EFFICIENCY FOR ACCESS

UK ENGINEERS WITHOUT BORDERS

The Unintended Consequences of the Sector's Growth

Funded by: UKaid from the British people, IKEA Foundation, energy saving trust

Agenda

- Guest Speakers
  - **Richa Goyal**
  - **Rowan Spear**
  - **Timon Lanz**
  - **Olivier Mbera**
- Q&A
- Webinar feedback survey

Our guest speakers

- **Richa Goyal–** Energy Saving Trust

- **Rowan Spear–** University of Edinburgh

- **Timon Lanz–** Ennos

- **Olivier Mbera-** Enviroserve

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IKEA Foundation

UKaid from the British people

Thinking about unintended consequences while designing and deploying off-grid appliances: An overview

7th April 2021

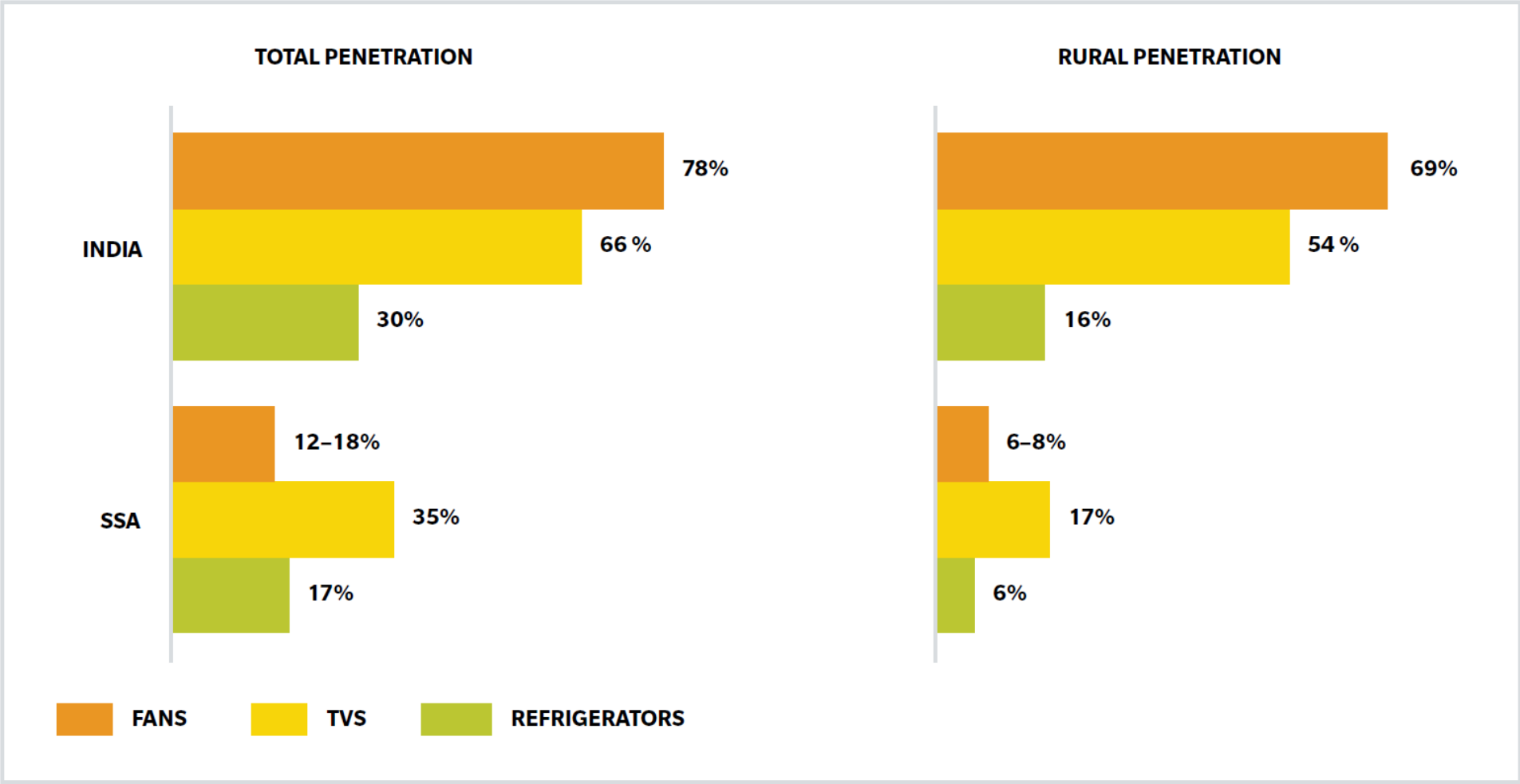
What are unintended consequences

Unintended consequences (sometimes **unanticipated consequences** or **unforeseen consequences**)
are **outcomes** of a purposeful action that are not intended or foreseen.

- Robert K. Merton

Low appliance ownership rates, and a high latent demand presents a unique opportunity to leapfrog rural populations to inclusive and low carbon appliances

Figure 9: Appliance ownership in sub-Saharan Africa and India (% of households owning an appliance)



Source: Latest available DHS and other national survey data (2012-2018); Dalberg analysis

Efficiency for Access Coalition, State of the off-grid appliance market, 2019

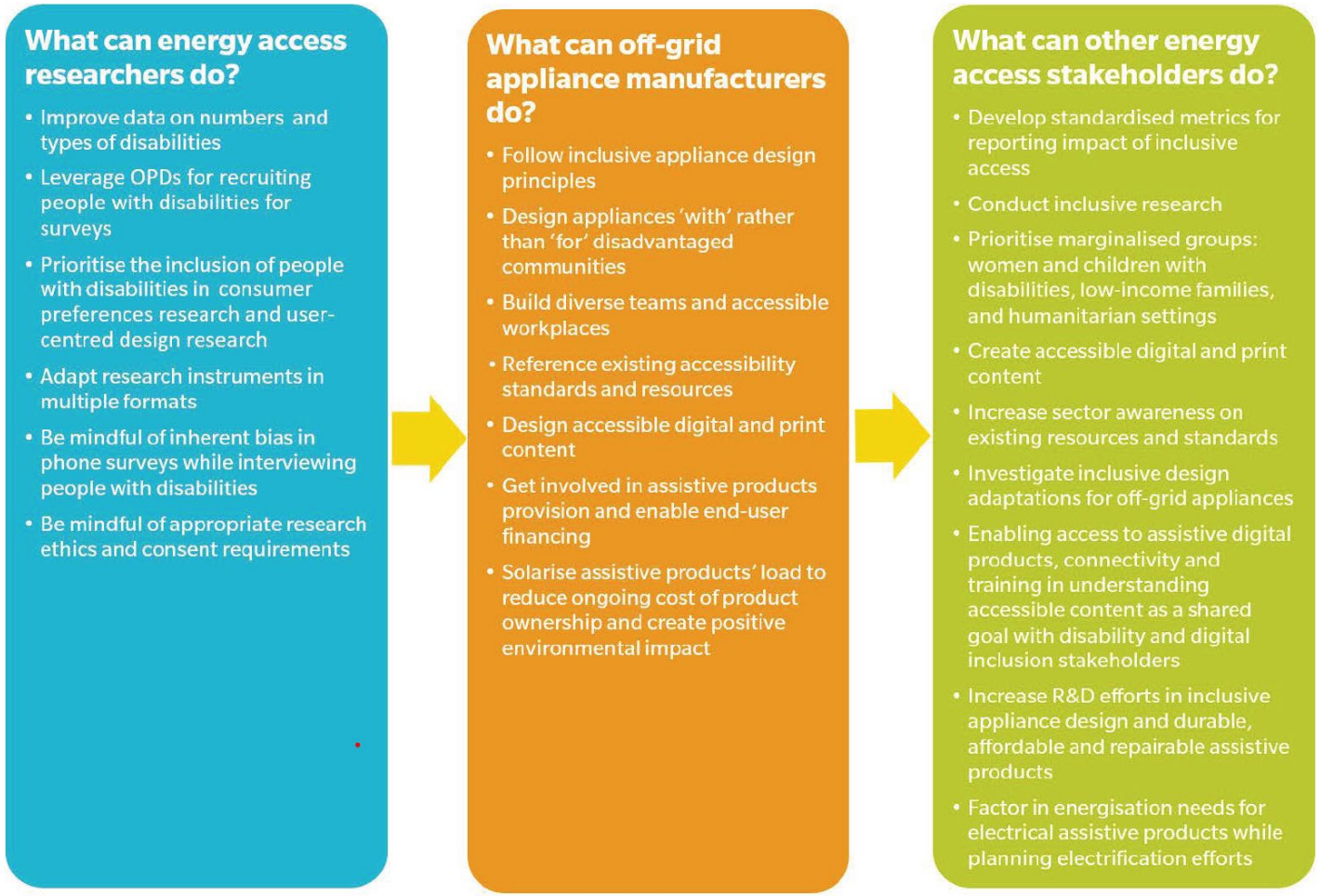
Inclusive design approach

- Gender inclusive (see presentation by Jennye Green here: https://vimeo.com/475010401)
- Accessible design (or, disability inclusive design)
- Design for affordability: leaving no one behind

Why should energy access stakeholders care about disability?

- Globally, more than a billion people need one or more assistive products and 90% lack access to them.
- The Convention on the Rights of Persons with Disabilities (CPRD) specifies the need to ensure equal access to services and products. Many of these products need to be powered by electrical energy. Despite this, the Convention does not highlight the importance of energy access in enabling these goals. Similarly, SDG7 makes a reference to 'affordable, reliable, sustainable and modern energy for all', it does not explicitly mention access for people with disabilities.
- Disabilities tend to be spread disproportionately in favour of low-income countries, particularly in low-income households and off-grid regions.
  - UN estimates suggest that 80% of the world's disabled populations are in developing countries.
  - Mitra et al., 2013 looked at data from 15 developing countries and found that disabled populations were greater in rural than urban regions in 11 out of 15 surveyed countries.
  - 2018 UN Flagship Report shows the difference in electricity rates in households with and without electricity rates. In 37 of 44 countries, households with people with disabilities had lower levels of electricity access.
  - People with disabilities tend to have higher energy needs since they require assistive technologies.
- Within the energy access space, stakeholders involved in enabling access to off- and weak-grid appropriate appliances and disability stakeholders have a lot to benefit from collaborating in key strategic areas. Affordability, availability, and quality are key bottlenecks in both sectors.

So, what can we do to include people with disabilities in energy access efforts?



Framework to help the energy access sector address the needs of people with disabilities

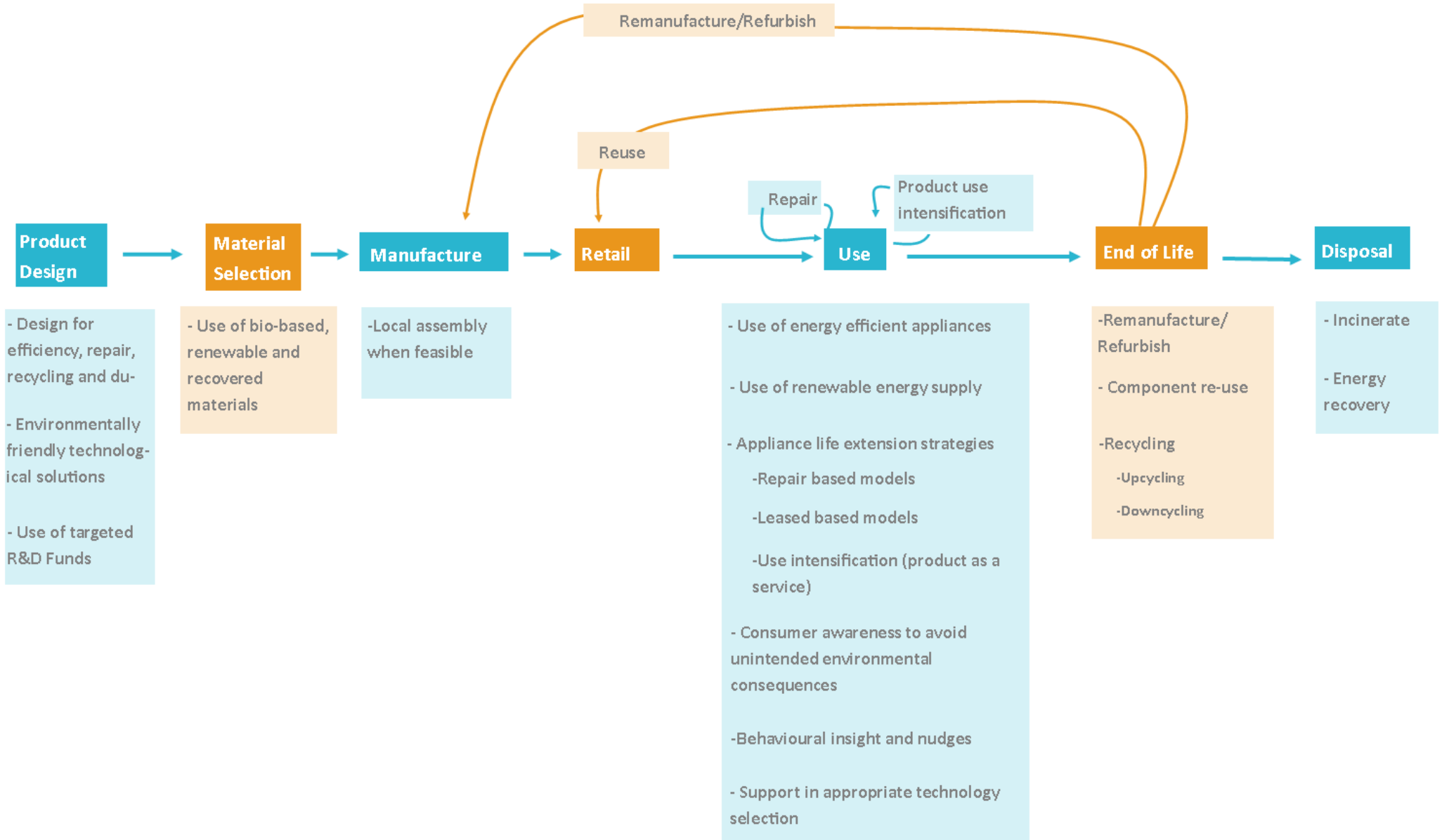
Efficiency for Access, 2021, 'HOW CAN ENERGY ACCESS PROGRAMMES ADDRESS THE NEEDS OF PEOPLE WITH DISABILITIES? AN INTRODUCTORY NOTE'
See here for further reading.

Design for affordability

- Thinking about integrating PAY-GO functionalities
- Shared-use models
- Efficiency as an affordability strategy
- Efficiency and import duties trade offs

For further reading on business model innovations addressing appliance affordability, see here.

Low carbon appliances: circular economy strategies



Appliance specific consequences to be mindful of: cooling

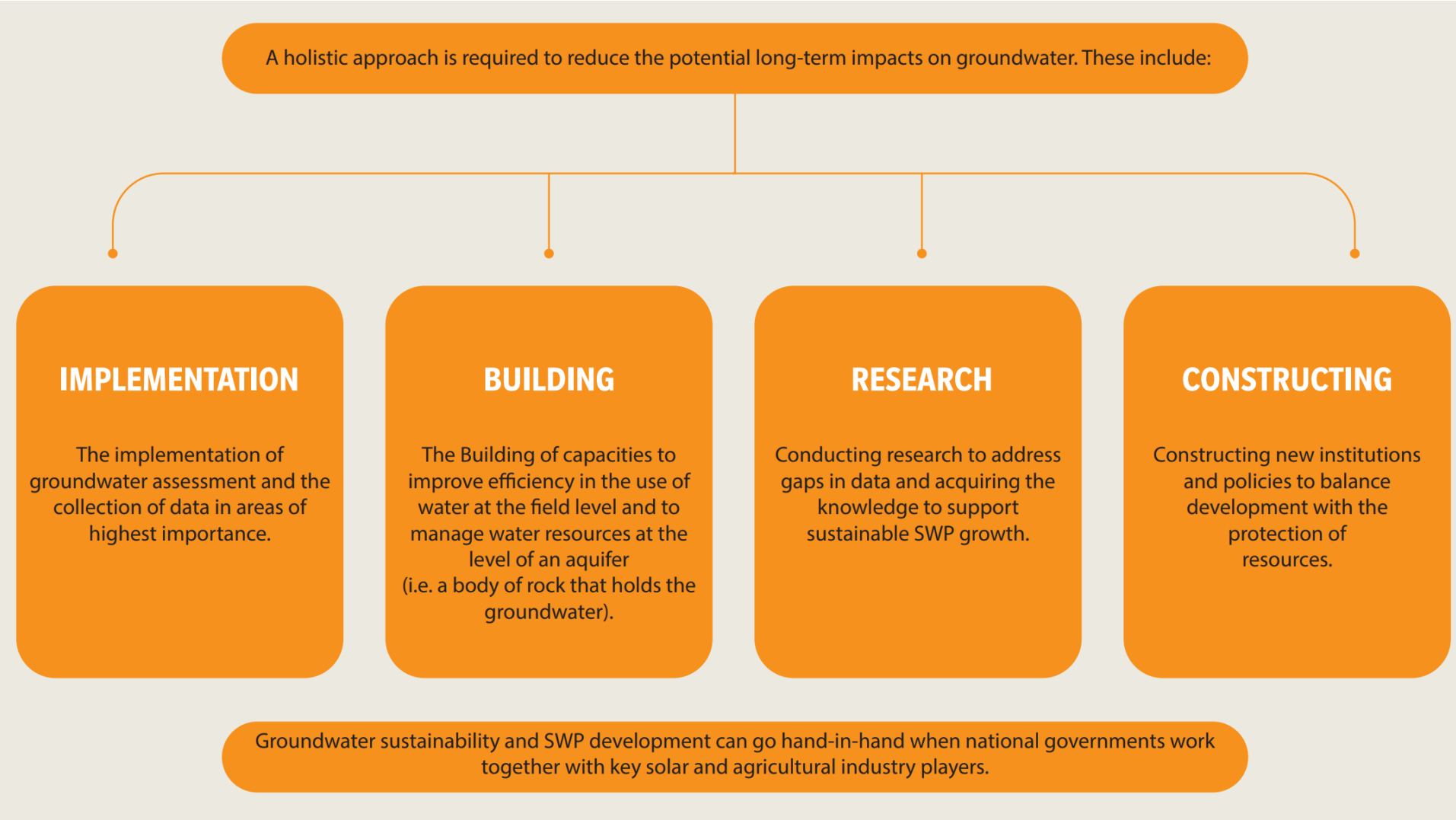
What are HFC gases, what is the Kigali Amendment and why should we care?

- **HFC gases:** Efforts under the Montreal Protocol led to a widespread adoption of HFCs, which have been used as the primary substitutes for ozone depleting substances controlled under the treaty. While HFCs do not deplete the ozone layer, many of these chemicals are potent greenhouse gases (GHGs) and are widely used as cooling agents or refrigerants in refrigeration and air conditioning technologies.
- **Kigali Amendment:** If the current growth in HFC use is not controlled, efforts to keep global temperatures at or below 2°C6 by the end of this century will be at risk. To circumvent the climate threat posed by HFC gases, in October 2016, the Parties to the Montreal Protocol adopted the Kigali Amendment which brings future production and consumption of HFCs within the Protocol's remit.
- **Kigali Amendment's implications for developing countries**: The Amendment requires parties to gradually phase down their use of HFCs to 80– 85% by the late 2040s. The first group of developing countries, which includes African countries, will start by freezing HFC consumption levels in 2014, and the second set of developing countries which includes India will start in 2028.

According to the UNEP OzonAction5, "Overall HFC emissions are growing at a rate of 8% per year and annual emissions are projected to rise to 19% of global carbon dioxide (CO^2) emissions by 2050."

Appliance specific consequences to be mindful of: pumping

Managing groundwater resources to ensure long term water availability while improving water access



Source: Efficiency for Access and IWMI research on sustainable pumping, to be published

Thank you!

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REPAIR FOR OFF-GRID ENERGY ACCESS

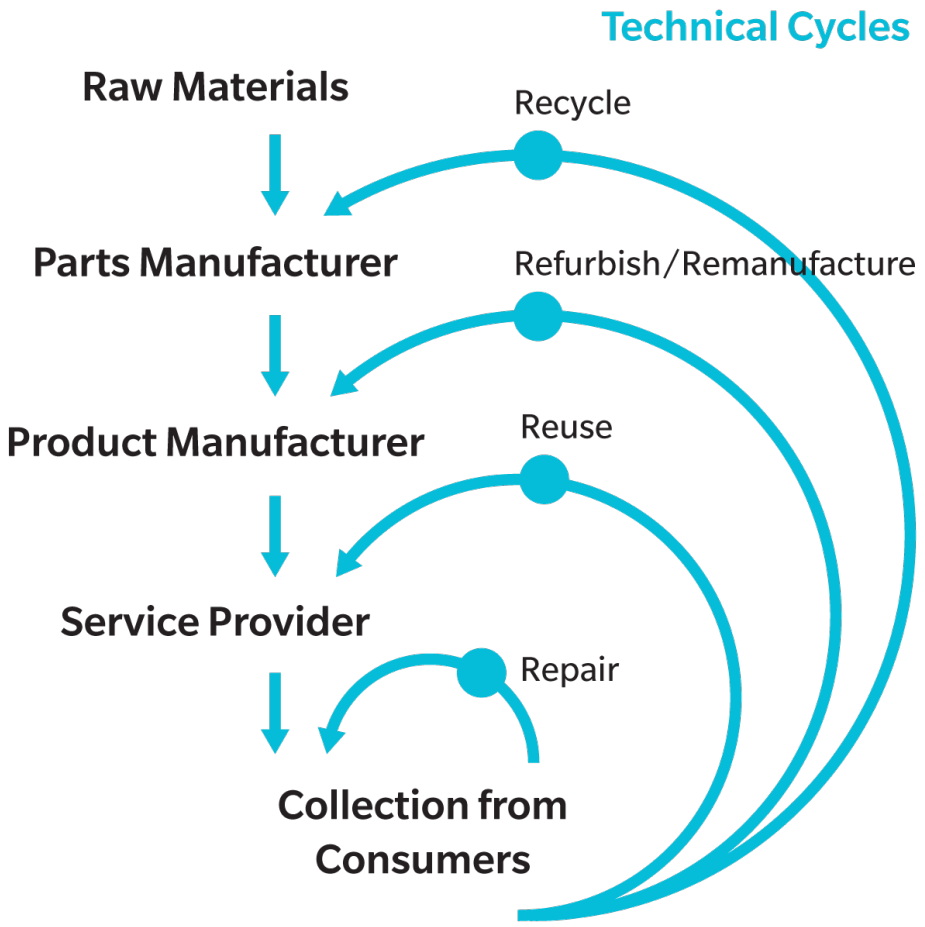
Rowan Spear

What do we mean by repairability?

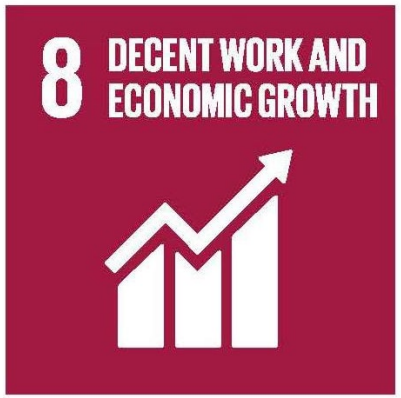
- Returns a broken product to a state where it can fulfil its intended use

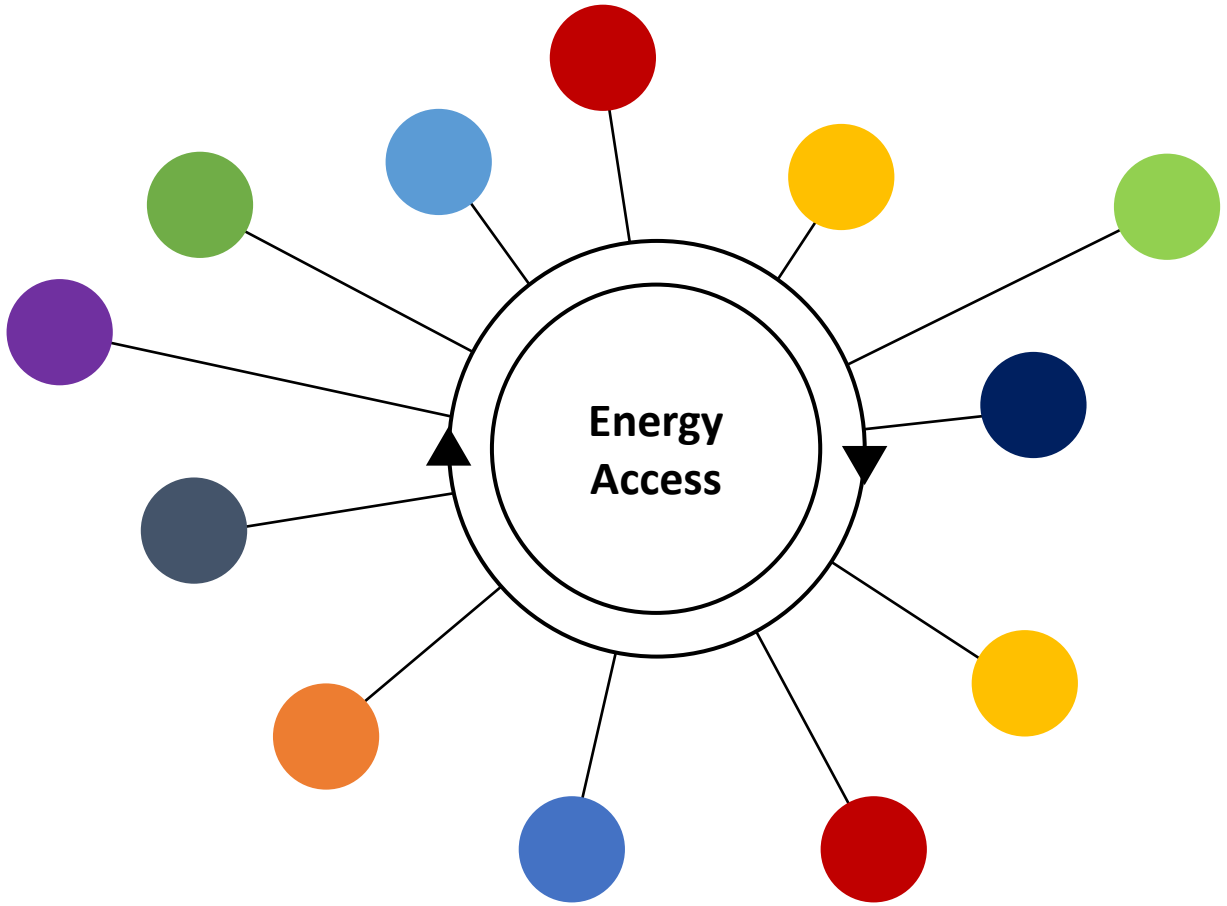
- Repair:
  - Extends the lifetime of a product
  - Retains its functionality
  - Avoids the purchase of a new product
  - Prevents unnecessary waste

- Repair is the inner most material loop in a circular economy



Repairability and Off-Grid Energy Access





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Benefits of Repairable Products

- Keeps products and components at high value levels
  - Conserves embodied energy, materials, and water
  - Minimises the loss of materials and energy represented by the production of waste
  - Facilitates the reuse of components

- Supports decentralised local businesses
  - Generates jobs to service repairs
  - Lowers costs compared to centralised maintenance

- Ease of disassembly- synergises with recycling efforts

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Unintended Consequences... Non-Repairable Products

- Large numbers of non-repairable products:
  - Loss of access to energy
  - Loss of associated benefits
  - Money must be spent to buy a new product
  - Materials and components are disposed of
  - Compromised functionality

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Design for Repair

- Easy to disassemble with common tools
- Prioritise common failure points
- Supply of spare parts
- Easy to reassemble using the same tools
- Communicate repair information
- Design products which are durable, repairable and recyclable

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Pathways to Repair in the Off-Grid Solar Sector

www.solarwhat.xyz

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ennos

Webinar Sustainable Water Management
Efficiency for Access Design Challenge
7th April 2021 / Timon Lanz

Table of Content

About ennos ag

Having an impact

ennos is a Swiss based company with more than 15 years of experience.

We bring innovative solar technologies to farmers and communities.

We distribute to the African market since 2016.

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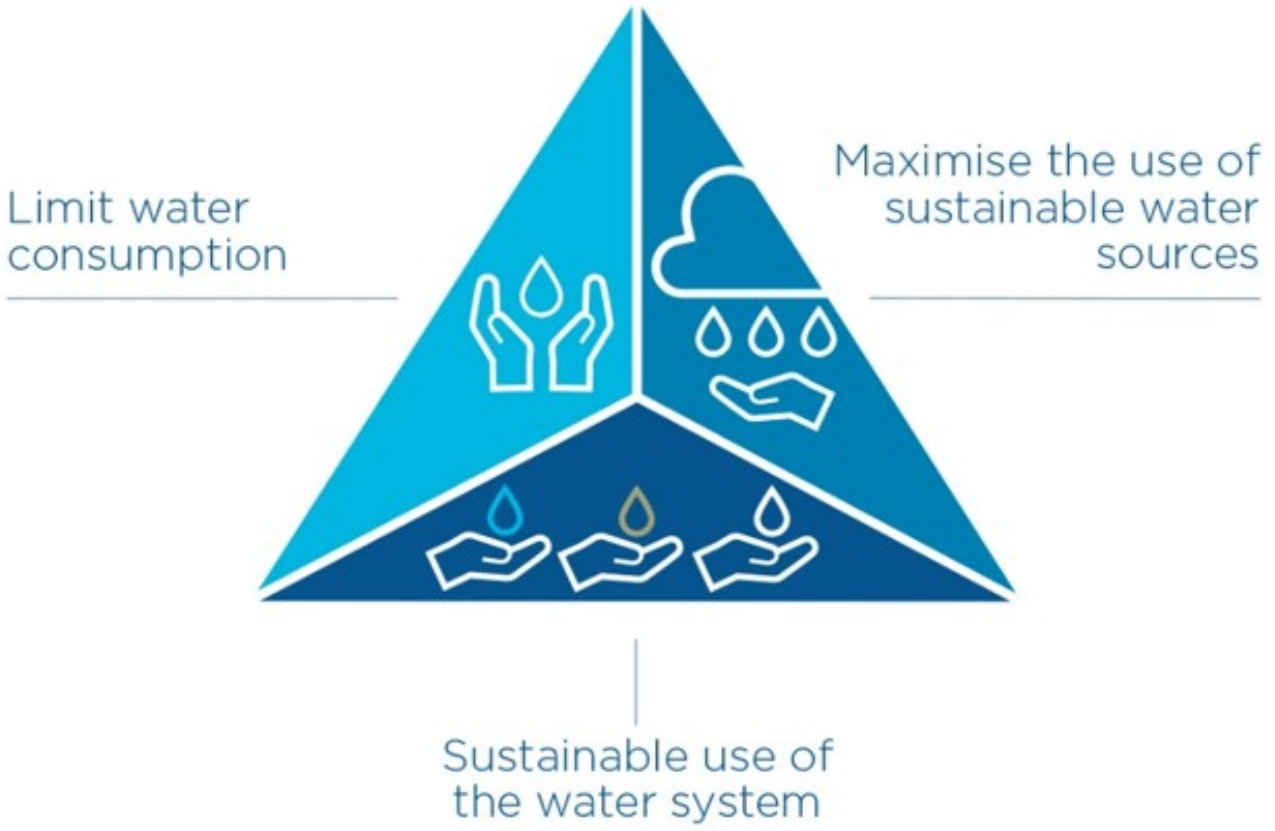
Every kind of specialist

We are an interdisciplinary team of engineers and marketing experts.

The close collaboration between disciplines allows us to continuously improve the design and functionalities of the sunlight pump to better meet the needs of the users.

Sustainable Water Use



Definition:

“The ability to meet the water needs of the present without compromising the ability of future generations to do the same.”

Goals and benefits:

- Reduce overall water consumption
- Maximise the share of sustainable water sources in the global water supply
- Use existing water systems with sustainable practices

Current Challenges (1)

Growth of water demand

- By 2050, the global water demand is expected to grow by 30-50 %
- Drivers: Population growth, Increase in food demand and climate change

Irrigation Techniques

- Over-irrigating is very common, mostly by flooding the irrigated fields
- Flooding results in using too much water and destroying the soil and crops

Current Challenges (2)

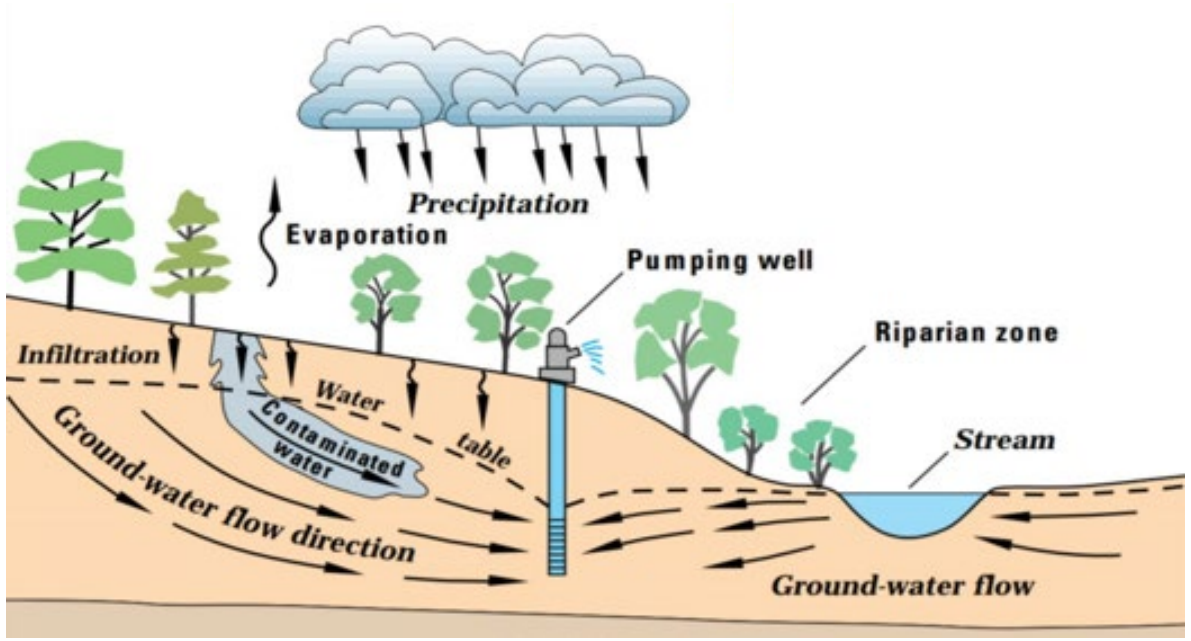
Conventional Irrigation

- Water losses (55-90%)
  - Conveyance (Transportation) : 20-25%
  - Seepage : 20-30%
  - Deep Percolation : 5-15%
  - Evaporation : 10-20%

Disadvantages

- Overall irrigation efficiency: 25-40%
- More prone to attract disease and pest
- Monitoring and Maintenance cost more labour

Groundwatertable



Key-Information:

- Groundwater is the largest freshwater reservoir in Africa
- Groundwater is fed by infiltration and inflows from lakes and rivers
- Excessive water use can cause the groundwater level to drop

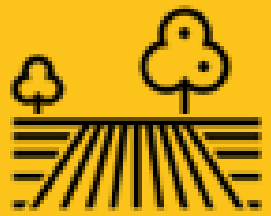
Consequences Of Groundwater Sinking

- Dried out soils
- Lack of groundwater supply for vegetation
- Thickening and compression of the soil

Survey Of Smallholder Farmers in Kenya

ennos conducted a survey, where farmers were asked about the size of their land, the irrigation technique used, their demand for water, and their operational costs. In summary, the following avarage values were obtained:

1-2 acres of land



5-7HP petrol pump

220’000 litres of water per day

277 days in use

Evaluation

- The Farmers are using an oversized pump
- The flooding technique is used by every farmer in this survey
- Most vegetables need an average of about 4 liters of water per square meter per day *(retrieved from https://harvesttotable.com)*
- Their current water consumption (up to 220’000 liters per day) uses over eight to ten times as much water, as they would need

➢ Something needs to change

Advantages Of Micro Irrigation System

Many Savings Opportunities

Water savings 50 to 70%

Fertilizer savings 50 to 70%

Power saving 50 to 70%

Labour savings

Cost savings

Yield increase

Increased in yield more than 50%

Higher irrigation efficiency 90%

Any type of land – plain as well as hilly

Saline soil can be brought under cultivation

For all crops (Fruits, vegetables, rice, wheat, maize)

By switching from conventional irrigation techniques to Micro Irrigation you save water and costs and at the same time you can increase your income.

Conclusion

Training and education of farmers is a next key step in achieving a more sustainable watermanagement

Get in touch

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Sustainable E-waste Management – Case of Rwanda

Olivier MBERA
CGM Enviroserve Rwanda

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Company Overview

- Registered in Rwanda in 2017. In partnership with the GoR, we operate a state of art and Environmentally friendly e-waste dismantling and recycling facility located in Bugesera, Rwanda, first of it's kind in East Africa
- Subsidiary of Enviroserve Dubai ,an ISO and OSHA certified with over 15 years of experience in E-waste management
- Pioneered sustainable e-waste dismantling and recycling in East Africa

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Electronic Waste Recycling

Dubai (HQ)
Abu Dhabi
Kuwait
Saudi Arabia

Egypt
Georgia
Lebanon

Angola
Kenya
Nigeria
Rwanda
South Africa
Zimbabwe

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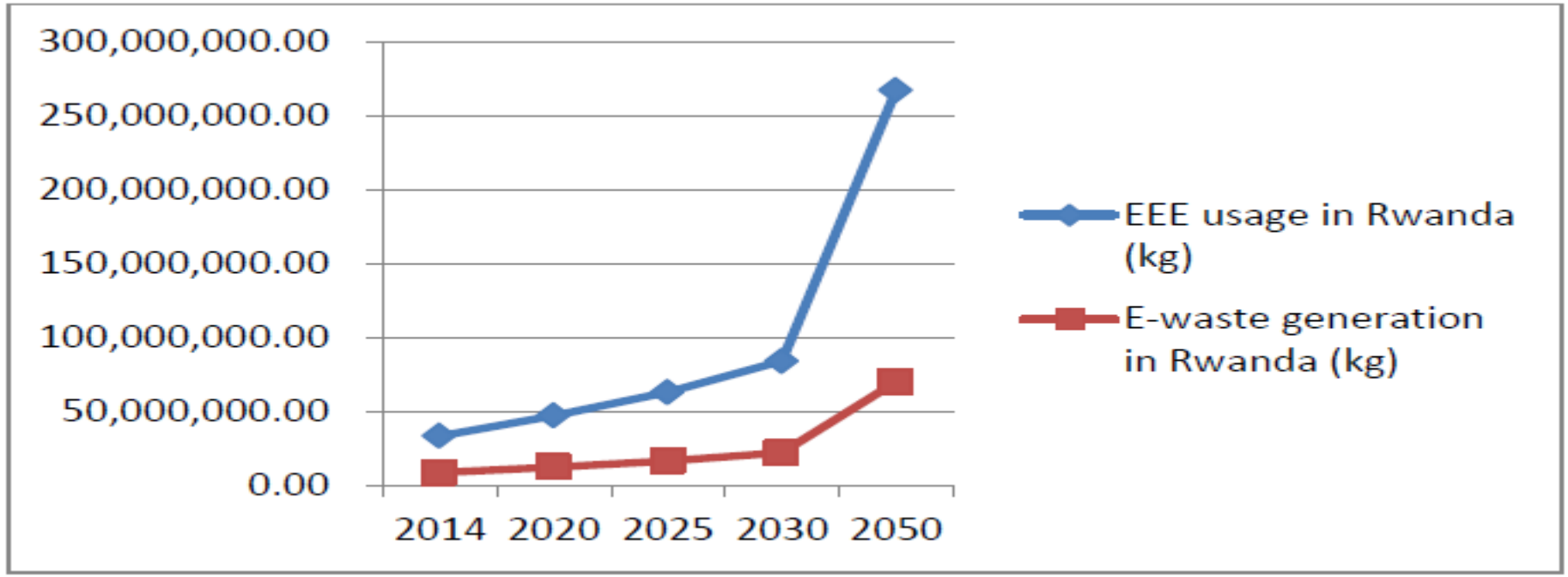
Annual Growth of 10% in e-waste generation in Rwanda



	2014	2020	2025	2030	2050
EEE usage in Rwanda (kg)	33,449,623.04	47,309,164.30	63,154,890.07	84,307,981.33	267,741,393.33
E–waste generation in Rwanda (kg)	8,790,255.66	12,432,416.62	16,596,528.74	22,155,368.07	70,359,994.68

Annual growth rate of 10%

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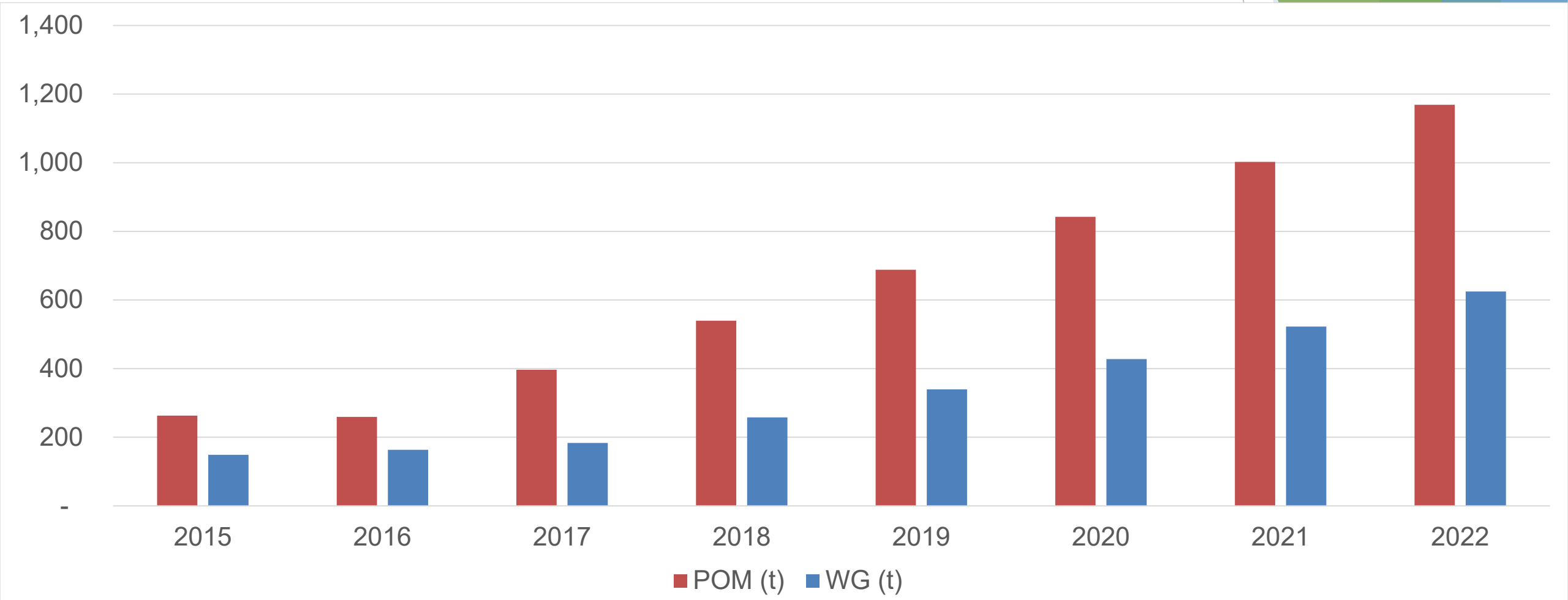
Off-grid solar products put on the market and waste generated in Rwanda



Source: Study on E-waste in the OffGrid Sector In Rwanda by Sofies 2017

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Impacts Off grid products

Product or Component	Presence of toxic/hazardous components	Relevant from resource management perspective	Relevant disposal costs	Valuable materials
SPL	CFL (Hg), if present		Plastics, especially if containing BFR	
SHS			Plastics, especially if containing BFR	Copper from cables PWB from control panels
Lamps	Mercury in CFL	Rare Earth in LED (mainly Y, Lu)	CFLs containing mercury	
PV modules	Cadmium and Tellurium	Gallium, Tellurium, Germanium and Indium	Eventually the Glass	Aluminium for larger frames
Batteries	Lead, Cadmium	Lead	Li-Phosphate, Ni-Cd	Lead, Li-Ion, Ni-MH

Source: Study on E-waste in the OffGrid Sector In Rwanda by Sofies 2017

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Legal Framework for E-waste management in Rwanda

- Environmental law (Revised to include article 20 – E-waste management) Approved by the Parliament in 2018
- E-waste Regulations based on EPR principles Approved by the board of the Regulatory Authority (RURA) in 2018
- National E-waste Policy (2017)
- National sanitation Policy Approved by the Cabinet in 2016
- Ministerial Guidelines on Minimum Standards requirements for Solar home systems

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E-waste Collection Network

- Through the Global Leap Awards, Enviroserve Rwanda is establishing collection points in the Country and neibouring border points

- 30 collection points are being established (at least one in each district of Rwanda) and at least one at the border points with neibouring countries (Eastern DRC, Burundi, Uganda and Tanzania)






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Return on Investment

- Collected and recycled more than 3000 tons/year (including 300 tons solar e-waste)
- More than 4000 computers refurbished (1000 donated to schools)
- More than 413 Green Jobs created
- More than 1872 tonnes of Carbon dioxide equivalent emissions mitigated

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THANK YOU!

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Q&A

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Short feedback survey

Bit.ly/EforADCFeedbackSurvey

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