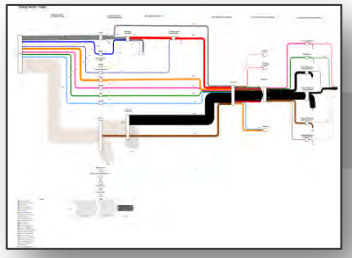
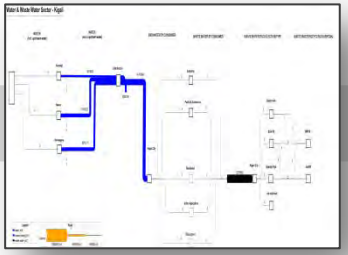
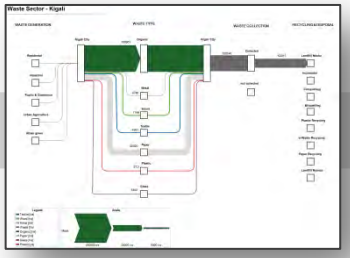
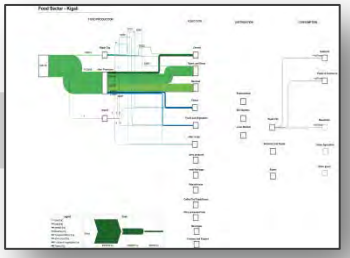
MATERIAL FLOW ANALYSIS (MFA) AS BASIS FOR URBAN PLANNING & RESOURCE MANAGEMENT

RP Stakeholder Conference Kigali 9th November 2016


Energy


Water + Waste Water


Solid Waste


Food

Bernd Franke Christin Zeitz

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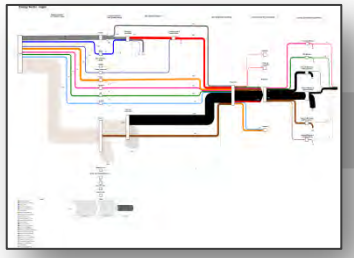
MATERIAL FLOW ANALYSIS FOR THE 4 SECTORS

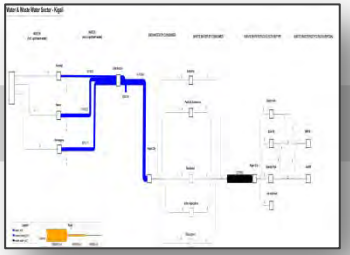
WP 4.1 Material flow analyses (MFA) for supply and disposal sectors

WP 4.2 Analyses of impact on urban quality

WP 4.5 Sector specific resources and potential synergies



Energy



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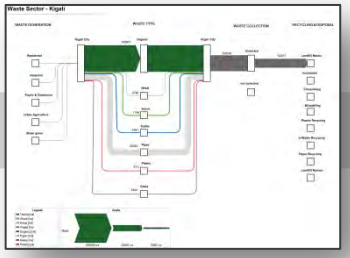

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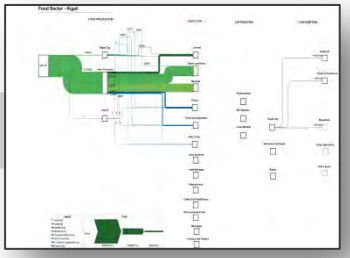

Food

MATERIAL FLOW ANALYSIS FOR THE 4 SECTORS

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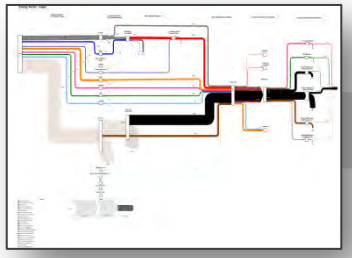
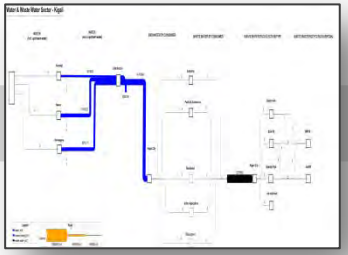
WP 4.2 Analyses of impact on urban quality

WP 4.5 Sector specific resources and potential synergies



Energy



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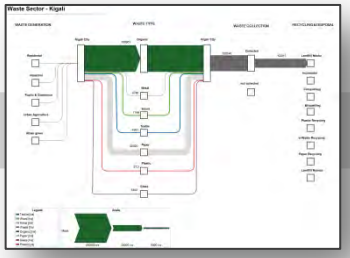
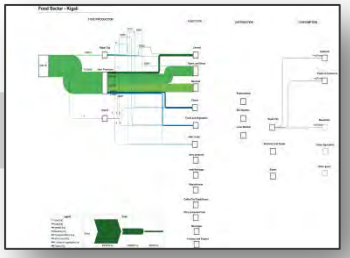
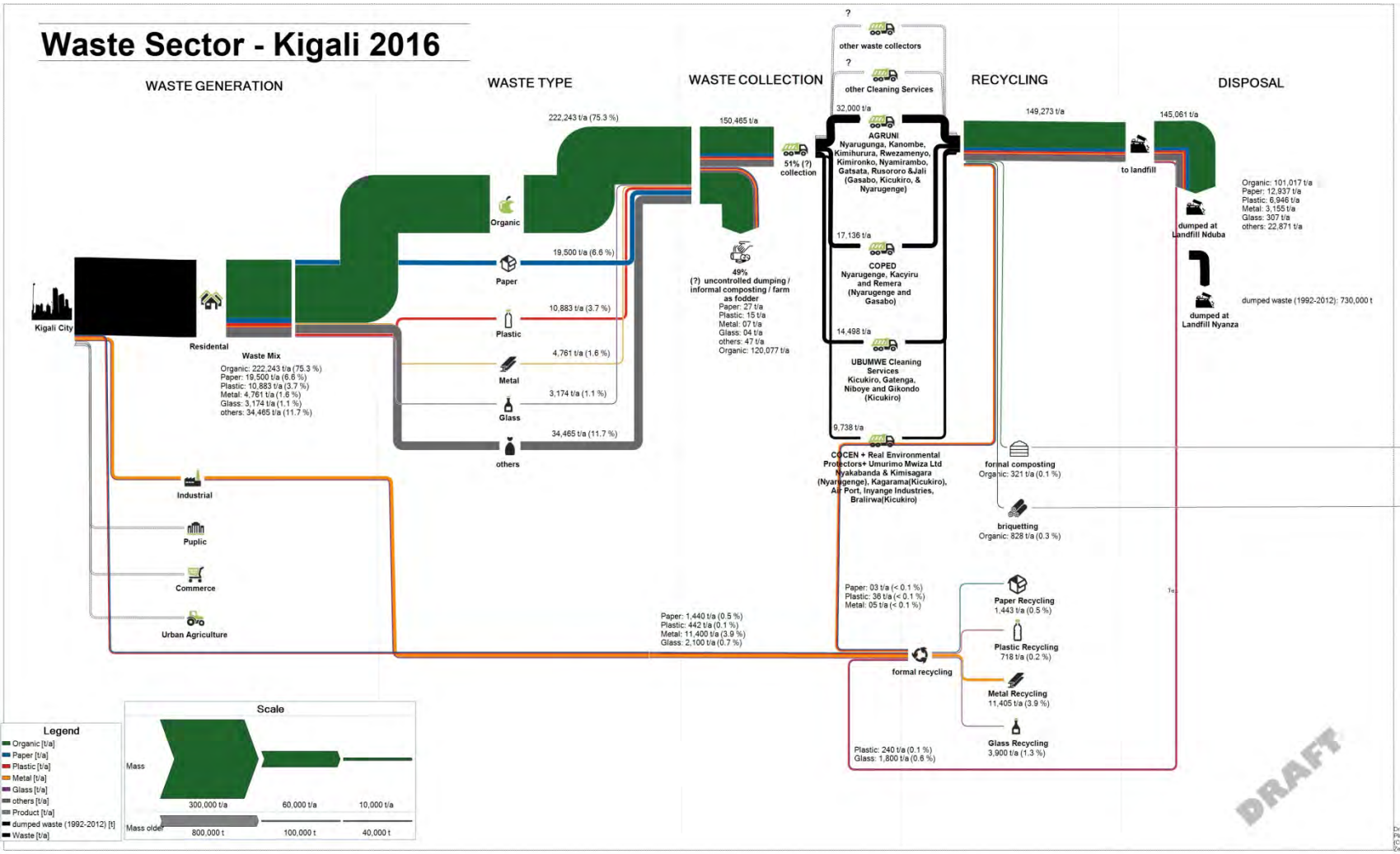


Solid Waste



Food


Waste Sector - Kigali 2016
WASTE GENERATION
WASTE TYPE
WASTE COLLECTION
RECYCLING
DISPOSAL
Kigali City
Residental
Waste Mix
Organic: 222,243 t/a (75.3 %)
Paper: 19,500 t/a (6.6 %)
Plastic: 10,883 t/a (3.7 %)
Metal: 4,761 t/a (1.6 %)
Glass: 3,174 t/a (1.1 %)
others: 34,465 t/a (11.7 %)
Industrial
Puplic
Commerce
Urban Agriculture
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Glass
34,465 t/a (11.7 %)
others
150,465 t/a
51% (?) collection
49%
(?) uncontrolled dumping / informal composting / farm as fodder
Paper: 27 t/a
Plastic: 15 t/a
Metal: 07 t/a
Glass: 04 t/a
others: 47 t/a
Organic: 120,077 t/a
?
other waste collectors
?
other Cleaning Services
32,000 t/a
AGRUNI
Nyarugunga, Kanombe, Kimihurura, Rwezamenyo, Kimironko, Nyamirambo, Gatsata, Rusororo &Jali (Gasabo, Kicukiro, & Nyarugenge)
17,136 t/a
COPED
Nyarugenge, Kacyiru and Remera (Nyarugenge and Gasabo)
14,498 t/a
UBUMWE Cleaning Services
Kicukiro, Gatenga, Niboye and Gikondo (Kicukiro)
9,738 t/a
COCEN + Real Environmental Protectors+ Umurimo Mwiza Ltd Nyakabanda & Kimisagara (Nyarugenge), Kagarama(Kicukiro), Air Port, Inyange Industries, Bralirwa(Kicukiro)
149,273 t/a
to landfill
145,061 t/a
dumped at Landfill Nduba
Organic: 101,017 t/a
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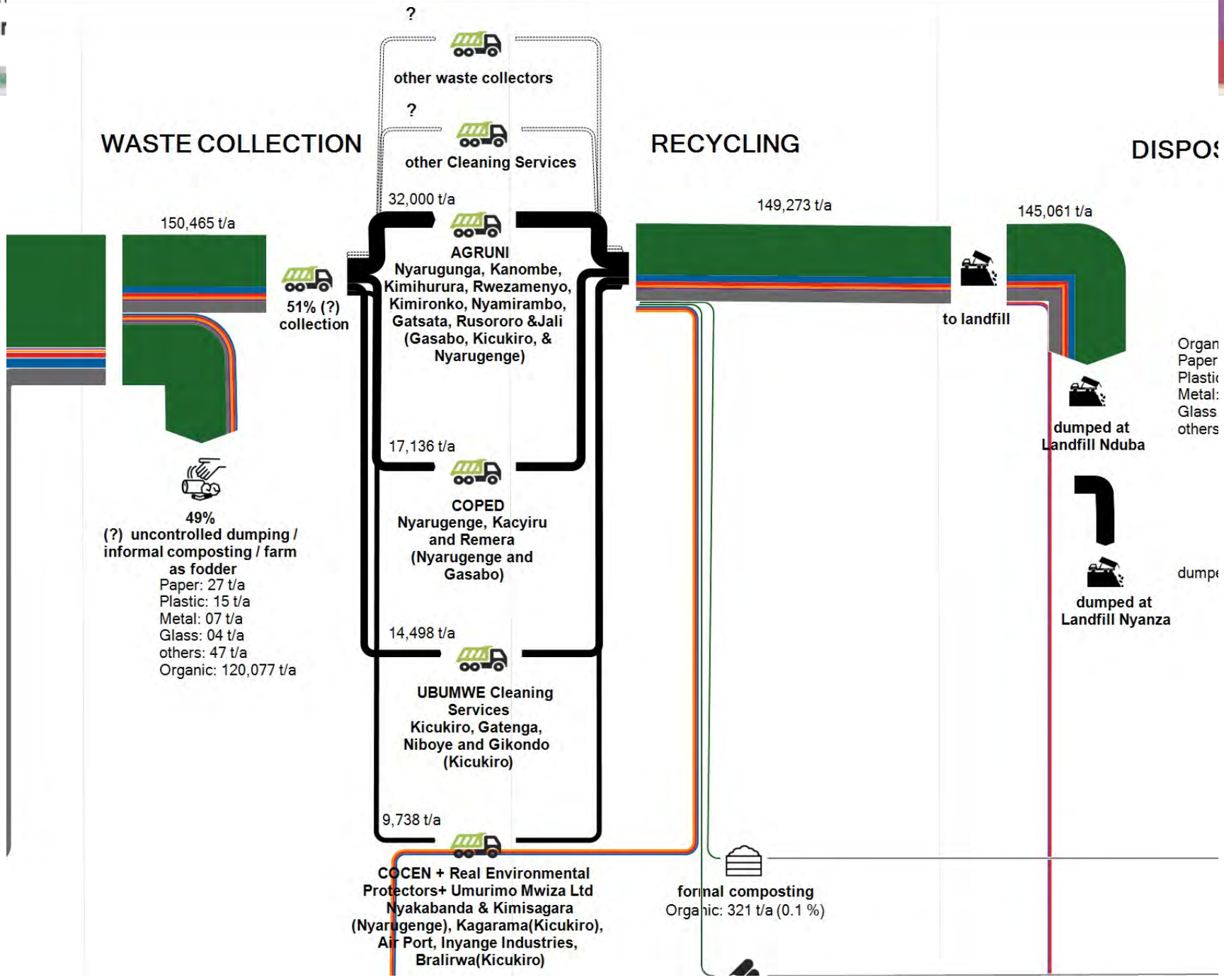
DRAFT
Legend
Organic [t/a]
Paper [t/a]
Plastic [t/a]
Metal [t/a]
Glass [t/a]
others [t/a]
Product [t/a]
dumped waste (1992-2012) [t]
Waste [t/a]
Scale
Mass
300,000 t/a
60,000 t/a
10,000 t/a
Mass older
800,000 t
100,000 t
40,000 t
Draft by Rapid Planning Project (Contact: Christin Zeltz)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Household waste genertion and composition

AGATARE CELL

Socio economi: low income
Building Type: rudimentarty
Urban Structure Type: compact/small
HH size: 7

waste: 0.610 kg/c/d

plastic: 0.006 kg/c/d (1.0 %)
paper: 0.006 kg/c/d (1.0 %)
carton: 0.006 kg/c/d (1.0 %)
glass: 0.006 kg/c/d (1.0 %)
metall: 0.006 kg/c/d (1.0 %)
organic: 0.470 kg/c/d (77.0 %)
other: 0.110 kg/c/d (18.0 %)

BIRYOGO CELL

Socio economi: low income
Building Type: rudimentarty
Urban Structure Type: compact mid size - small
HH size: 7

waste: 0.660 kg/c/d

plastic: 0.013 kg/c/d (2.0 %)
paper: 0.106 kg/c/d (16.0 %)
carton: 0.013 kg/c/d (2.0 %)
glass: 0.000 kg/c/d (0.0 %)
metall: 0.007 kg/c/d (1.0 %)
organic: 0.515 kg/c/d (78.0 %)
other: 0.092 kg/c/d (14.0 %)

KIYOVU CELL

Socio economi: high income
Building Type: luxery villa
Urban Structure Type: open/large - mid
HH size: 5

waste: 0.410 kg/c/d

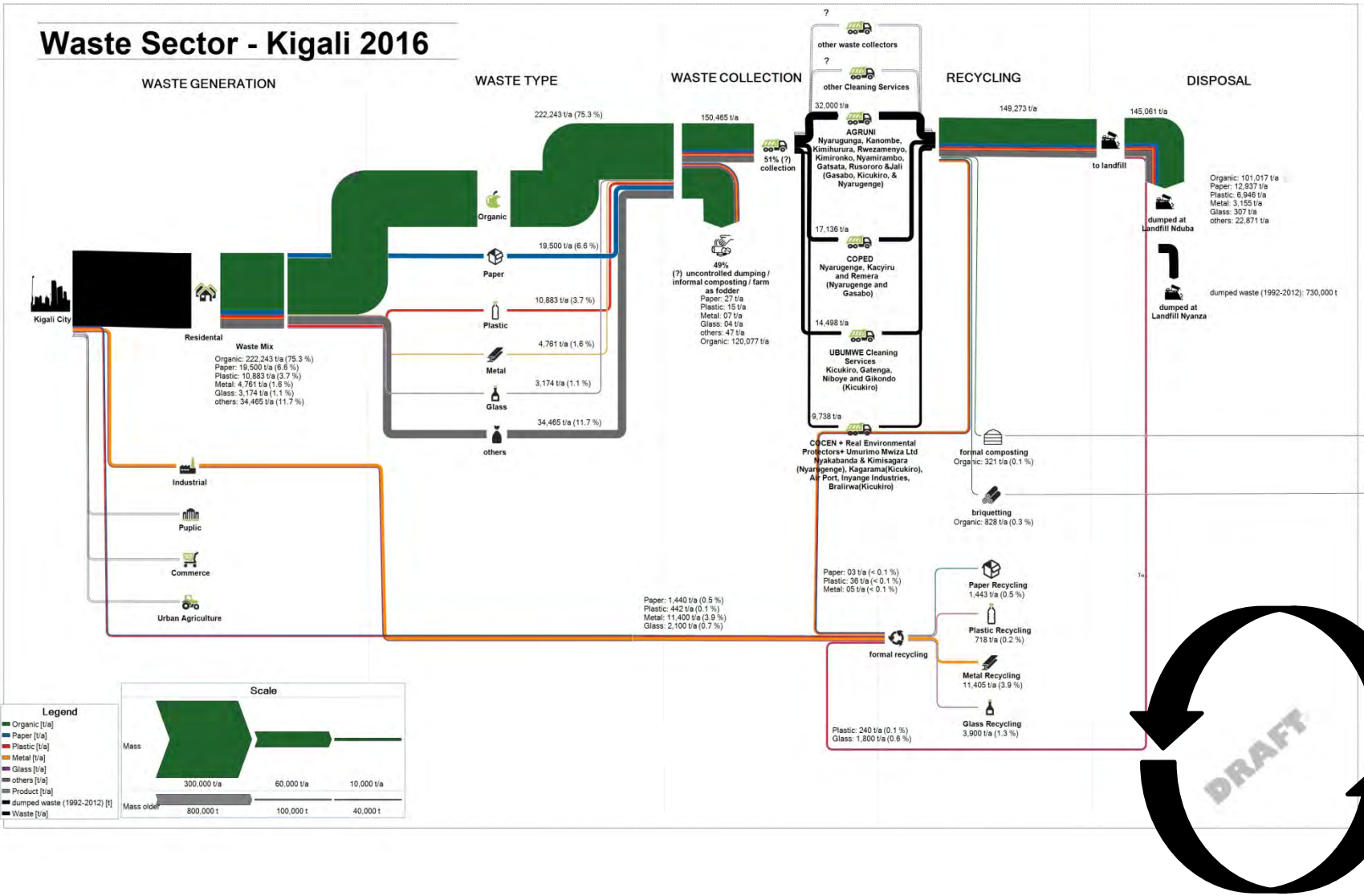
plastic: 0.049 kg/c/d (9.2 %)
paper: 0.152 kg/c/d (28.2 %)
carton: 0.025 kg/c/d (4.6 %)
glass: 0.025 kg/c/d (4.6 %)
metall: 0.012 kg/c/d (2.3 %)
organic: 0.242 kg/c/d (45.0 %)
other: 0.033 kg/c/d (6.1 %)

+

USTs Kigali: SVM-based approach

EBERHARD KARLS UNIVERSITÄT TÜBINGEN

RAPID PLANNING www.rapid-planning.net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Mass
300,000 t/a
60,000 t/a
10,000 t/a
Mass older
800,000 t
100,000 t
40,000 t
DRAFT

MFA USE IN PRACTICE FROM WASTE COLLECTOR PERSPECTIVE

Waste collection operations planning

- Trucks design & types
- Human resources
- Other waste materials & equipments
- Routing

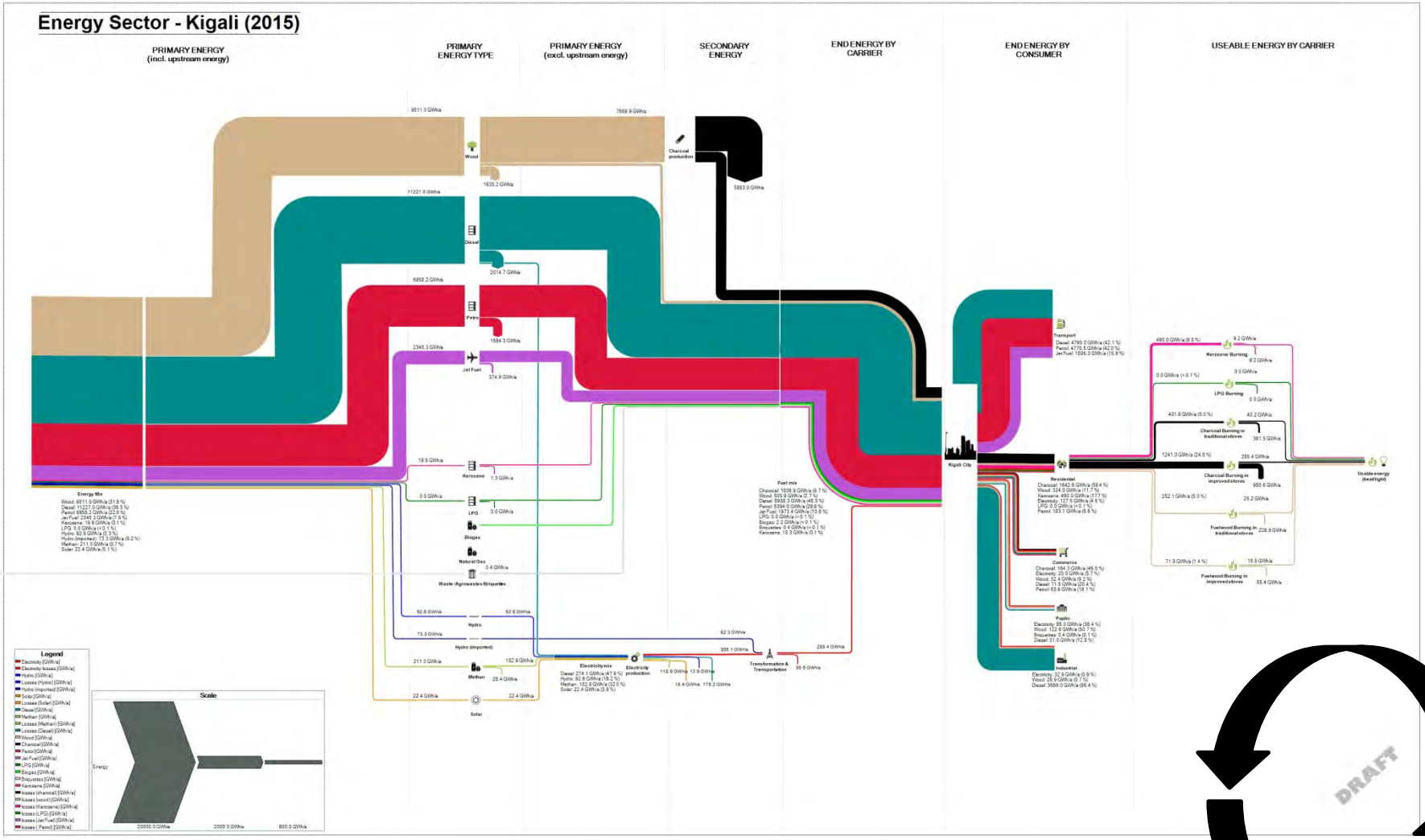
Waste valorisation & disposal planning

- Estimation of quantities/types/location/time
- Facilities requirements:
  - -Valorisation facilities
  - -Transit sites
  - -Disposal facilities

Business development

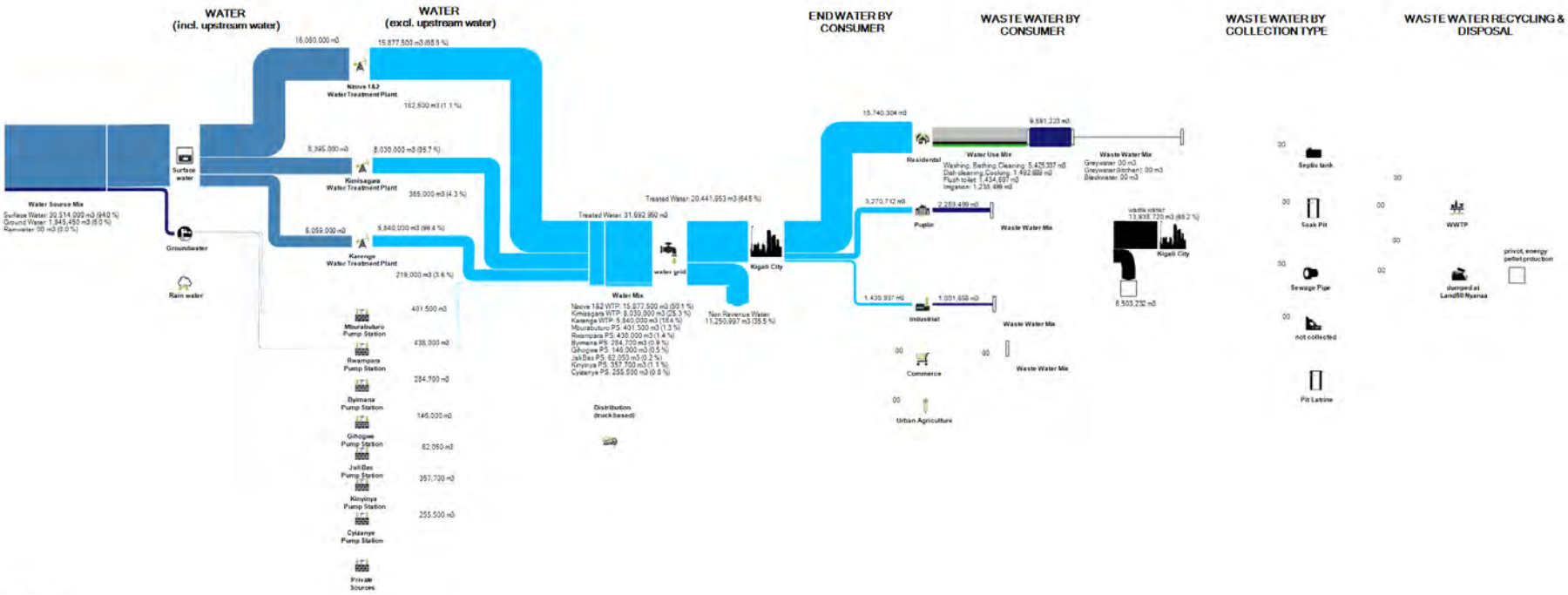
- Feasibility analysis and decision making

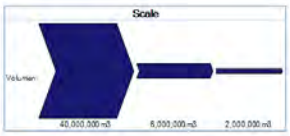
COPED GROUP

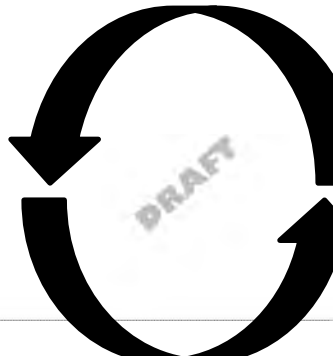

Energy Sector - Kigali (2015)
PRIMARY ENERGY (incl. upstream energy)
PRIMARY ENERGY TYPE
PRIMARY ENERGY (excl. upstream energy)
SECONDARY ENERGY
END ENERGY BY CARRIER
END ENERGY BY CONSUMER
USEABLE ENERGY BY CARRIER
Wood
Charcoal production
Diesel
Petrol
Jet Fuel
Kerosene
LPG
Biogas
Natural Gas
Waste /Agrowastes/Briquettes
Hydro
Hydro (imported)
Methan
Solar
Electricity mix
Electricity production
Transformation & Transportation
Fuel mix
Kigali City
Transport
Residential
Commerce
Public
Industrial
Kerosene Burning
LPG Burning
Charcoal Burning in traditional stoves
Charcoal Burning in improved stoves
Fuelwood Burning in traditional stoves
Fuelwood Burning in improved stoves
Usable energy (heat/light)
Energy Mix
Legend
Scale
waste/waste water to ENERGY SECTOR
Briquette/waste/agrowastes to ENERGY SECTOR

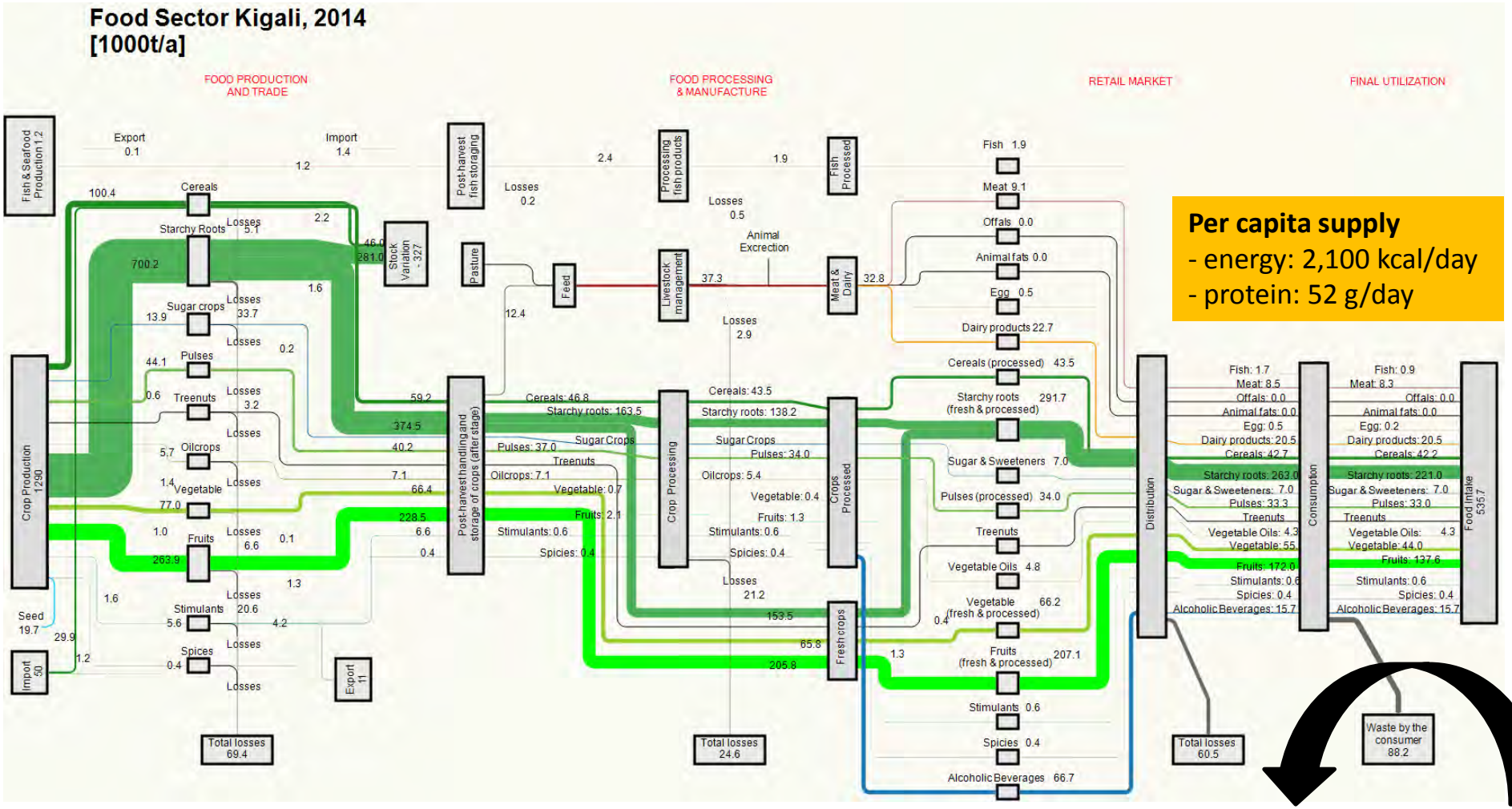
DRAFT

Water & Waste Water Sector - Kigali








Food Sector Kigali, 2014
[1000t/a]
FOOD PRODUCTION AND TRADE
FOOD PROCESSING & MANUFACTURE
RETAIL MARKET
FINAL UTILIZATION
Per capita supply
- energy: 2,100 kcal/day
- protein: 52 g/day
Fish & Seafood Production 1.2
Export 0.1
Import 1.4
Crop Production 1290
Cereals
Starchy Roots
Sugar crops
Pulses
Treenuts
Oilcrops
Vegetable
Fruits
Stimulants
Spices
Seed 19.7
Import 50
Export 11
Losses
Stock Variation - 327
Post-harvest fish storaging
Pasture
Feed
Post-harvest handling and storage of crops (after staging)
Processing fish products
Livestock management
Animal Excretion
Crop Processing
Meat & Dairy
Fish Processed
Crops Processed
Fresh crops
Total losses 69.4
Total losses 24.6
Total losses 60.5
Distribution
Consumption
Food Intake 535.7
Waste by the consumer 88.2
Fish 1.9
Meat 9.1
Offals 0.0
Animal fats 0.0
Egg 0.5
Dairy products 22.7
Cereals (processed) 43.5
Starchy roots (fresh & processed) 291.7
Sugar & Sweeteners 7.0
Pulses (processed) 34.0
Treenuts
Vegetable Oils 4.8
Vegetable (fresh & processed) 66.2
Fruits (fresh & processed) 207.1
Stimulants 0.6
Spicies 0.4
Alcoholic Beverages 66.7
Fish: 1.7
Meat: 8.5
Offals: 0.0
Animal fats: 0.0
Egg: 0.5
Dairy products: 20.5
Cereals: 42.7
Starchy roots: 263.0
Sugar & Sweeteners: 7.0
Pulses: 33.3
Treenuts
Vegetable Oils: 4.3
Vegetable: 55
Fruits: 172.0
Stimulants: 0.6
Spicies: 0.4
Alcoholic Beverages: 15.7
Fish: 0.9
Meat: 8.3
Offals: 0.0
Animal fats: 0.0
Egg: 0.2
Dairy products: 20.5
Cereals: 42.2
Starchy roots: 221.0
Sugar & Sweeteners: 7.0
Pulses: 33.0
Treenuts
Vegetable Oils: 4.3
Vegetable: 44.0
Fruits: 137.6
Stimulants: 0.6
Spicies: 0.4
Alcoholic Beverages: 15.7

THANKS FOR YOUR INTEREST!

ANY QUESTIONS?