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Sustainable Cycles Programme



SCYCLE
Programme

E-waste Regional Monitor
 Joint Taskforce on Environmental
 Indicators

29th of Oct, 2019
Geneva (Switzerland)

Dr. Kees Baldé




 UNITED NATIONS
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 United Nations Institute for Training and Research

UNU-Vie-SCYCLE – Key Projects & Activities

- 1. Policy advice**
 - European Commission (2007, 2014 & 2015)
- 2. SDG & E-waste Statistics**
 - Global E-waste Statistics Partnership
 - Global E-waste Monitor (2017, 2014)
 - Regional E-waste Studies: East and Southeast Asia (2017), Latin America (2018, 2015)
- 3. Capacity building and training**
 - E-waste Academies for Managers (EWAM) & Scientists (EWAS) (Global, since 2009)
- 4. Facilitating International Dialogue**
 - Hosting STEP Secretariat: Solving the e-waste problem (Global, since 2004)
 - UN E-waste: towards a joint e-waste effort of UN organizations (Global, since 2016)


Entire team in transition to UNITAR


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Outline

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- What is e-waste
- E-waste quantities
- CIS Regional E-Waste Monitor
 - Main principles on e-waste
 - Tools to assist to make e-waste statistics
 - Questionnaire



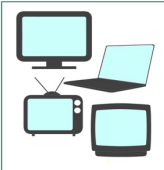
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What is e-waste


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Temp. Exchange




Screens



Lamps


“E-waste, refers to all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use”




Large Equipment



Small Equipment



Small IT



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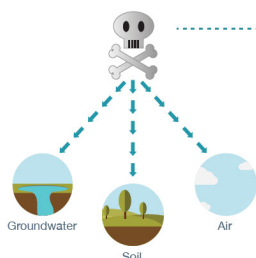
E-waste global problems

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1. Hazardous materials in e-waste

e.g. fridges, phones, laptops, washing machines, sensors, TVs, lamps

- Heavy metals (such as mercury, lead, cadmium etc.)
- Chemicals (such as CFCs/chlorofluorocarbon or various flame retardants)



E-waste can pose considerable environmental and health risks.



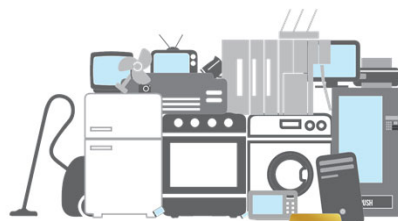
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E-waste global problems

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2. Losses of valuable material

- Precious metals including gold, silver, copper, platinum and palladium
- Valuable bulky materials such as iron and aluminum, and plastics



Estimated value of raw materials at

55 BILLION EUROS



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E-waste opportunities

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- At least 57 elements:
 - Materials
 - Base metals
 - Precious metals
 - Rare earth metals
 - Plastics
 - Glass
 -
- Hazardous materials
 - Mercury
 - CFCs
 - Lead
 - Flame retardants
 -

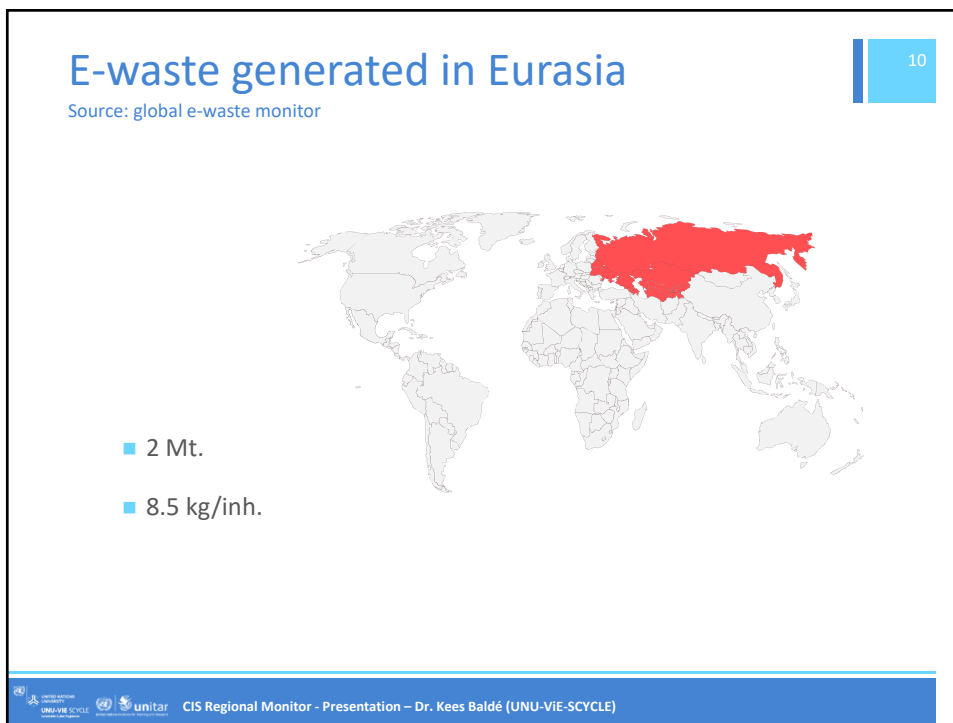
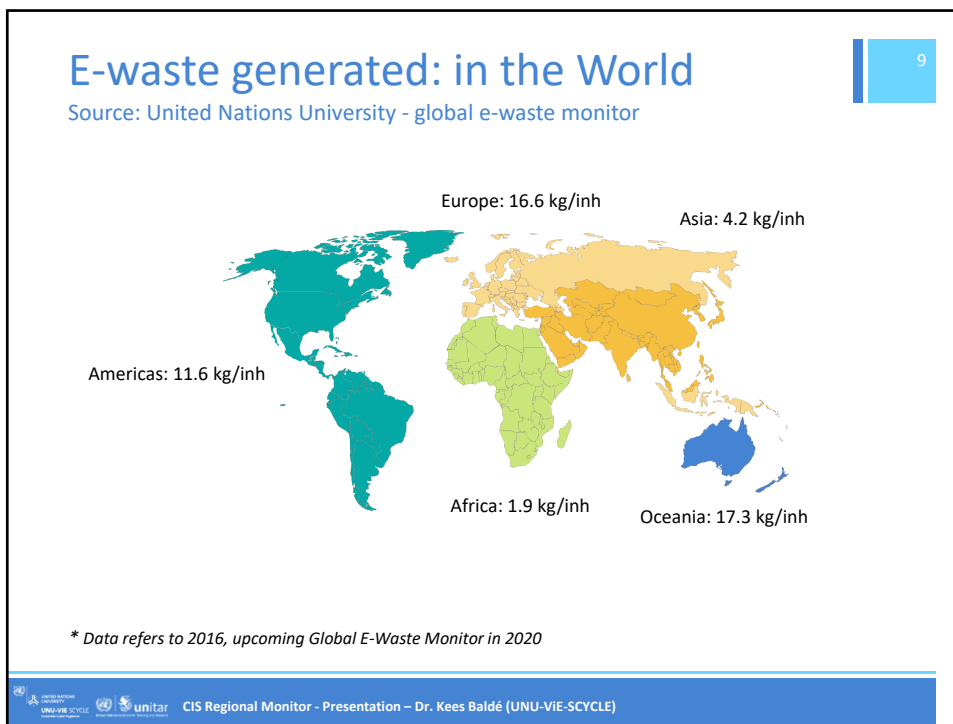
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SDG 12.5.1

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- E-waste has a sub-indicator under SDG 12.5.1 National Recycling Rate

EACO workshop on e-waste statistics - DAY 1 - Vanessa Forti (UNU-ViE-SCYCLE)



Estimation of electronics in Eurasia

Selected elements in Put on Market, Stock and Waste

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Product (CIS)		POM (tonnes)	Stock (tonnes)	Waste generated (tonnes)
Electronics (Mt)		2,6	29	2.3
Selected elements (t):	Plastics:	660'000	6'000'000	550'000
	Copper:	60'000	900'000	75'000
	Gold:	6	50	7
	Neodymium:	300	3'000	200
	Indium:	7	70	7
	Silver:	30	300	40



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CIS Regional E-Waste Monitor

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- Improve Statistics
- Analyse Policies and national stakeholders
- Countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Ukraine, Uzbekistan, Tajikistan, Turkmenistan
- Publication of Regional E-waste Monitor
- Implementation by UNU, ISWA, UNEP and ITU
 - www.globalewaste.org



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Objectives

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- Map the current status regarding E-Waste management, statistics, policy and regulations per country and in the CIS region.
- Increase the national capacity in gathering data and producing E-Waste statistics.
- Create the starting point for the Regional E-Waste Monitor for CIS.
- Help the SDG implementation process (SDG 12.5.1 on national waste recycling rate).

Timelines

WP	Activity	2019				2020				2021	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	• First Data collection and analysis										
	• Mapping of focal points										
	• Data collection by national experts in 12 countries (not financed by project).										
2	• Preparation training material										
3	• E-waste Statistics Support Hotline										
	• Validation of statistical data										
4	• Workshop 1 – Moscow – UNEP – 20-24 Jan										
	• Workshop 2 – t.b.d. – ± Sept 2020										
5	• Production Regional E-waste Monitor										
	• Media campaign										
	• Evaluation and closure										

Scope of first workshop

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- Build capacity in e-waste statistics
- Invite: NSO, Min Env, (and ITU Members)
- Train countries in e-waste statistics with the UNU Tools
 - Before workshop: they should already collect some basic data
 - During workshop: They integrate that in our tools before + also after the workshop
 - After workshop: consolidate data in the UNU Tools
- Core statistics are needed for the REM
- UNU have models to transfer core statistics into environmental impact
- Have group sessions that they need to gather info + write down the other needed information too during the workshop.
- After workshop → follow-up with countries
- Moscow – 20-23 January

Focal Points

- Ministries of Environment
- National Statistical Offices – environment Statistics
- ITU Members
- Questionnaires will be distributed

Questionnaire for Regional E-waste Monitor

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Objective of questionnaire

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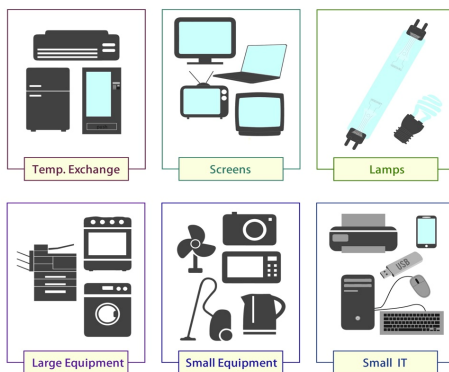
- Map the current status regarding
 - E-Waste management
 - E-waste statistics
 - E-waste policy and regulations
- One per country
- Basis for the Regional E-waste Monitor

Main Principles of e-waste statistics

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Six main e-waste categories

120



■ Corresponds with the waste management streams in practice

E-waste classification:

Link UNU-KEYS to the EU-6 Collection categories

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UNU KEY	DESCRIPTION	EEE CATEGORY UNDER EU-6	EEE CATEGORY UNDER EU-10
0001	Central Heating (household installed)	Large equipment	Large household appliances
0002	Photocopy Pools (incl. inventors)	Large equipment	Consumer equipment
0101	Professional Heating & Ventilation (excl. cooling equipment)	Large equipment	Large household appliances
0102	Dishwashers	Large equipment	Large household appliances
0103	Kitchen equipment (e.g. large furnaces, ovens, cooking equipment)	Large equipment	Large household appliances
0104	Washing Machines (incl. combined dryers)	Large equipment	Large household appliances
0105	Dryers (wash dryers, centrifuges)	Large equipment	Large household appliances
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	Large equipment	Large household appliances
0108	Fridges (incl. combi-fridges)	Temperature exchange equipment	Large household appliances
0109	Freezers	Temperature exchange equipment	Large household appliances
0111	Air Conditioners (household installed and portable)	Temperature exchange equipment	Large household appliances
0112	Other cooling equipment (e.g. dehumidifiers, heat pump dryers)	Temperature exchange equipment	Large household appliances
0113	Professional cooling equipment (e.g. large air conditioners, cooling displays)	Temperature exchange equipment	Large household appliances
0114	Microwaves (incl. combined, toast, grills)	Small equipment	Large household appliances
0201	Other small household equipment (e.g. small ventilators, irons, droids, adapters)	Small equipment	Small household appliances
0202	Equipment for food preparation (e.g. toaster, grills, food processing, frying pans)	Small equipment	Small household appliances
0203	Small household equipment for hot water preparation (e.g. coffee, tea, water cooker)	Small equipment	Small household appliances
0204	Vacuum Cleaners (excl. professional)	Small equipment	Small household appliances
0205	Personal Care equipment (e.g. toothbrushes, hairdryers, razors)	Small equipment	Small household appliances
0301	Small IT equipment (e.g. routers, mice, keyboards, external drives & accessories)	Small IT	IT and telecommunications equipment
0302	Desktop PCs (excl. monitors, accessories)	Small IT	IT and telecommunications equipment
0303	Laptops (incl. tablets)	Screens and monitors	IT and telecommunications equipment
0304	Printers (e.g. scanners, multi-functional, faxes)	Small IT	IT and telecommunications equipment
0305	Telecommunication equipment (e.g. cordless phones, answering machines)	Small IT	IT and telecommunications equipment
0306	Mobile Phones (incl. smartphones, pagers)	Small IT	IT and telecommunications equipment
0307	Professional IT equipment (e.g. servers, routers, data storage, copiers)	Large equipment	IT and telecommunications equipment
0308	Cathode Ray Tube Monitors	Screens and monitors	IT and telecommunications equipment
0309	Flat Display Panel Monitors (LCD, LED)	Screens and monitors	IT and telecommunications equipment
0401	Small Consumer Electronics (e.g. headphones, remote controls)	Small equipment	Consumer equipment



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Which products are in the e-waste categories?

UNU-KEYS

- 54 products
- Products are classified by:
 - Similar function
 - Comparable material composition (in terms of valuable materials and hazardous substances)
 - Related end-of life attributes
- Products within same category have similar average weight and life-time distributions
- Large or environmentally-relevant e-waste products are assigned separately



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E-waste classification:

Link UNU-KEYS to the HS codes

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UNU-KEY	UNU KEY DESCRIPTION	HS	HS DESCRIPTION
0001	Central Heating (household installed)	840310	Boilers; central heating boilers (excluding those of heading no. 8402)
0001	Central Heating (household installed)	854140	Electrical apparatus; photosensitive, including photovoltaic cells, whether or not assembled in modules or made up into panels, light emitting diodes
0101	Professional Heating & Ventilation (excl. cooling equipment)	845110	Dry-cleaning machines
0101	Professional Heating & Ventilation (excl. cooling equipment)	845130	Ironing machines and presses (including fusing presses)
0102	Dish washers	842211	Dish washing machines; of the household type
0102	Dish washers	842219	Dish washing machines; of other than household type
0103	Kitchen equipment (e.g. large furnaces, ovens, cooking equipment)	851660	Ovens, cookers, cooking plates, boiling rings, grilles and roasters; of a kind used for domestic purposes (excluding microwaves)
0104	Washing Machines (incl. combined dryers)	845011	Washing machines; household or laundry-type, fully-automatic, (of a dry linen capacity not exceeding 10kg)
0104	Washing Machines (incl. combined dryers)	845012	Washing machines; household or laundry-type, with built-in centrifugal drier, (not fully-automatic), of a dry linen capacity not exceeding 10kg
0104	Washing Machines (incl. combined dryers)	845019	Washing machines; household or laundry-type, not fully-automatic, without built-in centrifugal drier, of a dry linen capacity not exceeding 10kg
0104	Washing Machines (incl. combined dryers)	845020	Washing machines; household or laundry-type, of a dry linen capacity exceeding 10kg
0105	Dryers (wash dryers, centrifuges)	842112	Centrifuges; clothes-dryers
0105	Dryers (wash dryers, centrifuges)	845121	Drying machines; of a dry linen capacity not exceeding 10kg
0105	Dryers (wash dryers, centrifuges)	845129	Drying machines; of a dry linen capacity exceeding 10kg
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	841460	Hoods; ventilating or recycling hoods incorporating a fan, whether or not fitted with filters, having a maximum horizontal side not exceeding 120cm
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	851621	Heating apparatus; electric storage heating radiators
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	851629	Heating apparatus; electric soil heating apparatus and space heating apparatus (excluding storage heating radiators)
0108	Fridges (incl. combi-fridges)	841810	Refrigerators and freezers; combined refrigerator-freezers, fitted with separate external doors, electric or other
0108	Fridges (incl. combi-fridges)	841821	Refrigerators; for household use, compression-type, electric or other

E-waste classification:

Statistical use of the UNU-KEYS

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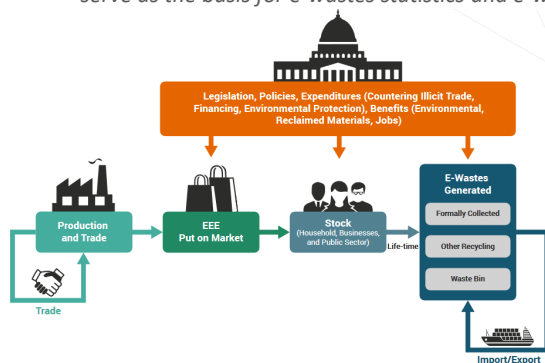
- Used to convert EU-6 to UNU-KEYS and vice versa
- Used to collect statistical data on Put on Market
 - by linking HS codes to UNU-KEYS
- Used to convert unit to weight by applying average weights
- Used to collect data on life-times of products
- Used for material flow analysis of the raw materials in EEE and WEEE

Framework on e-waste statistics:

Flows

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The framework can integrate the harmonized existing data at country level and can serve as the basis for e-wastes statistics and e-waste indicators



- In the model Stock and flows relate to one another
- It allows to use data on possession, sales data or disposal

Harmonized framework to measure e-waste: The Partnership Measuring ICT for Development

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- Objectives:
 - Framework based on internationally defined indicators:
 1. Total EEE Put on the Market (unit kg/inh)
 2. E-waste generated (unit kg/inh)
 3. E-waste formally collected (unit kg/inh)
 4. E-waste collection rate (%)
 - Statistical guidelines (in 2015 and 2018)
http://collections.unu.edu/eserv/UNU:6477/RZ_EWaste_Guidelines_LoRes.pdf
 - Translated into Russian:
 - <https://globalewaste.org/publications/?tags%5B0%5D=445&tags%5B1%5D=468>



Harmonized framework to measure e-waste

Internationally identified indicators VS SDG 12.5.1 Indicator

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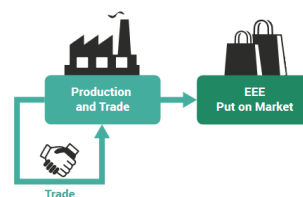
$E - \text{waste generated} = \text{Own e-waste that is environmentally sound managed} + \text{Other managed own e-waste} + E - \text{waste unaccounted for}$	Expressed in tonnes
$\text{E-waste generated per capita} = \frac{\text{Quantity of ewaste generated during the year}}{\text{Population}}$	Expressed in tonnes/capita
$\text{Proportion of e-waste treated} = \frac{\text{Quantity of own ewaste that is environmentally sound managed during the reporting year}}{\text{E-waste generated}} \times 100$	Expressed as %

1. Total EEE Put on the Market (unit kg/inh)
2. E-waste generated (unit kg/inh)
3. E-waste formally collected (unit kg/inh)
4. E-waste collection rate (%)

Track EEE sales

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- Long time series, detailed for equipment
- Data collected and published by specific registers or custom organizations and/or national statistical institutes
- If not: “Apparent consumption method”:
- Link between trade statistics and national production statistics



$$POM(t) = \text{Domestic production}(t) + \text{Imports}(t) - \text{Exports}(t)$$

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Track EEE stock

Equipment in households, business and public sector destined to become waste ("urban mine")

- Data available in national statistical institutes from households survey about:
 - Household possessions
 - Penetration rate
- Number of subscriptions
- Penetration rates of ICT use (statistics are compiled by ITU)

$$S(n) = \sum_{t=t_0}^n POM(t) - \sum_{t=t_0}^n E \text{ waste generated } (n)$$

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EEE life-time

(Time spent at household, business or public sector)

- Includes the exchange of second-hand equipment
- Should ideally be determined empirically per product
- Possible data available from studies
- UNU calculates the lifespan using Weibull functions (Wang et al., 2013)
- **Validated estimates are available from UNU**
- National data can be made with:
 - Household surveys
 - Waste collection points
 - Work with universities / Literature

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EEE life-time: Equations

$$L^{(p)}(t, n) = \frac{\alpha(t)}{\beta(t)^{\alpha(t)}} (n - t)^{\alpha(t)-1} e^{-[(n-t)/\beta(t)]^{\alpha(t)}}$$

For more stable products, time dependent life-times sufficiently describe actual behavior. The variation of shape and scale parameters over time can be neglected

$$L^{(p)}(t, n) = \frac{\alpha}{\beta^{\alpha}} (n - t)^{\alpha-1} e^{-[(n-t)/\beta]^{\alpha}}$$

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Measure e-waste generated

EEE is disposed of after a certain lifetime and becomes e-waste (generated)

- E-waste generated
 - E-waste amounts prior to collection/treatment
 - excludes imports of e-waste.
- E-waste generated in a given year in a specific country is based on:
 - Amount of EEE placed on the market (POM) in the preceding years
 - Corresponding product lifespan

$$E \text{ waste generated } (n) = \sum_{t=t_0}^n POM(t) * L^{(p)}(t, n)$$

- E-waste generated

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Measure e-waste generated

- Then if there is an indication of the stock amounts, one can do a comparison to check if the Stock data (estimated or empirical) are comparable:
 - If not: are the stock data off? Or the POM?

$$S(n) = \sum_{t=t_0}^n POM(t) - \sum_{t=t_0}^n \text{E waste generated } (n)$$

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E-waste Tools

- Have been in use since 2015 in EU
- Adapted to outside EU in 2017
- First tested and successfully used in 2018 and 2019 in Tanzania, Bosnia, Jordan, Cameroon, Costa Rica
- Two tools
 - EEE POM Tool
 - E-waste Generated Tool

EEE Put on Market Tool

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- Insert HS and Domestic Production data
- Standard conversion factors to convert units into weight
- After validation
 - Output is compatible with international standards + E-waste Generation Tool

E-Waste Tools

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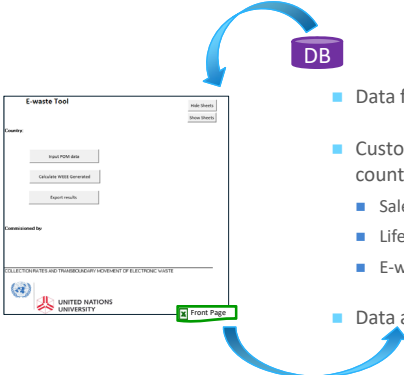
The "WEEE calculation tool" is an integral part of the methodologies for the calculation of the weight of electrical and electronic equipment (EEE) placed on the market, imported, exported, collected and recycled

- Supported by European Commission and US EPA
- Tools for 177 countries
- Customized and pre-populated with the necessary data to allow for direct application
- The prepopulated data have been estimated by UNU
- Countries can update Put on Market data or life-time data, if available


Assists in the calculation of the quantity of WEEE generated

Overview of the WEEE Calculation Tool

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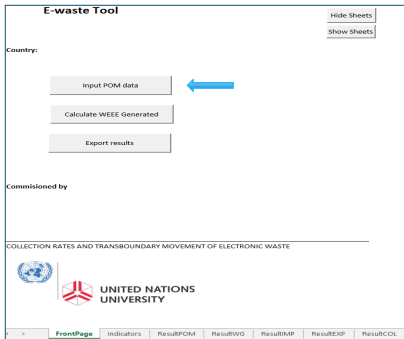
- Data from UNU estimates
- Customised for each country in the world except for the countries in the European Union. Populated with data:
 - Sales
 - Lifespans
 - E-waste generated
- Data available from 1995 to 2015


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Entering data in the Calculations tool


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- POM



Options to select different classifications:

1. EU-6 categories: 6 categories
2. UNU categories: 54 categories


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Calculate E-waste Generated (WG)

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E-waste Tool

Country:

Input POM data

Calculate WEEE Generated

Export Results

Commissioned by

COLLECTION RATES AND TRANSBOUNDARY MOVEMENT OF ELECTRONIC WASTE

UNITED NATIONS UNIVERSITY

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Once the user has entered into the tool the POM data for a year of reference, the tool can calculate the quantity of E-waste generated.

Calculations are done until last year of POM data

POM needs to be inserted annually

Open discussion

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- ➔ What do you think are the possibilities in your country to compile e-waste statistics?
- ➔ Which national challenges do you think should be addressed by the project?
- ➔ Which are your expectations towards the project? What would you like to achieve?

Open discussion (alternative slide, more specific)

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- ➔ What's the legislative framework about e-waste in your country?
- ➔ Which data can you provide?
- ➔ Is there an e-waste statistics already in place?
- ➔ How is e-waste usually treated? What is the role of the informal sector?
- ➔ Is e-waste managed sound in your country?

Questions?

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For further information on the E-Waste survey please contact:

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THANK YOU FOR YOUR ATTENTION!