Technical standards for NASS (New Alternative Sanitation Systems) in Germany

University of Natural Resources and Life Sciences, Vienna
Department of
Water, Atmosphere, and Environment

Günter Langergraber
IWA Fellow
Secretary IWA ROS SG

Institute of Sanitary Engineering and
Water Pollution Control

RUN4LIFE @ IFAT

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Content

- Definitions
- Activities of DWA regarding NASS
- The standard DWA-A 272
- Guideline for using DWA-A 272
- Further DWA standards for New Alternative Sanitation Systems
- Conclusions

- Announcement of new COST Action CA17133

Definition 1 (IWA ROS SG)

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- **Resources-oriented sanitation systems safely recycle excreta and other organic waste products** to crop production **in such a way that the use of non-renewable resources is minimised.**

- The statement **'safely recycle' includes hygienic, microbial and chemical aspects**. Thus, the recycled human excreta product, in solid and liquid form, shall be of high quality both concerning pathogens and all kind of hazardous chemical components. This means the product should not pose any significant health threat or environmental impact when used.

Definition 2 (Germany)

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- **NASS** = **N**eu**A**rtige **S**anitär**S**ysteme
  = **N**ew **A**lternative **S**anitation **S**ystems

- New alternative sanitation systems (NASS) are based on the separate collection, discharge, treatment and reuse of source separated flows.
- The aim of these systems is to reuse water and utilize useful substances extracted from the wastewater (especially nutrients and organic matter but also energy and water).
- Applicable for different scales but mainly for (semi)-decentralized systems → one of the main aims is high flexibility

Activities of DWA regarding NASS

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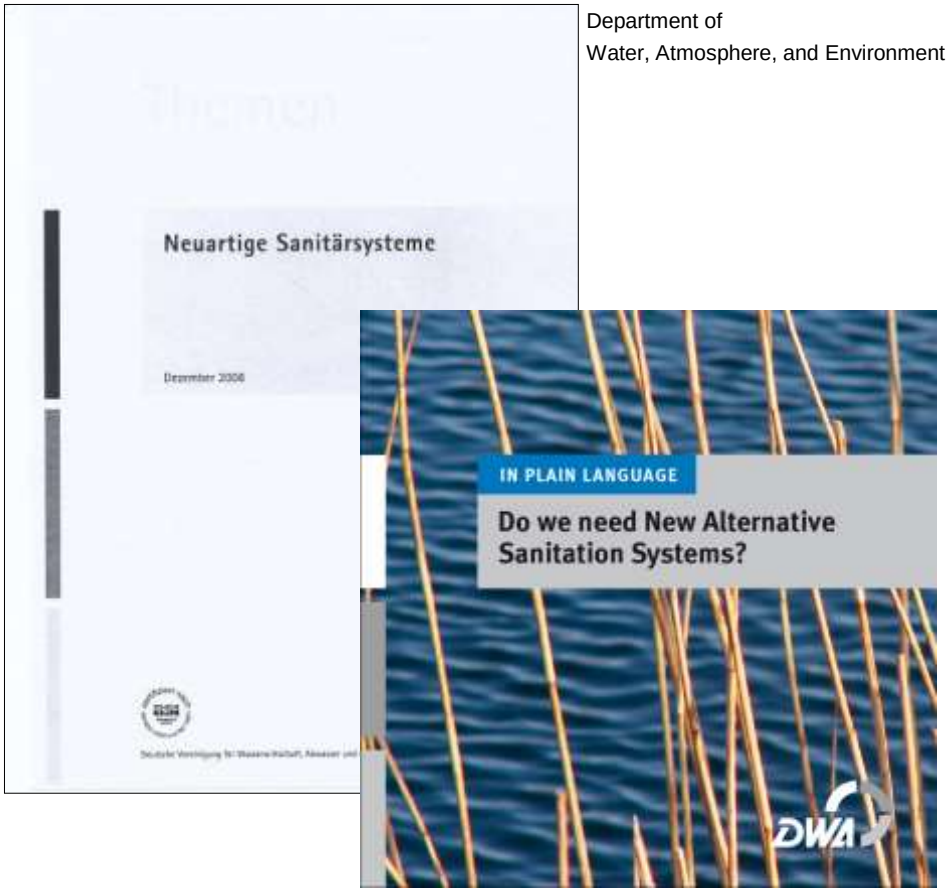
- since 2005: expert committee KA-1 “New Alternative Sanitation Systems“ (NASS), several working groups
- 2008: DWA publication “Neuartige Sanitärsysteme” (in German)
- 2010: NASS brochure “Do we need New Alternative Sanitation Systems?” (in 2012 in English)
- since 2009: work on a new standard for NASS (working group KA 1.4 “Systemintegration”)



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The standard DWA-A 272

- **Title: ”*Principles for planning and implementing new sanitation systems*“**
- Target: Description of the distinctive features of NASS compared to conventional systems
- Target groups: planners, technology providers, building contractors, utilities, authorities
- Main content:
  - fundamental principles of new sanitation systems
  - recommendations for use
  - implementation into planning processes
  - hints for assessment and evaluation
- published June 2014

The standard DWA-A 272

Content 1/5

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Key components of NASS

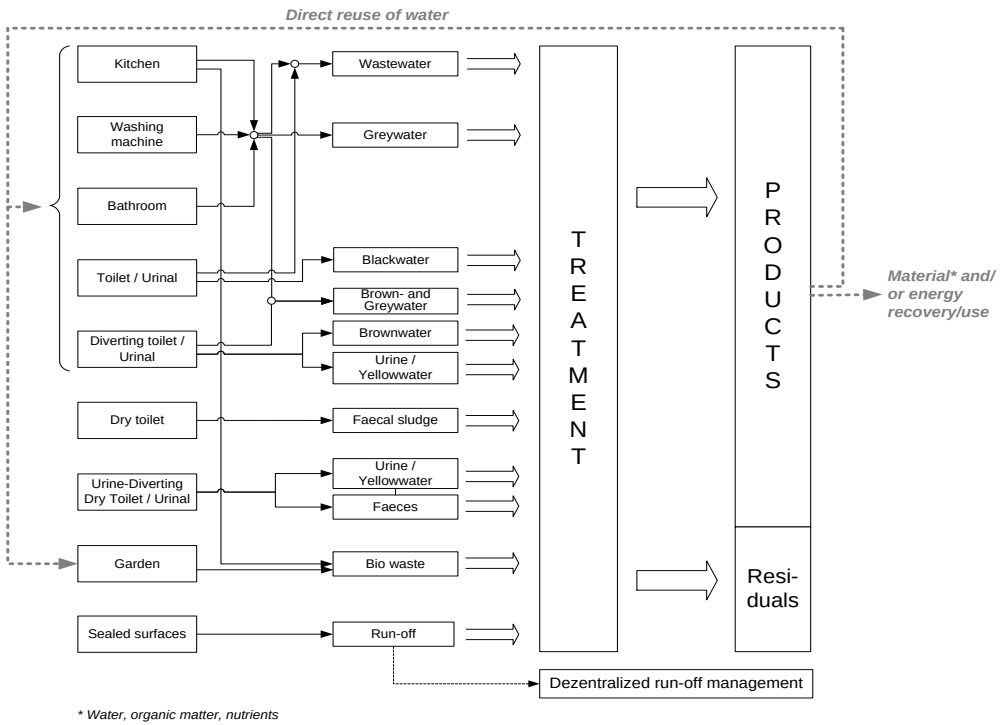
→ *manifold options to separate different wastewater sub-streams*

Definition of waste(water) sub-streams

Urine, Faeces, Faecal sludge, Yellow water, Brown water, Black water, Greywater

Classification of system groups

1-Material flow system
2-Material flow system (w/o diverting toilet)
3-Material flow system (with diverting toilet, dry toilet or diverting dry toilet)



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Treatment processes for source streams

Mass flow	Treatment objective	Possible treatment process
yellow water / urine	sanitisation	storage
	concentration of N + P (production of a nutrient-rich fertiliser)	struvite precipitation (MAP)
	N-concentration (fertiliser production) / sanitisation	ammonia stripping
	stabilisation / concentration of nutrients	nitrification/distillation
black and brown water	separation / concentration	filtration
black and brown water, high solids phase	sanitisation / production of soil conditioner	aerobic (composting)[1)]
	energy production / Stabilisation (biogas)	anaerobic (mesophilic)
	sanitisation/ volume reduction	dehydrating[1)]
	sanitisation/ stabilisation	liming[1)]
black and brown water, low solids phase	concentration of nutrients	precipitation/flocculation
	elimination of nutrients	aerobic
	energy production	anaerobic (mesophilic)
greywater	high quality service water	biological (membrane) process

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Content 3/5

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Design

no detailed instructions for dimensioning the individual technical components of new concepts because of

- great variety of possible approaches
- the development dynamics in this area

But **resident-specific volume flows and material loads of wastewater sub-streams** for Germany

Particularities

- different sub-streams + limited data available
- smaller units = higher degree of variability (concentrations, volume flows, loads and temperatures)
- importance of how the objects are used (residential buildings, offices, buildings frequented by the general public)

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Recommended uses for NASS

- developing new urban areas
- renovating or modernizing existing properties
- capacity bottlenecks in existing infrastructures

→ Importance of the current situation of the water infrastructure and the boundary conditions!

→ list of favourable and challenging prerequisites – examples:

Favourable	Challenging
▪ rehabilitation necessary ▪ functional problems of the existing system ▪ high vacancy rate of buildings and declining demand for water/volume of sewage	▪ investments in the existing system ▪ free capacities in the existing infrastructure ▪ Lack of acceptance for NASS-products

→ ***If some of the favourable prerequisites are fulfilled, the implementation of new sanitation systems should be investigated!***

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Content 5/5

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Assessment of NASS

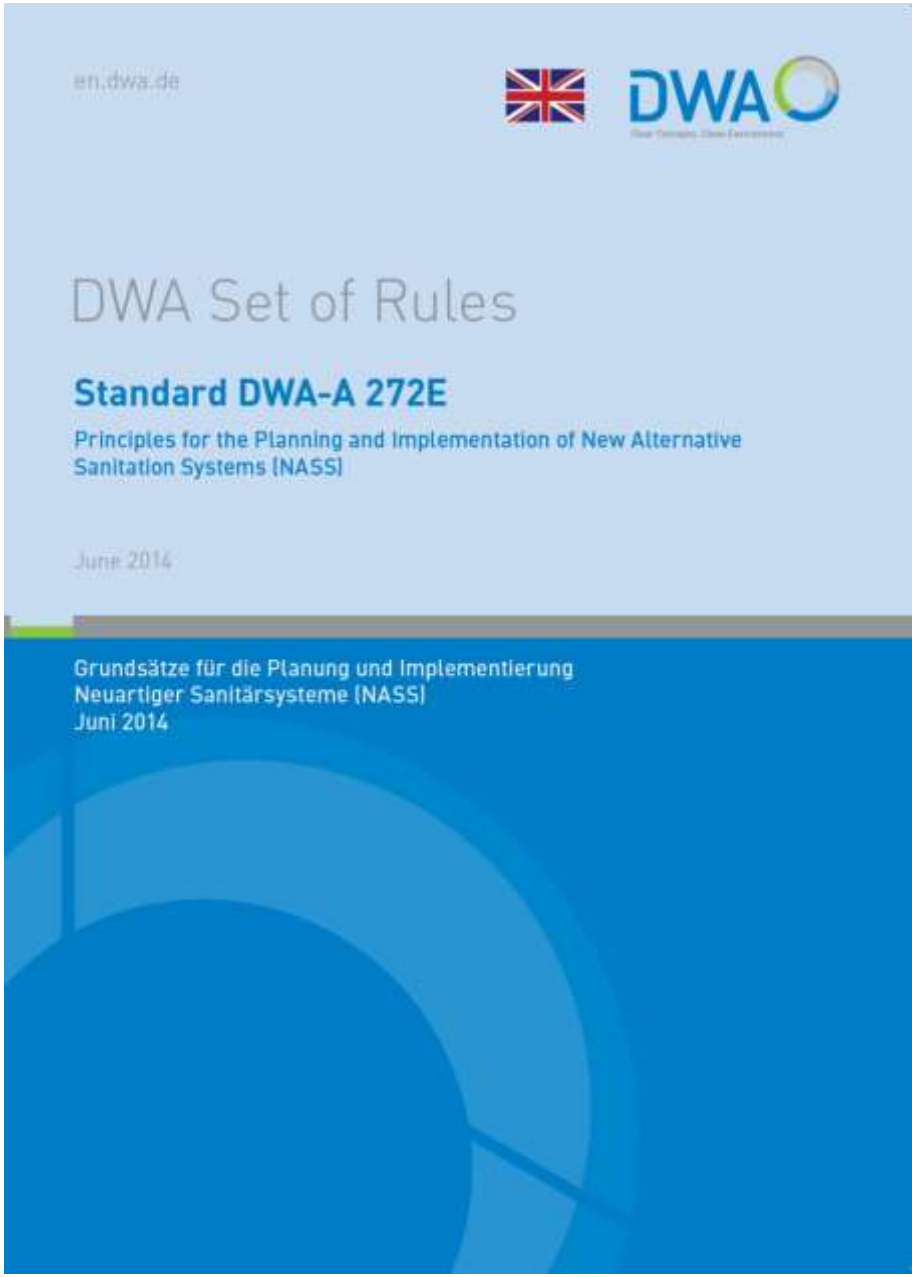
- definition of **system boundaries** (e.g. incl. production of fertilizers)
- **planning horizon**:
  integration in existing systems: 50 to 100 years
  isolated solutions (without components with long useful lives): 10 to 20 years
- different benefits of different concepts → **extended methods** necessary
- list of relevant **evaluation criteria**

  Categories of criteria: environmental (incl. resources recovery), hygiene (has to be fulfilled by any alternative), economical, social and technical
- involvement of **uncertainties**:
  e.g. consideration of changing conditions (climate change, demographic change), cost development of "new" technologies
  → scenario analysis or foresight methods

The standard DWA-A 272

Outlook

- **English Translation of DWA-A 272**
  - will be released soon



Guideline for using DWA-A 272

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- Goal: **Increase use of technical standard in practice**
- Description of the **methodology for comparing different solutions for water infrastructure**
  - Considering all relevant criteria
  - Describing where to get data in a way that the effort is practicable
- Method: multi-criteria assessment
- Guideline proposes
  - criteria for assessment and their weighting
  - values and functions for the criteria
  - describe the process of decision making

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Description of criteria values and functions

		Relevance	Values and functions	Description
1. Environment and resources				
a) Water Pollution Control	1. Reduction of emissions of nutrients (N and P)	1	Elimination efficiency 1 = 100% elimination 0.5 = Average value for Germany (or 0 = 0% elimination)	▪ Separate evaluation for N and P ▪ Average value for Germany: 63 g P und 665 g N pro person and year
	2. Reduction of emissions of eco-toxic compounds (e.g. micro-pollutants, NH_4-N, NO_2-N, microbial contamination)	1	Elimination efficiency 1 = very high 0 = very low	▪ Separate evaluation for different micro-pollutants (micro-pollutants, NH_4-N, NO_2-N, microbial contamination, etc.). ▪ Due to lack of data usually only relative comparison of alternatives possible

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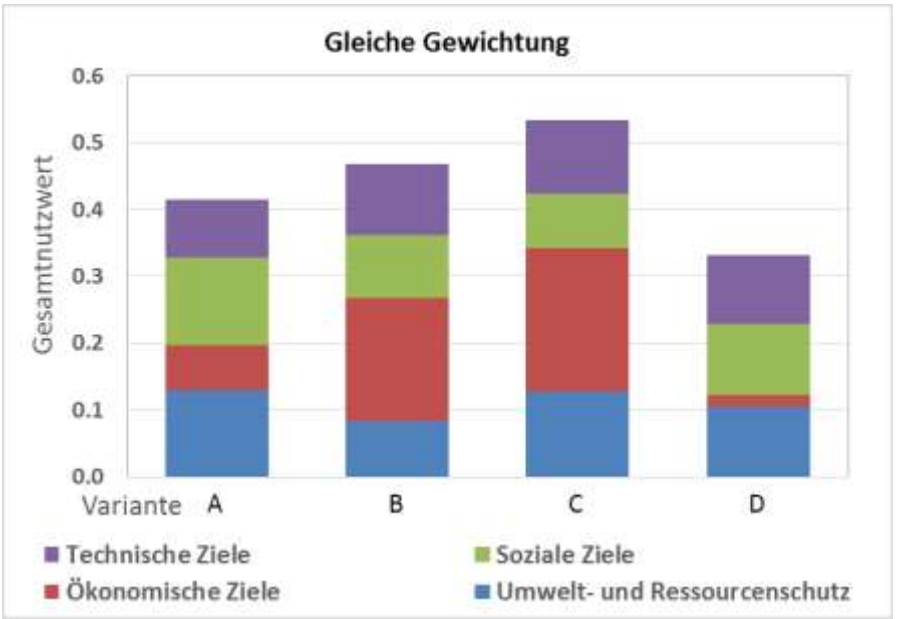
Example:

Settlement in rural area in Eastern Germany, about 0.5 km distance to a larger community

- **Variant A**: Connection via pressurised sewers to the central WWTP
- **Variant B**: MBR Plants for each household
- **Variant C**: UDDTs (transport of urine and faeces to central WWTP) and TWs for greywater
- **Variant D**: cesspits and transport of collected wastewater to central WWTP.



Guideline for using DWA-A 272

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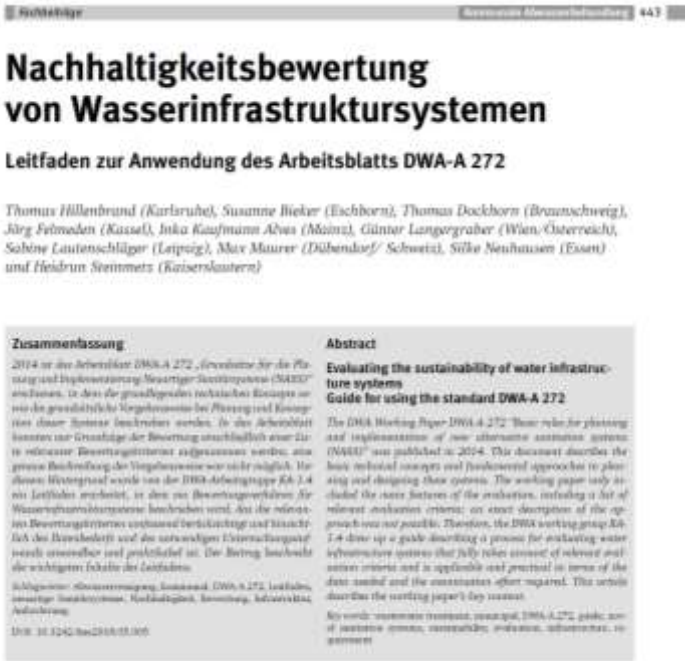
- Article on Guideline in *Korrespondenz Abwasser, Abfall* 65(5), pp.443-449.
- Guideline ("Leitfaden") and calculation tool (xls-file) available for download for free


Nachhaltigkeitsbewertung von Wasserinfrastruktursystemen

Leitfaden zur Anwendung des Arbeitsblatts DWA-A 272

Thomas Hillenbrand (Karlsruhe), Susanne Bieker (Eschborn), Thomas Dockhorn (Braunschweig), Jörg Felmeden (Kassel), Inka Kaufmann Alves (Mainz), Günter Langergraber (Wien/Österreich), Sabine Lautenschläger (Leipzig), Max Maurer (Dübendorf/ Schweiz), Silke Neuhausen (Essen) und Heidrun Steinmetz (Kaiserslautern)

Zusammenfassung

Abstract

Evaluating the sustainability of water infrastructure systems
Guide for using the standard DWA-A 272

https://de.dwa.de/de/arbeitshilfen-aus-dem-dwa-regelwerk.html

Working group DWA KA 1-4
Members

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- Dr.-Ing. Thomas Hillenbrand (Speaker), ISI Fraunhofer, Karlsruhe
- Dr. Susanne Bieker, GIZ, Eschborn **
- Prof. Dr.-Ing. Thomas Dockhorn, TU Braunschweig
- Dr.-Ing. Jörg Felmeden, Cooperative Infrastruktur und Umwelt, Kassel
- Dr.-Ing. Inka Kaufmann Alves, Hochschule Mainz
- Bernd Kirschbaum, UBA *
- Priv.-Doz. Dr. Günter Langergraber, BOKU Wien
- Sabine Lautenschläger, Universität Leipzig
- Prof. Dr. Max Maurer, ETH Zürich & EAWAG
- Silke Neuhausen, Emschergenossenschaft Lippeverband, Essen
- Dr.-Ing. Julia Sigglow, formerly TU Dortmund *
- Prof. Dr.-Ing. Heidrun Steinmetz, TU Kaiserslautern

* during work on standard only; ** during work on guideline only

Further DWA standards for NASS

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- **Information leaflet (“Merkblatt”) DWA-M 143-18 (April 2015):**

  Rehabilitation of Drainage and Sewer Systems Outside Buildings – Part 18: Rehabilitation through system change to pressure drainage system and vacuum sewer system

  (*Sanierung von Entwässerungssystemen außerhalb von Gebäuden - Teil 18: Sanierung durch Systemumstellung auf Druck- oder Unterdruckentwässerung*)

- **Information leaflet (“Merkblatt”) DWA-M 277 (2017):**

  Principles for planning and implementing facilities to treat and use greywater

  (*Grundsätze für die Planung und Implementierung von Grauwasserbehandlungs-/-nutzungsanlagen*)

  Written in collaboration by BDZ, fbr und DWA

Conclusions

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- To solve future challenges to our water infrastructure systems we need new **solutions with high flexibility and resource efficiency**.
- New sanitation systems are complex technical systems at the interface of the public and private spheres, sometimes combined with other infrastructure sectors.
- Water infrastructure systems are embedded in a socio-technical system (legal bases, technical regulations, institutional and organizational involvement etc.).
- **The standards DWA A 272 helps accelerating implementation of ”NASS”** (at least in German speaking countries).

Announcement of new COST Action CA17133

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Circular City
RE.SOLUTION

cost
EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

Implementing nature based solutions for creating a resourceful circular city (*Circular City Re.Solution*)

The main aim and objective of the Action is to

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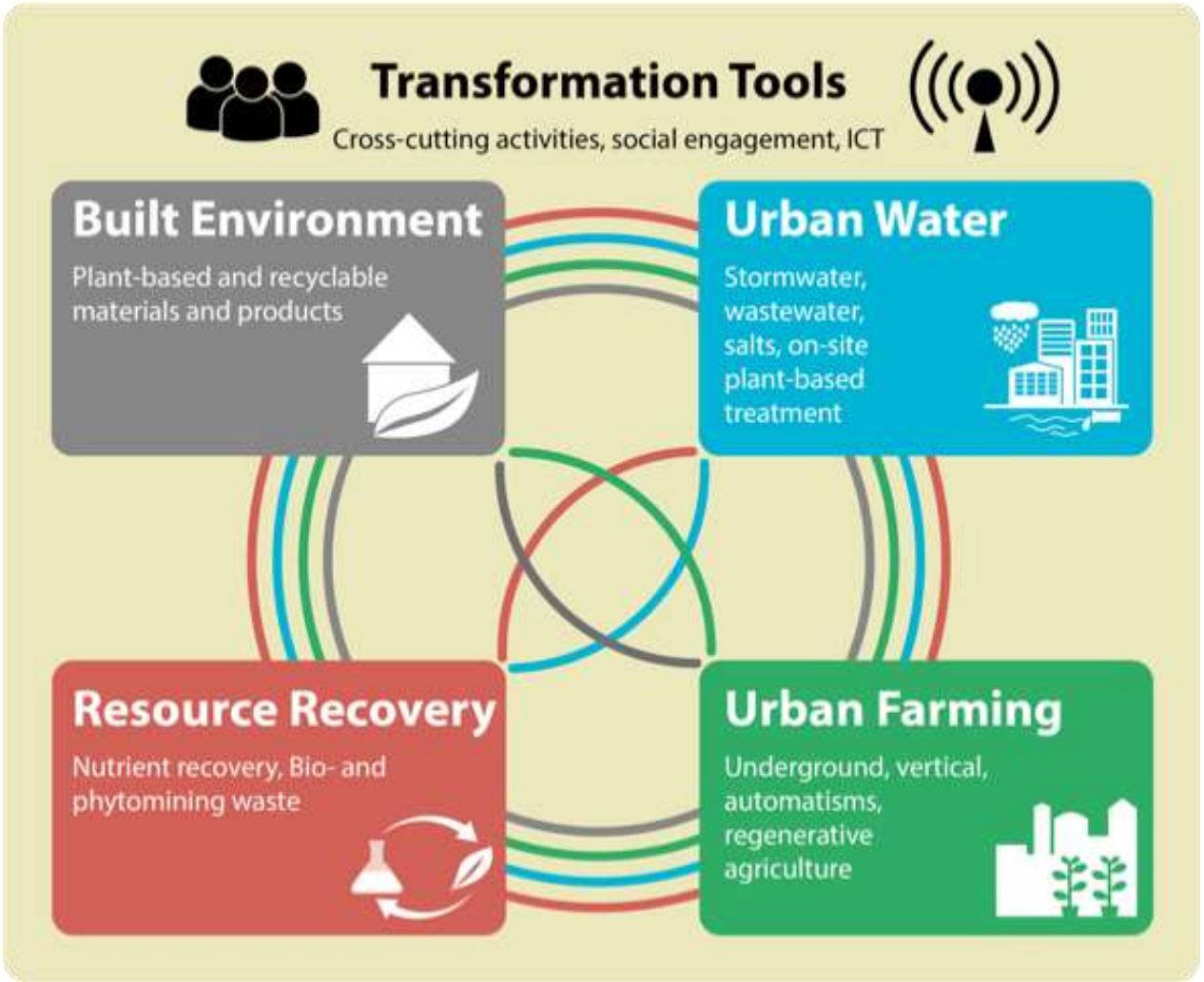
build an **interdisciplinary platform** for connecting city planners, architects, system designers, economists, engineers and researchers from social and natural sciences

that **develop nature based solutions in the urban landscape** that

- facilitate circular economies based on the 3Rs (Reduce, Reuse and Recover) and
- allow cities to cope with future challenges.

Main outcome: **Guideline on solutions combining NBS and CE in the urban environment**

5 Working Groups



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Timeline

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- ✓ 7 September 2017: Submission of the proposal
- ✓ 13 April 2018: Proposal accepted
- ✓ 27 April 2018: MoU published
- ✓ 7 May 2018: Entry into force of MoU (6 countries signed MoU)
  - Status 15 May 2018: 13 countries + 18 MC members
- **22 October 2018**: first MC meeting where
  - Chair, WG Leaders, etc. will be elected
  - Workplan for first year will be decided on
- 2019: expected start of activities of COST Action

Contact

Dr. Guenter Langergraber

University of Natural Resources and Life Sciences, Vienna
Department of
Water, Atmosphere, and Environment

University of Natural Resources and Life Sciences, Vienna (BOKU University)
Department of Water, Atmosphere and Environment
Institute of Sanitary Engineering and Water Pollution Control

Muthgasse 18, A-1190 Vienna, Austria
Tel.: +43 (0)1 47654-81111

Email: guenter.langergraber@boku.ac.at