natural gas {RER}| market group for heat, central or small-scale, natural gas | Cut-off, U Electricity, medium voltage {RER}| market group for electricity, medium voltage | Cut-off, U
Wooden EURO Pallet	Tertiary	Wooden pallets	0.8*1.2*0.44		EUR-flat pallet {RoW}| EUR-flat pallet production | Cut-off, U	-

Table 5. Data modelling for the WASH Kit

WASH Kit Items Inventory					
Item	**Material**	**Quantity**	**Material dataset**	**Process dataset**	**Packaging dimensions**
Water container without logo	LDPE	0.6mm thickness – 10 L – 21*21*27 cm = 0.21kg	Polyethylene, low density, granulate {RoW}| polyethylene production, low density, granulate | Cut-off, U	Blow moulding {RoW}| blow moulding | Cut-off, U	**Primary** : cardboard box for head (25*25*30cm) **Secondary** : - **Tertiary** : Tape + wooden pallet Asia Pallet
Bucket with lid	Bucket in HDPE, lid in LDPE	0.6kg for bucket, 0.15kg for lid	**Bucket :** Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U **Lid :** Polyethylene, low density, granulate {RoW}| polyethylene	**Bucket :** Blow moulding {RoW}| blow moulding | Cut-off, U **Lid :** Injection moulding {RoW}| injection moulding | Cut-off, U	**Primary** : cardboard box for head (35*35*30cm) **Secondary** : - **Tertiary** : PVC Tape + wooden pallet Asia Pallet

			production, low density, granulate | Cut-off, U		
Soap toilet bar wrapped	Soap	0.125kg	Soap {RoW}| soap production | Cut-off, U	-	**Primary** : cardboard box (10*8*5cm) **Secondary** : - **Tertiary** : PVC Tape + wooden pallet Asia Pallet
Water purification tablets	NaDCC - Sodium dichlorois-ocyanurate	33mg per tablets, 50 tablets per unit = 1.65kg	Chemical, inorganic {GLO}| chemical production, inorganic | Cut-off, U	-	**Primary** : aluminium alloy tablets (20g) **Secondary** : cardboard box (10*5*5cm) **Tertiary** : PVC Tape + wooden pallet Asia Pallet
Child potty	PEHD	0.7kg	Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U	Blow moulding {RoW}| blow moulding | Cut-off, U	**Primary** : - **Secondary** : - **Tertiary** : PE film + Tape + wooden pallet Asia Pallet
Multipurpose cloth	100% cotton flannel dark coloured	1m*1.5m with 175g/m2 = 0.26kg	Textile, woven cotton {RoW}| textile production, cotton, weaving | Cut-off, U	Batch dyeing, fibre, cotton {RoW}| batch dyeing, fibre, cotton | Cut-off, U	**Primary** : PP bag (30*40cm) **Secondary** : - **Tertiary** : Tape + wooden pallet Asia Pallet
Reusable menstrual pads set with 2 pad holders, 2 straight pads, 3 winged pads, 1 storage pouch	**Pads (80%) :** Absorbent core (cotton 55%), Bottom layer (cotton 35%), Barrier liner (10%) **Pad holders and Storage pouch (20%)** : Plastic textile	0.3kg	**Absorbant core :** Fibre, cotton {RoW} | fibre production, cotton, ginning | Cut-off, U **Bottom layer :** Textile, woven cotton {RoW}| textile production, cotton, weaving | Cut-off, U **Release liner :** Styrene-acrylonitrile copolymer {GLO}| market for styrene-acrylonitrile copolymer | Cut-off, U	-	**Primary** : cardboard box (20*12*10cm) **Secondary** : - **Tertiary** : Tape + wooden pallet Asia Pallet

			Pad holders and Storage pouch : Textile, nonwoven polypropylene {RoW}| textile production, nonwoven polypropylene, spunbond | Cut-off, U		
Female disposable sanitary pads with wings	Absorbent core (wood pulp 55%), Bottom layer (PP 35%), Barrier liner (Plastic film 10%)	20 units per package, 10g per unit = 0.2kg	**Absorbant core :** Stone groundwood pulp {GLO}| market for stone groundwood pulp | Cut-off, U **Bottom layer :** Textile, nonwoven polypropylene {RoW}| textile production, nonwoven polypropylene, spunbond | Cut-off, U **Release liner :** Styrene-acrylonitrile copolymer {GLO}| market for styrene-acrylonitrile copolymer | Cut-off, U	-	**Primary** : LDPE packaging per pad (10*8cm) **Secondary** : LDPE packaging per package (20*12cm) **Tertiary** : Tape + wooden pallet Asia Pallet
Whistle	Stainless Steel (90%), cord lanyard (10%)	20g	**Stainless steel :** Steel, chromium steel 18/8 {RER}| steel production, electric, chromium steel 18/8 | Cut-off, U **Cord :** Textile, nonwoven polypropylene {RoW}| textile production, nonwoven polypropylene, spunbond | Cut-off, U	**Stainless Steel :** Metal working, average for chromium steel product manufacturing {RoW}| metal working, average for chromium steel product manufacturing | Cut-off, U	**Primary** : cardboard box (5*5*5cm) **Secondary** : - **Tertiary** : Tape + wooden pallet Asia Pallet
Female Underwears set with 3 size S, 3 M and 3 L	Cotton	0.225kg	Textile, knit cotton {RoW}| textile production, cotton, circular knitting | Cut-off, U	-	**Primary** : PP bag (20*10cm) **Secondary** : cardboard box (20*10*5cm) **Tertiary** : Tape + wooden pallet Asia Pallet

Laundry detergent	Concentrated washing powder	1.5kg	Chemical, inorganic {GLO}| chemical production, inorganic | Cut-off, U	-	**Primary** : cardboard box (30*20*10) **Secondary** : **Tertiary** : Tape + wooden pallet Asia Pallet
Guidance on kit use	Paper	0.1kg	Paper, newsprint {RoW}| paper production, newsprint, virgin | Cut-off, U		

Table 6. Packaging modelling for WASH Kit

WASH Kit Packaging Inventory						
Packaging	**Type of packaging**	**Material**	**Dimensions (example)**	**Quantity**	**Material dataset**	**Process dataset**
LDPE liner	Primary	LDPE	10*8*2cm 2mm thickness Density : 0.92g/cm3	Thickness * Area * density LDPE = 0.2*(2*8*10 + 2*8*2 + 2*10*2) * 0.92 = 42g	Polyethylene, low density, granulate {RoW}| polyethylene production, low density, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
PP Bag	Primary	PP	For 10kg bag = 40*55*50cm 100 microns thickness	Thickness * Area * density PP = 100* 10E-4cm* (2*40*55 + 2*55*50 + 2*50*40) * 0.910g/cm3 = 0.126kg	Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
Cardboard boxes	Primary, Secondary or tertiary	Cardboard	Box 30*20*10cm 700g/m2	Area * density = (2*30*20 +2*30*10+ 2*20*10)* 0.07g/cm2 = 0.154kg	Corrugated board box {RoW}| corrugated board box production | Cut-off, U	-
Aluminium tablets	Primary	Aluminium		20g	Aluminium collector foil, for Li-ion battery {GLO}| aluminium collector foil	

					production, for Li-ion battery | Cut-off, U	
Tape	Tertiary	PVC film 50%, rubber adhesive 10%, Plasticizers 26%, CaCO3, 14%	Box 30*20*10cm Thickness: 65 micrometer Width : 5cm 2 bands Density : 1.35g/cm3	Object perimeter on both sides * width * thickness * density = (30*2 + 10*2 + 20*2 + 10*2) * 5 * 65E-04 * 1,35 = 6.1425g	**PVC film :** Polyvinylidenchloride, granulate {RoW}| market for polyvinylidenchloride, granulate | Cut-off, U **Rubber resin :** Synthetic rubber {GLO}| market for synthetic rubber | Cut-off, U **Plasticizers :** Chemical, organic {GLO}| market for chemical, organic | Cut-off, U **CaCO3 :** Calcium carbonate, precipitated {RoW}| market for calcium carbonate, precipitated | Cut-off, U	**PVC Film :** Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U **Rubber adhesive :** Acrylic binder, with water, in 54% solution state {RoW}| market for acrylic binder, with water, in 54% solution state | Cut-off, U
Wooden Asia Pallet	Tertiary	Wooden pallets	1.1*1.1*0.144m		EUR-flat pallet {RoW}| EUR-flat pallet production | Cut-off, U	-

Table 7. Data modelling for the Non-Food Item (NFI) Kit

NFI Kit Items Inventory					
Item	**Material**	**Quantity**	**Material dataset**	**Process dataset**	**Packaging dimensions**
Plastic sheet / tarpaulin	HDPE laminated with LDPE on both sides	2X 4*5m (190g/m2)	Polyethylene, high density, granulate {GLO}| market for polyethylene, high density, granulate | Cut-off, U	Extrusion, plastic film {GLO}| market for extrusion, plastic film | Cut-off, U	**Primary:** Polyester Straps (5 items) **Secondary:** - **Tertiary:** Wooden Pallets
Sleeping mat	Polyester fibres	3X 1,8*0,9m (500 g/m2)	Fibre, polyester {GLO}| market for fibre, polyester | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, S	**Primary:** Polyester Straps (25 items) **Secondary:** - **Tertiary:** Wooden Pallets
Blankets	Polyester fibres	3X 1,5*2m (510 g/m2)	Fibre, polyester {GLO}| market for fibre, polyester | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, U	**Primary:** Plastic film + PP woven bag + Polyester straps (20 items) **Secondary:** - **Tertiary:** Wooden Pallets
Jerrycans	LDPE	2X 21*21*27cm (200 g/u)	Polyethylene, low density, granulate {GLO}| market for polyethylene, low density, granulate | Cut-off, U	Blow moulding {GLO}| market for blow moulding | Cut-off, U	**Primary:** Carton boards (50 items) **Secondary:** - **Tertiary:** Wooden Pallets
Solar lamp / Torch light	Battery (15%) – Diiode (2%) – Electronics (15%) – Plastics (68%)	1X 0.2kg for the whole lamp	**Battery :** Battery, NiMH, rechargeable, prismatic {GLO}| battery production, NiMH, rechargeable, prismatic | Cut-off, U **Diode :** Light emitting diode {GLO}| light emitting diode production | Cut-off, U **Electronics :** Printed wiring board, surface mounted,	**Plastics :** Injection moulding {RER}| injection moulding | Cut-off, U	**Primary** : cardboard box (35*35*30cm) **Secondary** : **Tertiary** : PVC Tape + wooden pallet Asia Pallet

			unspecified, Pb containing {GLO}| printed wiring board production, surface mounted, unspecified, Pb containing | Cut-off, U **Plastics :** Polypropylene, granulate {RER}| polypropylene production, granulate | Cut-off, U		
Mosquito net	Polyester with mosquito repellents coating	2X 1,8*1,6*1,6 m if rectangle or 10,5*2,2m if cylinder (30g/m2)	**Polyester:** Fibre, polyester {GLO}| market for fibre, polyester | Cut-off, U **Pesticide:** Pesticide, unspecified {GLO}| market for pesticide, unspecified | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, U	**Primary:** PE liner + plastic straps (for 100 items) **Secondary:** - **Tertiary:** Wooden Pallets
Family tent		~55 kg			**Primary:** Polycotton canva (2.3 m*1m) **Secondary:** Master bundle (2.25m*0.4m PE 180g/m2) **Tertiary:** Wooden Pallets
Tent	40% cotton/60% Polyester		**Polyester:** Fibre, polyester {GLO}| market for fibre, polyester | Cut-off, U Yarn, cotton {GLO}| market for yarn, cotton | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, U	
Mud flaps			Polyethylene, high density, granulate {GLO}| market for polyethylene, high density, granulate | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, U	
Mosquito nets			**Polyester:** Fibre, polyester {GLO}| market for fibre, polyester | Cut-off, U **Pesticide:** Pesticide, unspecified {GLO}| market for pesticide, unspecified | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, U	

Ground floor sheet			Polyethylene, high density, granulate {GLO}| market for polyethylene, high density, granulate | Cut-off, U	Weaving, synthetic fibre {GLO}| market for weaving, synthetic fibre | Cut-off, S	
Kitchen Sets		~ 6.8 kg			**Primary Packaging:** - **Secondary Packaging:** Cardboard **Tertiary Packaging:** PE + Tape + Pallet
Bowls, Cooking pot (with lid), cup, frying pan, Plates, Serving ladle, serving spoons, table knives, table forks, tablespoons,			Steel, chromium steel 18/8 {GLO}| market for steel, chromium steel 18/8 | Cut-off, U	Metal working, average for chromium steel product manufacturing {GLO}| market for metal working, average for chromium steel product manufacturing | Cut-off, U	
Knife			**Steel:** Steel, chromium steel 18/8 {GLO}| market for steel, chromium steel 18/8 | Cut-off, U **PP:** Polypropylene, granulate {GLO}| market for polypropylene, granulate | Cut-off, U	Metal working, average for chromium steel product manufacturing {GLO}| market for metal working, average for chromium steel product manufacturing | Cut-off, U Injection moulding {GLO}| market for injection moulding | Cut-off, U	
Wire scouring pad			Steel, chromium steel 18/8 {GLO}| market for steel, chromium steel 18/8 | Cut-off, U	Wire drawing, steel {GLO}| market for wire drawing, steel | Cut-off, U	

Table 8. Packaging modelling for NFI Kit

NFI Kit Packaging Inventory					
Packaging	**Type of packaging**	**Material**	**Quantity for example**	**Material dataset**	**Process dataset**
PE liner/film	Primary	Polyethylene	For 10kg bag:	Polyethylene, high density, granulate {RoW}| polyethylene production, high density, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
PP Bag	Secondary	Polypropylene		Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U	Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U
Cardboard boxes	Secondary	Unbleached Cardboard	30 x 30 x 20 cm 700 g/m2	Corrugated board box {RoW}| corrugated board box production | Cut-off, U	-
Tape	Tertiary	PVC film 50%, rubber adhesive 10%, Plasticizers 26%, CaCO3, 14%	Box 30*20*10cm Thickness: 65 micrometer Width : 5cm 2 bands Density : 1.35g/cm3	**PVC film :** Polyvinylidenchloride, granulate {RoW}| market for polyvinylidenchloride, granulate | Cut-off, U **Rubber resin :** Synthetic rubber {GLO}| market for synthetic rubber | Cut-off, U **Plasticizers :** Chemical, organic {GLO}| market for chemical, organic | Cut-off, U **CaCO3 :** Calcium carbonate, precipitated {RoW}| market for calcium carbonate, precipitated | Cut-off, U	**PVC Film :** Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U **Rubber adhesive :** Acrylic binder, with water, in 54% solution state {RoW}| market for acrylic binder, with water, in 54% solution state | Cut-off, U
Wooden Asia Pallet	Tertiary	Wooden pallets		EUR-flat pallet {RoW}| EUR-flat pallet production | Cut-off, U	

Logistic scenarios

For the **Food basket,** these sources were used to identify specific origins and transportation distances, as detailed in the table below. For **other Kits**, Ecoinvent's general market datasets were utilized, which provide average material transportation distances to consumers. While these averages offer a generalized rather than exact estimate due to the complexities of tracing individual materials, they represent the best available data. Notably, the upstream transportation of raw materials for kit production is inherently included in the Ecoinvent datasets and, therefore, incorporated into the overall assessments, though not itemized separately in the table.

Regarding transportation distances, the origins of materials are typically India, China, or Uganda. Most components arriving from overseas were estimated to be transported to the port of Mombasa, Kenya. Following this, they are transported by road to Juba, South Sudan or Kinshasa, DRC, which serves as the final destination for the aid.

Table 9. Logistics routes for the Food basket

Item	Origin - share	Distance (km)	Transport dataset *
Flour	Kampala (Uganda) 100%	636*1= **636**	Lorry
Pulses	Kampala (Uganda) 100%	636*1= **636**	Lorry
Rice	Shanghai (China) 50% Mumbai (India) 7% Kampala (Uganda) 43%	11523 *0.5+4445*0.07= **6072**	Ship
		1168*0.57+636*1= **1301**	Lorry
RUTF	Rouen (France) 100%	11349*1= **11349**	Ship
		1168*1+636*1= **1804**	Lorry
Salt	Kampala (Uganda) 100%	636*1= **636**	Lorry
Sugar	Kandala (Somalia) 16% Shanghai 47% Mombasa 10% Kampala 27%	11523*0.47= **5415**	Ship
		4494*0.16+1168*0.73+636*1= **2207**	Lorry
Vegetable Oil	Kampala (Uganda) 100%	636*1= **636**	Lorry

**** Lorry:** Transport, freight, lorry >32 metric ton, EURO5 {RoW}| market for transport, freight, lorry >32 metric ton, EURO5 | Cut-off, U **Ship:** Transport, freight, sea, container ship {GLO}| transport, freight, sea, container ship | Cut-off, U*

Transportation logistics for the packaging of the aforementioned items were modelled separately. This approach accounts for packaging materials being imported to the country of food origin, where they are assembled with the food products and then, they are shipped to final destinations. So, the closest market dataset was used for transportation of packaging to the manufacturer of food products and then a separate transportation included from the food manufacturer to the country of origin.

End-of-Life

As previously discussed in part **Error! Reference source not found.**, the end-of-life scenarios considered in the two studied countries include open dumping, controlled dumping sites (treated as landfills), recycling, and composting. The inventories listed below are used to model the end-of-life processes for the reference scenarios.

Collection of Waste

From page 84 in the D3.3 10% of the waste is collected, and an average distance to controlled dumpsite is from 40km in DRC based on the Mpasa household waste landfill[2] and 14km in South Sudan based on Juba controlled dumping site[3]

Open Dump

Ecoinvent 3.10 offers several open-dump datasets, which vary based on the material type and the infiltration class. The available infiltration classes are summarized in the table below and, according to the dataset documentation, are determined by the mean annual precipitation.

Table 10. Ecoinvent dataset description for open dump

Infiltration class	Infiltration (mm/year)	Mean Annual precipitation (mm/year)	Leachate residence time (years)
1 : hyperarid	-250	350	7.01
2 : dry	100	550	17.5
3 : moist	300	900	5.84
4 : wet	500	1100	3.5
5 : very wet	1000	1900	1.75

To select the appropriate infiltration classes for the studied countries, annual precipitation data were consulted[4]. In 2024, the mean annual precipitation in South Sudan was found to be 763 mm/year, corresponding to the 'moist' infiltration class. For the Democratic Republic of Congo (DRC), the mean annual precipitation in 2024 was 1279 mm/year, corresponding to the 'wet' infiltration class."

The following table summarizes the datasets used to model the open-dump end-of-life scenarios in the two countries, based on the type of waste.

Table 11. Open Dump datasets per type of waste for the two countries studied

Country	Type of waste	Dataset
South Sudan	Municipal solid waste	Municipal solid waste {GLO}| treatment of municipal solid waste, open dump, moist infiltration class (300mm) | Cut-off, U
	Paperboard	Waste paperboard {GLO}| treatment of waste paperboard, open dump, moist infiltration class (300mm) | Cut-off, U

[2] Antea Group - Solid waste collection in Kinshasa, Democratic Republic of the Congo https://int.anteagroup.com/projects/solid-waste-collection-in-kinshasa#87043
[3] African Clean Cities – Juba juba_en.pdf
[4] Our World in Data - Annual precipitation, 2024

	Plastic, mixture	Waste plastic, mixture {GLO}| treatment of waste plastic, mixture, open dump, moist infiltration class (300mm) | Cut-off, U
	Polyethylene	Waste polyethylene {GLO}| treatment of waste polyethylene, open dump, moist infiltration class (300mm) | Cut-off, U
	Polypropylene	Waste polypropylene {GLO}| treatment of waste polypropylene, open dump, moist infiltration class (300mm) | Cut-off, U
	Polyvinylchloride	Waste polyvinylchloride {GLO}| treatment of waste polyvinylchloride, open dump, moist infiltration class (300mm) | Cut-off, U
DRC	Municipal solid waste	Municipal solid waste {GLO}| treatment of municipal solid waste, open dump, wet infiltration class (500mm) | Cut-off, U
	Paperboard	Waste paperboard {GLO}| treatment of waste paperboard, open dump, wet infiltration class (500mm) | Cut-off, U
	Plastic, mixture	Waste plastic, mixture {GLO}| treatment of waste plastic, mixture, open dump, wet infiltration class (500mm) | Cut-off, U
	Polyethylene	Waste polyethylene {GLO}| treatment of waste polyethylene, open dump, wet infiltration class (500mm) | Cut-off, U
	Polypropylene	Waste polypropylene {GLO}| treatment of waste polypropylene, open dump, wet infiltration class (500mm) | Cut-off, U
	Polyvinylchloride	Waste polyvinylchloride {GLO}| treatment of waste polyvinylchloride, open dump, wet infiltration class (500mm) | Cut-off, U

Controlled dumping (landfill)

Ecoinvent 3.10 offers several landfill datasets that vary based on waste material, infiltration class, and whether the landfill is sanitary or not. Contrary to an open dump, an unsanitary landfill has some minimal management, such as periodic waste covering and organized dumping, but lacks gas capture and leachate control. In contrast, a sanitary landfill is fully engineered, featuring liners, leachate treatment, and gas recovery systems to mitigate environmental impacts. In the Democratic Republic of Congo (DRC) and South Sudan, landfill sites are predominantly unsanitary.

The infiltration class follows the same rules as for open dump datasets in Ecoinvent: "moist" conditions are assigned to South Sudan, and "wet" conditions to the DRC, based on their respective climates and precipitation levels.

The following table summarizes the datasets used to model the open-dump end-of-life scenarios in the two countries, based on the type of waste.

Table 12. Landfill datasets per type of waste for the two countries studied

Country	Type of waste	Dataset
South Sudan	Municipal solid waste	Municipal solid waste {GLO}| treatment of municipal solid waste, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
	Paperboard	Waste paperboard {GLO}| treatment of waste paperboard, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
	Plastic, mixture	Waste plastic, mixture {GLO}| treatment of waste plastic, mixture, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
	Polyethylene	Waste polyethylene {GLO}| treatment of waste polyethylene, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
	Polypropylene	Waste polypropylene {GLO}| treatment of waste polypropylene, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
	Polyvinylchloride	Waste polyvinylchloride {GLO}| treatment of waste polyvinylchloride, unsanitary landfill, moist infiltration class (300mm) | Cut-off, U
DRC	Municipal solid waste	Municipal solid waste {GLO}| treatment of municipal solid waste, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U
	Paperboard	Waste paperboard {GLO}| treatment of waste paperboard, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U
	Plastic, mixture	Waste plastic, mixture {GLO}| treatment of waste plastic, mixture, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U
	Polyethylene	Waste polyethylene {GLO}| treatment of waste polyethylene, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U
	Polypropylene	Waste polypropylene {GLO}| treatment of waste polypropylene, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U
	Polyvinylchloride	Waste polyvinylchloride {GLO}| treatment of waste polyvinylchloride, unsanitary landfill, wet infiltration class (500mm) | Cut-off, U

Recycling

According to B4H Deliverable D3.3, the waste collected by waste pickers and sent for recycling consists mainly of plastics, metals, and aluminium. Based on data from the Joint Initiative, polypropylene (PP) bags represent the largest share of plastic waste, accounting for approximately 70%. For these waste streams, a percentage allocation will be applied, using the following parameters for energy inputs and substitution credits.

Table 13. Recycling datasets per type of waste for the two countries studied

	Energy inputs	Avoided Product credit
Plastic mixture	1.2MJ/kg electricity + 2MJ/kg thermal energy[5]	Polypropylene, granulate {RoW}| polypropylene production, granulate | Cut-off, U (94.5% efficiency)
Aluminium	7MJ electricity + 1MJ thermal energy[6]	Aluminium, primary, ingot {RoW}| aluminium production, primary, ingot | Cut-off, U

Compost

Biowaste and garden waste are managed through composting. The ecoinvent database offers composting inventories that vary depending on the waste type and whether the process is home-based or industrial. The following datasets are available:

- Biowaste {RoW}| treatment of biowaste, industrial composting | Cut-off, U
- Biowaste, garden waste {RoW}| treatment of garden biowaste, home composting in heaps | Cut-off, U
- Biowaste, kitchen and garden waste {RoW}| treatment of kitchen and garden biowaste, home composting in heaps and containers | Cut-off, U

Home composting differs from **industrial composting** in scale and process control. It is a small-scale, low-temperature method managed by households, best suited for kitchen and garden waste. In contrast, industrial composting is highly controlled, operates at higher temperatures, and accepts a wider range of organic materials, including compostable plastics like PLA. It also ensures better management of odours, pathogens, and greenhouse gas emissions.

For the bio-based solutions that were marked as industrial composting, LCA partners ensured the compostability of the solutions by asking the compostability certificate following *EN 13432 Requirements for packaging recoverable through composting and biodegradation. test scheme and evaluation criteria for the final acceptance of packaging*. With this certification it is ensure the industrial compostability of the Bio-based solutions[7]. Industrial composting is feasible in this context, since, no specific qualification is needed, and low investment: tractor for the turning of the piles, thermometer and maintain moisture with irrigation. If there is too much heat it can be done with a cover. For this end-of-life option the Ecoinvent database have been selected: *Biowaste {RoW}| treatment of biowaste, industrial composting | Cut-off, U*

[5] https://pubs.rsc.org/en/content/articlelanding/2024/gc/d4gc02594f
[6] https://base-empreinte.ademe.fr/
[7] It should be taken into account that some of the bio-based solutions are not exactly being produced in the market, maybe at other capacities (PLA bottle) or a similar product (fishing net/mosquito tent), so we ensure the materials were industrially compostable, but the final product should also be tested to be industrially compostable.

In the case of home composting, based on an ADEME study[8] "*Impact sanitaire et environmental du compostage domestique*", on compost maturation, the nutrient content of composted kitchen and garden waste depends on stirring frequency and duration. After 6 or 12 months, the nutrient composition is summarized in *Table 14*.

Table 14. Nutrient proportion of kitchen and garden waste depending on time and stirring

Mass proportion nutrients	No stirring – 6 months	No stirring – 1 year	Once a trimester – 6 months	Once a trimester – 1 year
%C organic	31	26.7	24.4	24.9
%N	0.73	1.09	0.83	1.05
%P2O5	0.19	0.41	0.34	0.51
%K2O	0.28	0.47	0.31	0.38

The first option was chosen for conservative purposes.

These values will be used to compare the fertilizing potential of compost with conventional fertilizers in terms of avoided impacts with the following datasets :

- Inorganic nitrogen fertiliser, as N {RoW}| market for inorganic nitrogen fertiliser, as N | Cut-off, U
- Inorganic phosphorus fertiliser, as P2O5 {RoW}| market for inorganic phosphorus fertiliser, as P2O5 | Cut-off, U
- Inorganic potassium fertiliser, as K2O {RoW}| market for inorganic potassium fertiliser, as K2O | Cut-off, U
- Carbon uptake

[8] Impact sanitaire et environnemental du compostage domestique.