Eawag:
Das Wasserforschungsinstitut
des ETH-Bereichs

eawag
aquatic research

Wings – Developing non-grid water and sanitation solutions for urban areas

Dr. Sabine Hoffmann

Team

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C. Lüthi, C. Zurbrügg

World Water Week
31.08.2017, Stockholm

Program

11:00	**Introduction** Dr. Sabine Hoffmann
11:10	**Treatment of separated wastewater streams within the building (Switzerland)** Prof. Dr. Janet G. Hering
11:15	**Container-based systems in informal settlements (Kenya)** Dr. Christoph Lüthi
11:20	**Integrated systems in planned urban areas (Mexico)** Dr. Christian Zurbrügg
11:25	**Questions & Answers** Caroline Saul
11:40	**Conclusions** Caroline Saul

Swiss Federal Institute of Aquatic Science and Technology


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Grauwasser
leicht
Urin
Schwarzwasser
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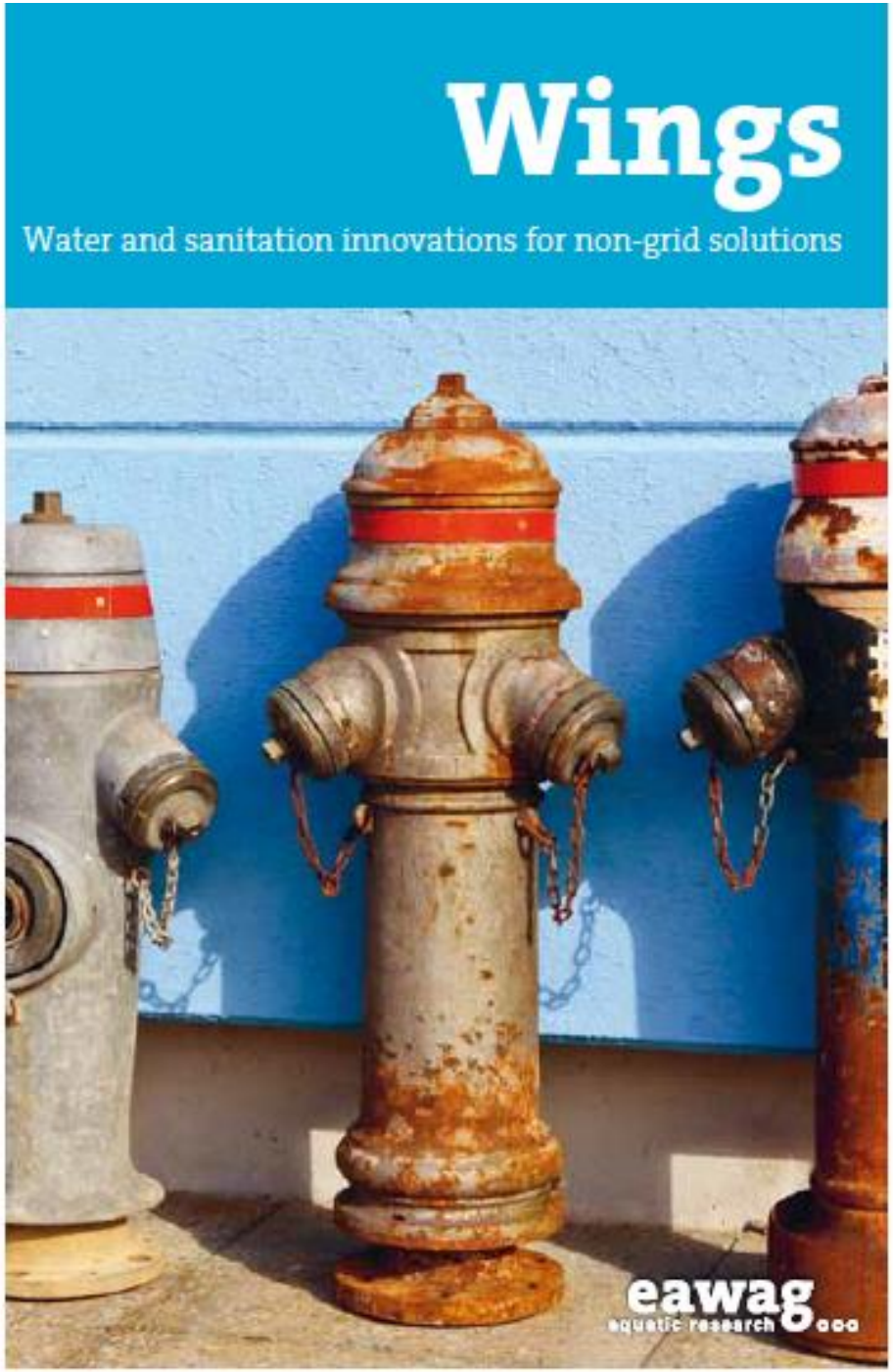

An inter- and transdisciplinary research program that ...

... strives to develop novel non-grid connected water and sanitation solutions


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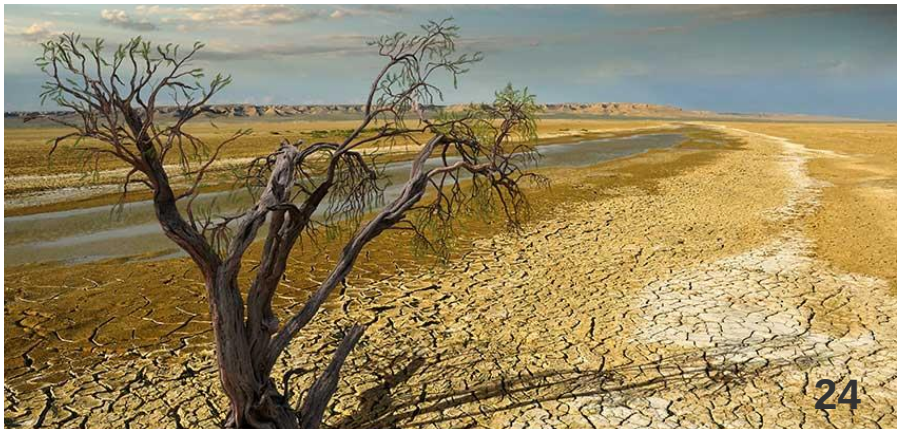
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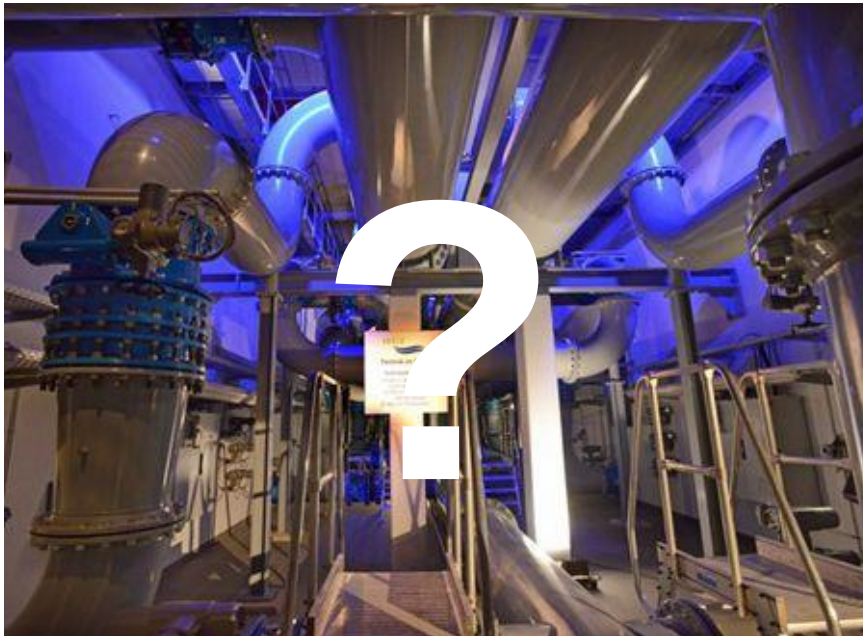


Research Opportunity


The Self Sufficient Home
self


MAKE INDIA
Marktformierung
2.5
I
Potenzialanalyse
3.5
I
- Regionaler Fokus?
Industrieformierung
1.5
I
Kompetenzstruktur
Indische Industrie (www)
& deren globale Vernetzung
(GVC)
How to upscale new technologies/ systems?
Potentielle Marktformierungsprozesse (Strategic Niche Mgt)
How can companies apply (Micro-) Transitional theory for reaching the low-income segment?
What are socio-economic factors that favour new OST solutions?
Is there a potential for disruptive innovation? (economic) (political)
- Übertragbarkeit auf andere Länder
Technologie-maturity for water & quality technologies?
Bewertung
1.6
I
Life cycle analysis of different system configuration
- Rolle Utilities?
Wie sind neue Technologien + Systeme zu bewerten?
How well do different technologies achieve objectives? Trade-offs among?
Reverse innovation within India? (cut-off-hotel)
What are suitable growth strategies? Replication, Expansion, ...
Analyse ähnlicher DL-Angebote für das Zielmarktsegment
How to learn from India's BOP market?
How to "sell" new technologies? (...)
- hip technology - games
- "Circus" -> Hum. - 24/7
Purchasing Motives
informelle Institutionen
3.6
I
Who are important Stakeholders? Who makes decisions? How?
Entscheidungsstrukturen ind. Wasserbehörde & enabling environment
formelle Institutionen
(Incentives)
2.6
I
From individual unit to (complex) functional models?
Analyse institutioneller Kontext → feco phobia (Practices)
Can socio-cultural taboos be overcome in an Indian context & how?
What is important to stakeholders?
Which factors of the enabling environment are crucial for scalability of OST?
Which types of technologies / systems are acceptable? (taboo)
Welche Faktoren fördern / hindern d. Etablierung neuer Systemkont.?
incentives

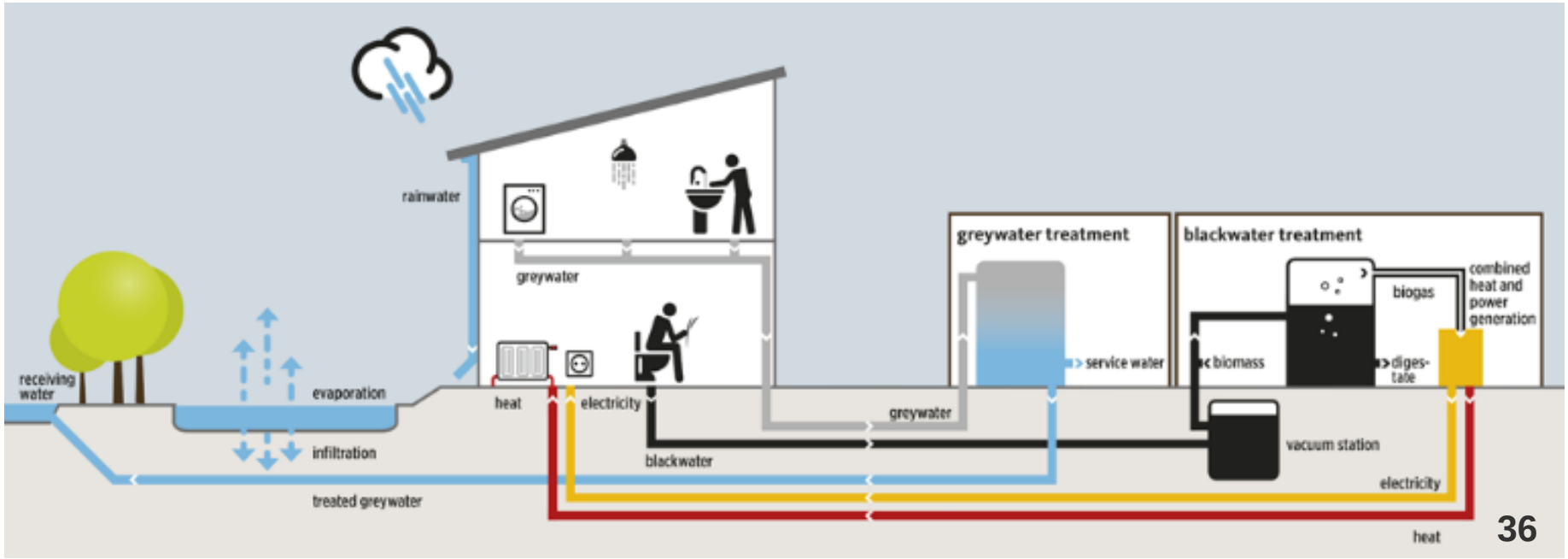

32
Industrialized


33
Emerging


34
Developing

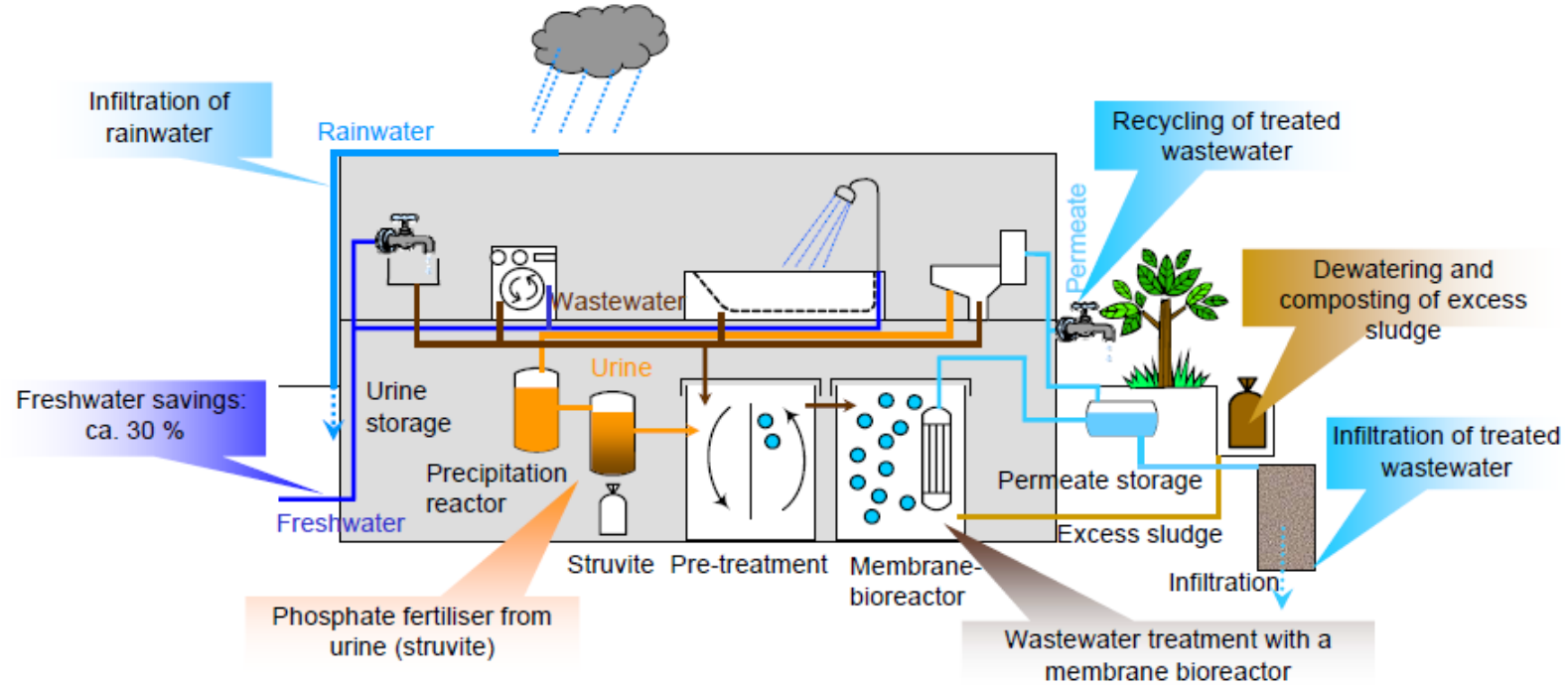

Emerging


Emerging

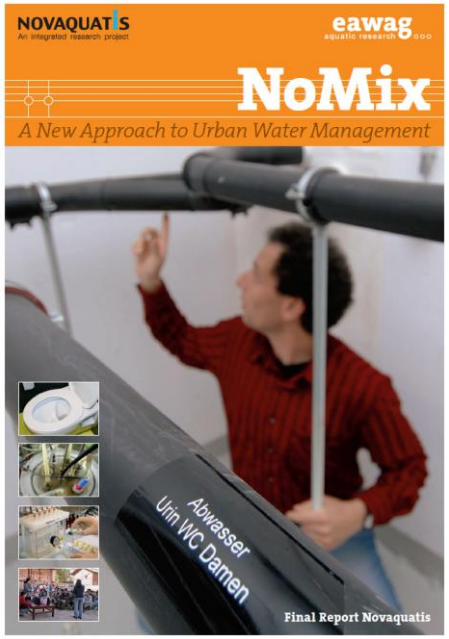

rainwater
greywater
greywater treatment
blackwater treatment
combined heat and power generation
biogas
service water
biomass
diges-tate
receiving water
evaporation
heat
electricity
greywater
blackwater
vacuum station
infiltration
treated greywater
electricity
heat


Industrialized

Zerodischarge house, Switzerland



Novaquatis
(2000-2006)



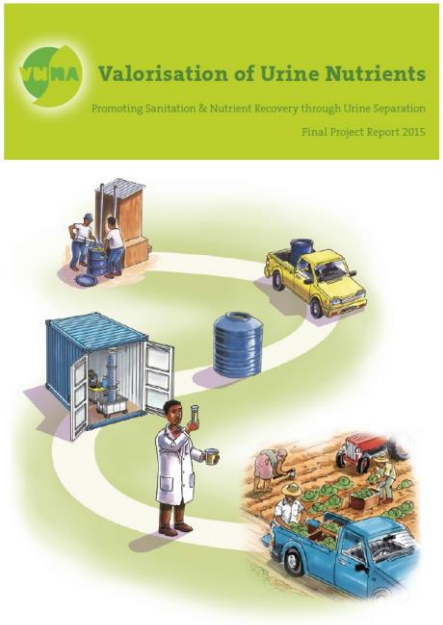
Nutrient recovery from urine
(2009-2015)

Blue Diversion
(2011-2014)

Blue Diversion AUTARKY
Sanitation off the grid
(2015-2016)

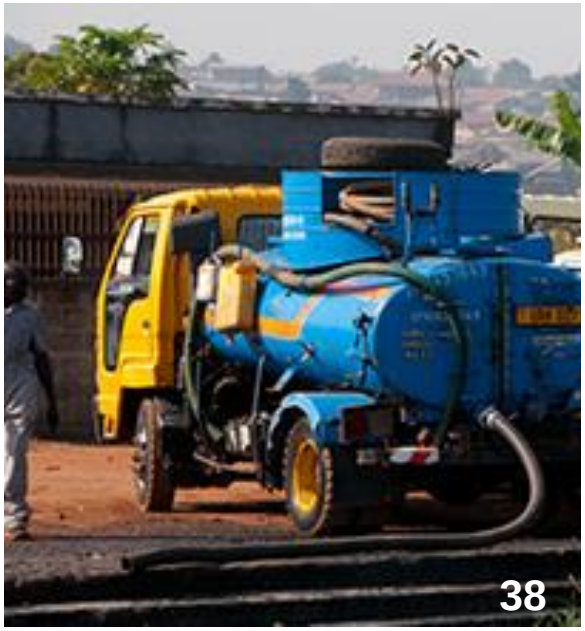
Novaquatis
(2000-2006)

Nutrient recovery from urine
(2009-2015)



Blue Diversion
(2011-2014)

Blue Diversion AUTARKY
Sanitation off the grid
(2015-2016)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Treatment of separated wastewater streams within the building (Switzerland)

Prof. Dr. Janet G. Hering

Container-based systems in informal settlements (Kenya)

Dr. Christoph Lüthi

Integrated systems in planned urban areas (Mexico)

Dr. Christian Zurbrügg

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Materials Science and Technology

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Water Hub within NEST

Treatment of separated wastewater streams within the building

Prof. Dr. Janet Hering

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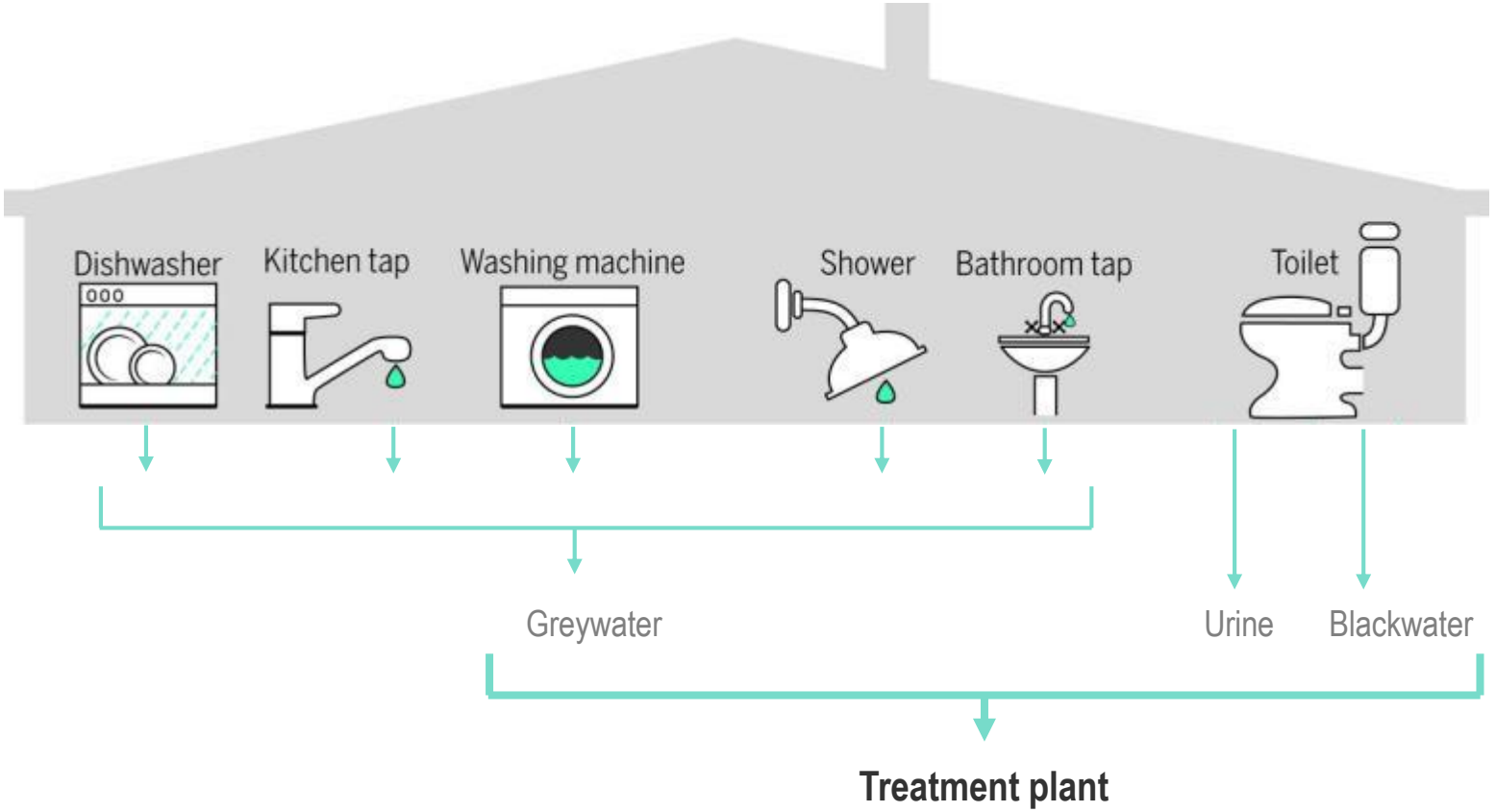
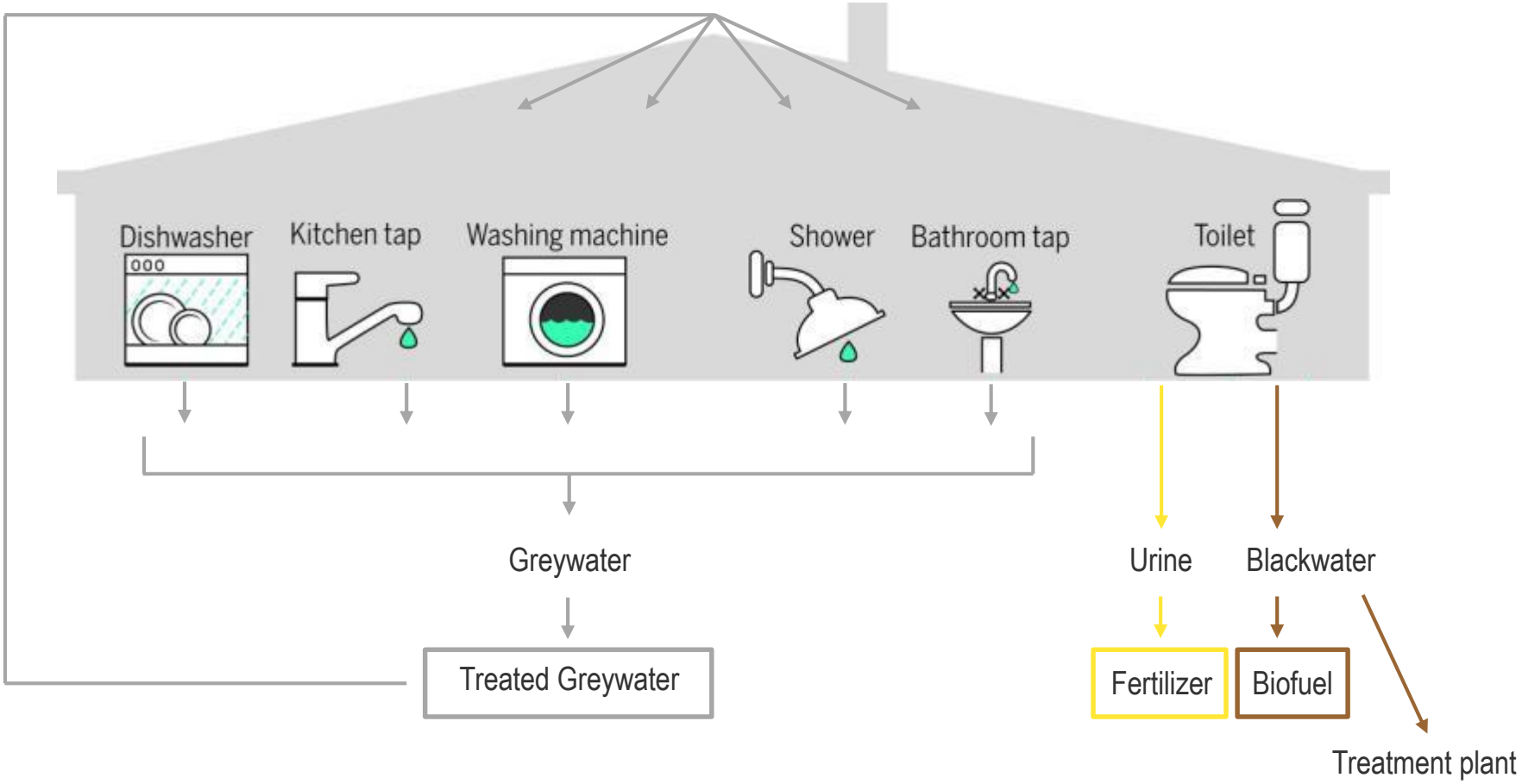
Conventional approach



Adapted from Larsen et al., «Emerging solutions to the water challenges of an urbanizing world», Science (2016)

Treating separated wastewater streams

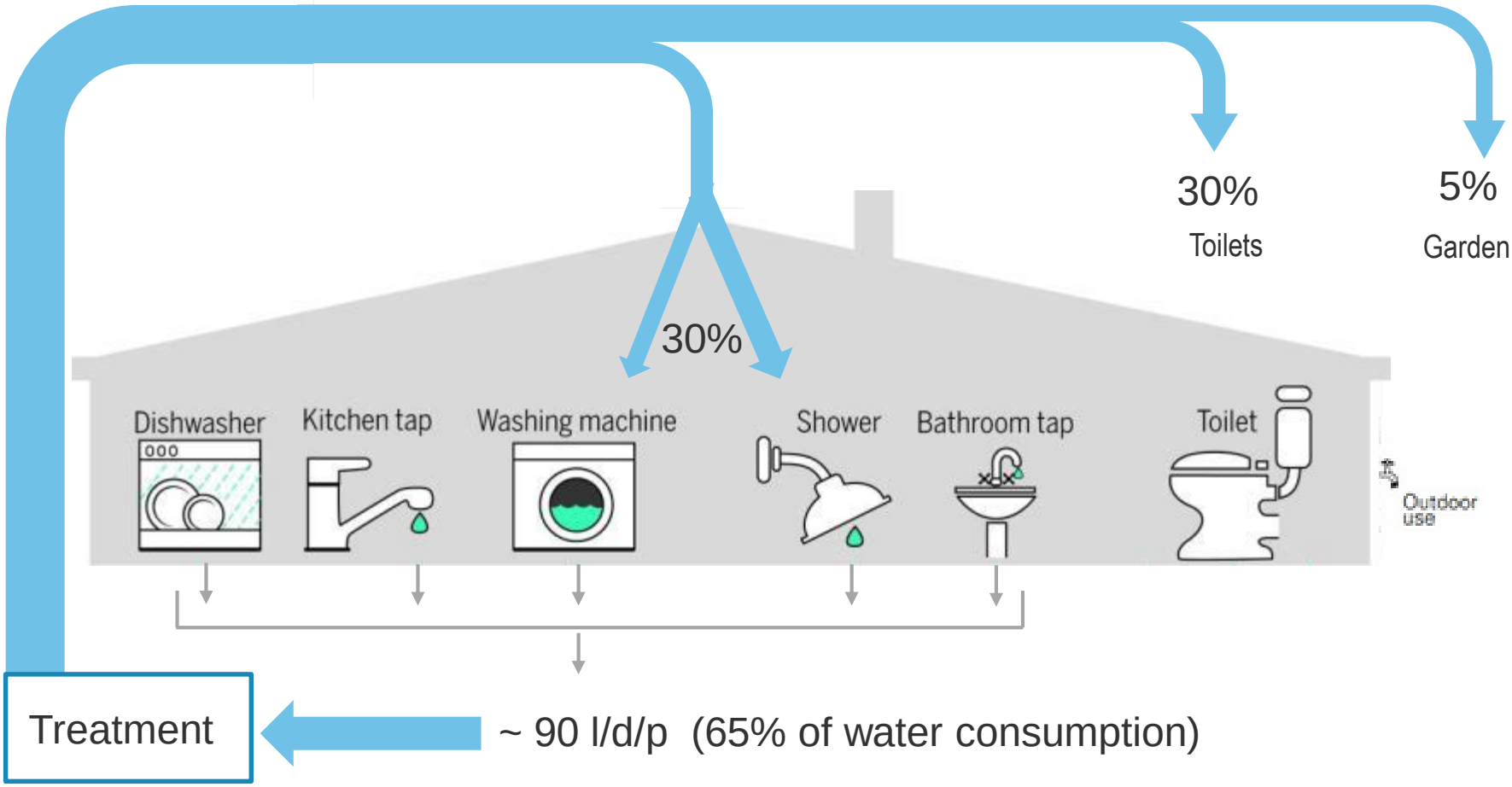
Reuse water
Extract nutrients and energy



Adapted from Larsen et al., «Emerging solutions to the water challenges of an urbanizing world», Science (2016)

Greywater

Total water consumption: 142 l/d/p → **~ 52 l/d/p**



See the video online at:

http://www.eawag.ch/repository/newsletter/2017-02/waterhub_en/

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Container-based systems in informal settlements

Dr. Christoph Lüthi

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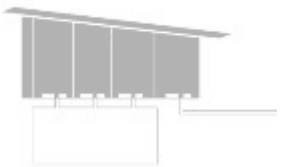
Informal areas

Sanitation service regimes in African cities*

1. Domestic sewer regime

2. Shared on-site sanitation regime

3. Public sanitation regime



economically viable?

scalable?

5. Container-based regime

socially acceptable?

institutional interface?

*van Welie, M.J., Cherunya, P.C., Truffer, B. & Murphy, J.T. (submitted). Analyzing transition pathways in developing cities: The case of Nairobi`s splintered sanitation regime

Example Sanivation

Sanivation
Sanitation as a Service

Sanitation Service

- 100+ households
- Subscription based model
- 80%+ renewal rate

Sludge treatment

- Solar-thermal energy
- CDC approved health and safety protocols
- Patent pending

Briquette production

- Producing 9 tons/month
- 97% of sales to restaurants

Example Sanergy

Fresh Life toilets

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Integrated systems in planned urban areas

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Why are emerging markets interesting?

- Emerging markets (BRIC countries, Middle East, South Africa, Mexico, Indonesia...) offer interesting opportunities for non-grid systems
  - Construction growth
  - Degrees of freedom
  - Water scarcity
  - Financial resources
- Leap in innovative technologies will be driven by emerging markets

Example: Social housing projects in Mexico

- Social housing project are in need for integrated systems
- Examples (Échale! A tu Casa - 180’000, Cemex - 70’000 households)

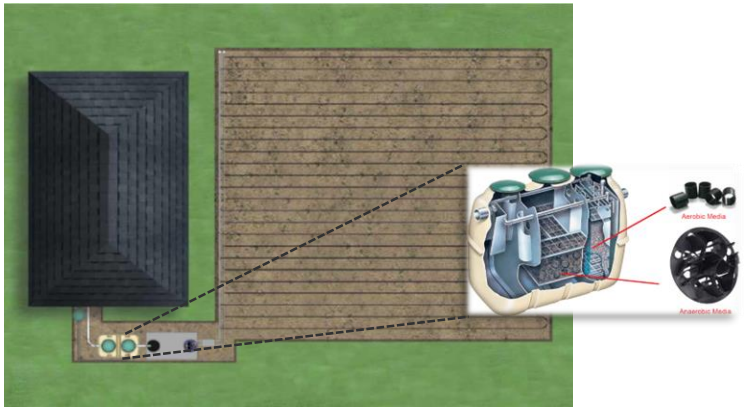
Before

After

Integrated systems

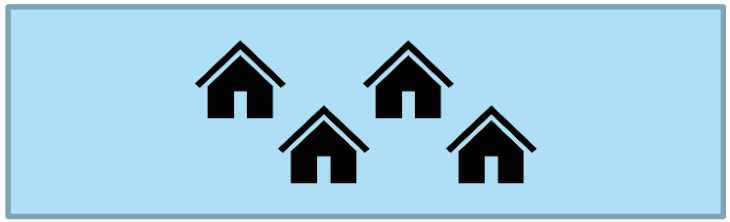
How does innovation happen in emerging markets?

- International and local companies
- R&D competences in emerging markets, but still linked to headquarters
- Replicating pilots in a single emerging markets, transferring it to other emerging markets
- Bringing it back to industrialized markets, and adapting it for low-income markets



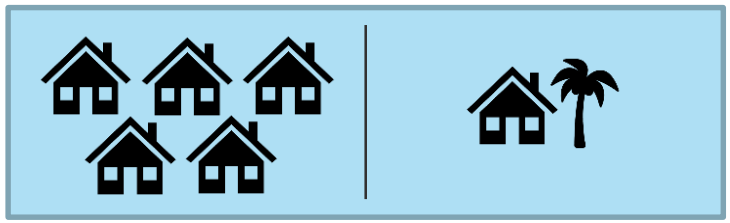
What are the promising applications for non-grid systems in emerging markets?

1. Social housing



3. Micro-compounds

2. Private compounds



4. High-rise buildings

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