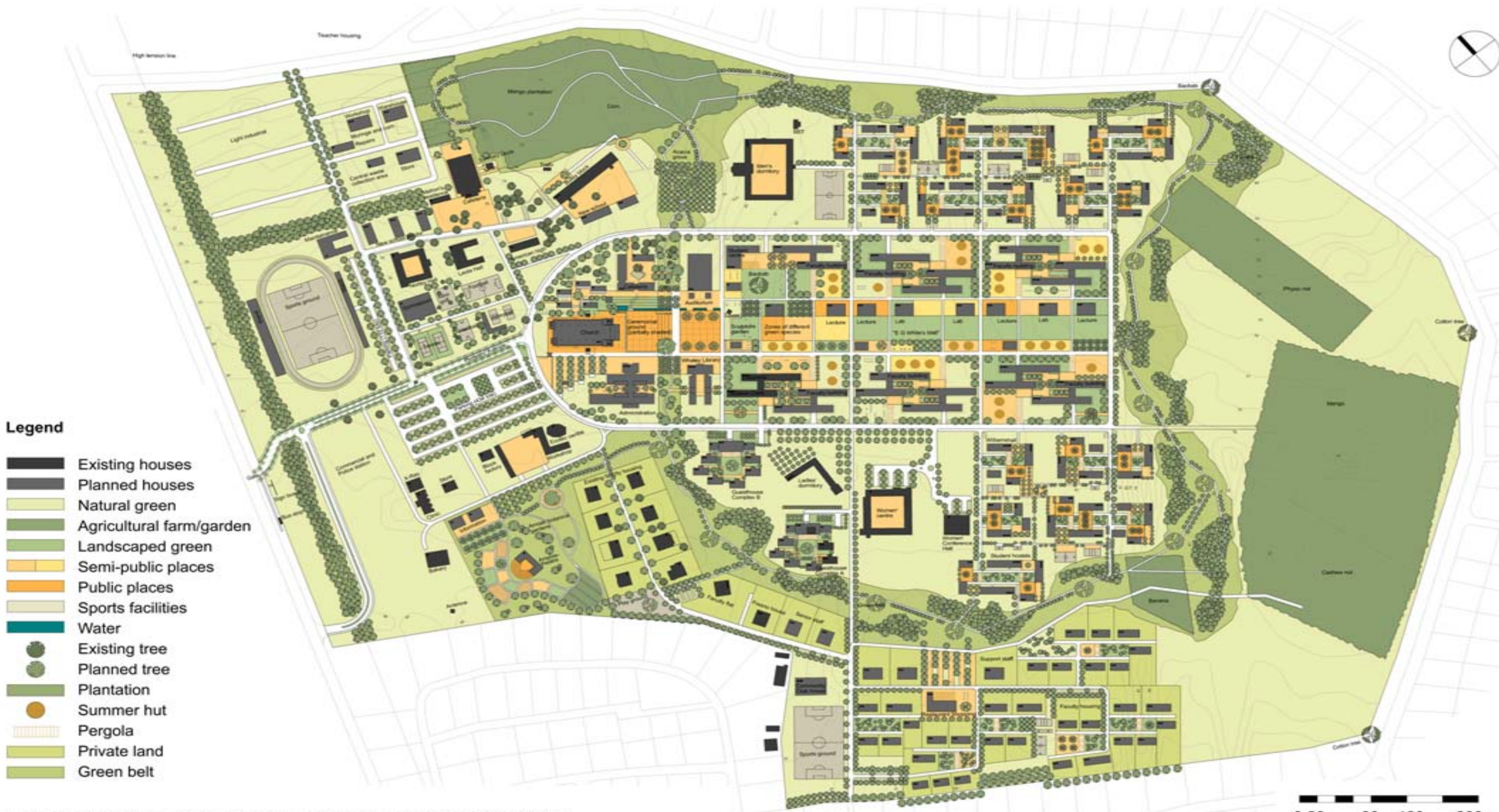
BERGER BIOTECHNIK GmbH
Sustainable Systems and Products for on site Biological Waste Treatment, Ecological Sanitation and Water Saving

From pit latrine to nutrient conservation – Design and construction of an optimised public dehydration toilet in Ghana

Wolfgang Berger, Berger Biotechnik GmbH, Hamburg

Sub-project of the research project "Ecological development at Valley View University in Accra, Ghana", supported by the German Federal Ministry of Research and Education (2003 – 2009).



Ecological master plan by Bauhaus-University Weimar, March 2009

Ecological master plan for Valley View University,2015

(Project partner Bauhaus-University Weimar, Prof. D. Glücklich)

New buildings as part of the research project

Faculty buildings and sanitary block equipped with water saving and urine separating toilets supplied by rainwater
(Project-partners Bauhaus University Weimar, Palutec GmbH, Augsburg)

Urine collecting and water saving devices

Separation flush toilet, 4 l faeces flush and 2 l urine flush (Gustavsberg) Dry urinal with membrane trap (Keramag)

Urine storage and crop production (corn)

Urine is applicated to mango, papaya, cashew, sorghum and maize after 3 month retention period
(Project partner University of Hohenheim UHOH, Prof. Sauerborn, Dr. Germer)

BERGER BIOTECHNIK GmbH

Sustainable Systems and Products for on site Biological Waste Treatment, Ecological Sanitation and Water Saving

Kumasi Ventilated Improved Pit Latrine (KVIP)

Central public toilet in Komenda for 5.000 inhabitants

Highest rate of cholera and typhus infections in Ghana

(open defecation, private wells, low water table)

BERGER BIOTECHNIK GmbH
Sustainable Systems and Products for on site Biological Waste Treatment, Ecological Sanitation and Water Saving

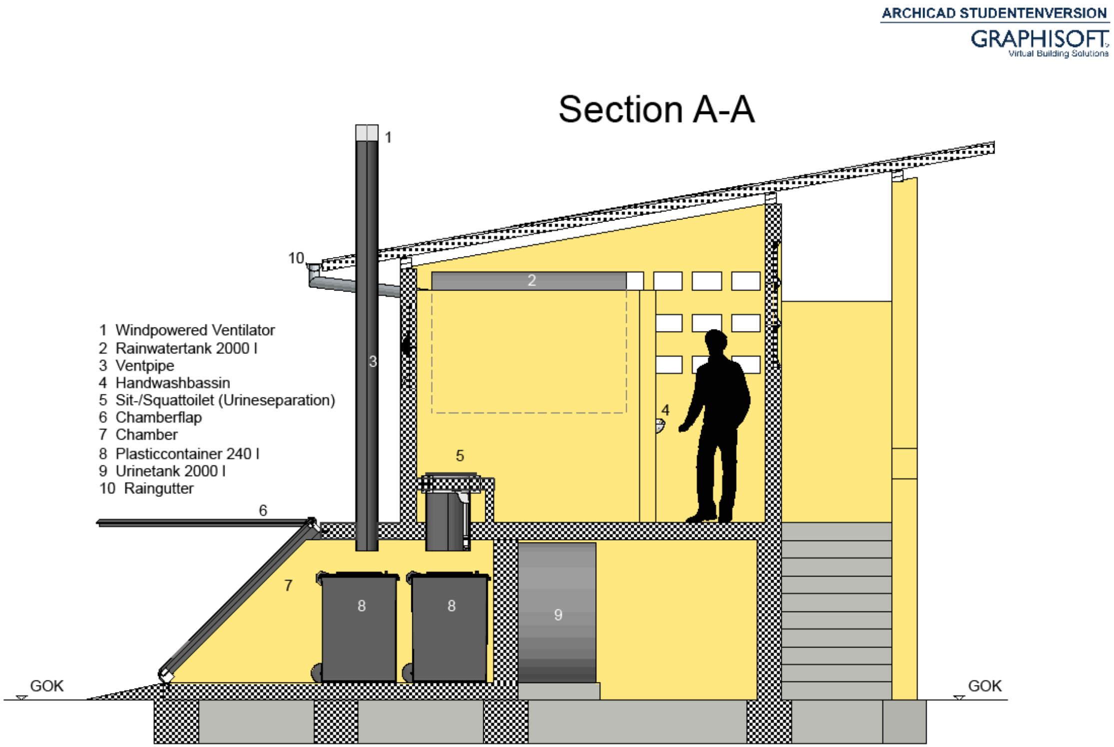
Projects on composting toilets since 1985

Dry toilet in a settlement with 300 inhabitants in Bielefeld, (1995), 4-storey buildings and public Kindergarden; Ventilated composting container in the basement, family house in the settlement Hamburg-Allermöhe (1987);

The BBT Dry toilet building at VVU

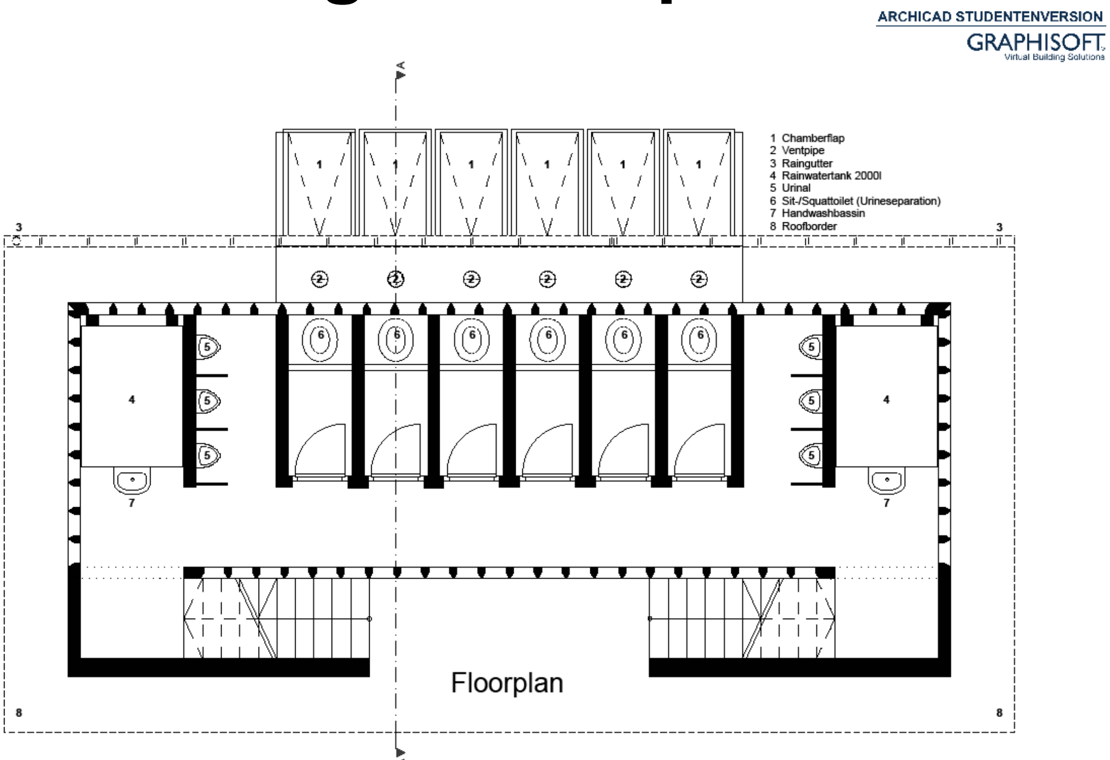
Front side and back side view, acces from groundlevel
Solar heated and ventilated storage chambers
(project leader, concept and design, final realisation Berger Biotechnik GmbH)

Dry toilet building, section view



Exchangeable 240 l-dust bins,1000 l urine collection tanks, urine separating dry toilets,1000 l rainwater storage tanks (Master study S. Weselmann, HCU Hamburg, final design, planning, drawing)

Dry toilet building – Floor plan



Acces from both sides for flexible use (e.g. male/female).
Back side chambers for flexible storage (bin/vault).
(Drawing by S. Weselmann, construction supervisor A. Mitterer, Gangkofen)

BERGER
BIOTECHNIK GmbH
Sustainable Systems and Products for on site Biological Waste Treatment, Ecological Sanitation and Water Saving

Hand-made separation dry toilet from concrete

Terrazo surface, polished with fluid wax (Design by W. Berger)
Membrane trap for urine discharge (Smellstop, SA)
(„Dry flush“ by adding wood chips, saw dust or grass clippings once a day)

Dry urinals and urine collection

Polyethylene-plastic urinals with membrane trap
Pump connection for urine transport

Hand washing using collected rainwater

Rain gutter with filter connected to the tank and down-pipe.
Self-closing tap, supplying about 200 ml of water each use.

Solar dehydration of urine separated faeces

Each chamber has one bin in use and one bin for solar drying. Reduction rate is about 50 % after 6 weeks.

(Monitoring of temperature, airflow, and pathogen survival by UHOH)

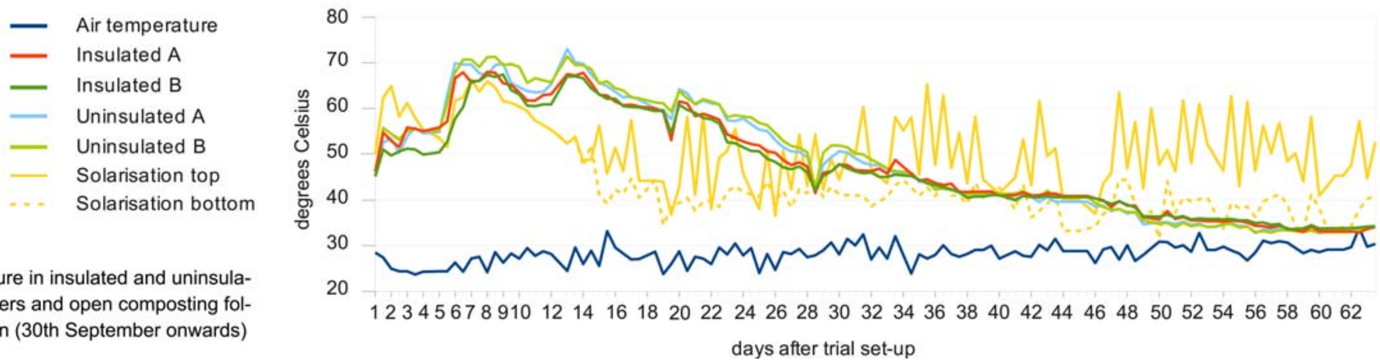
Solar and wind powered ventilation

Heat absorbing covers and surfaces, Savonius fans

Co-composting with grass clippings

Brick composting chambers with backside vent pipes.
Taking samples for a second test after 3 month retention.

Co-composting tests of faecal matter



Course of temperature in insulated and uninsulated compost chambers and open composting followed by solarisation (30th September onwards)

Temperature profiles for hygienisation efficiency validated by bacteria, virus and ascaris egg deactivation rates. More than 55°C was achieved for 3 weeks after periodic turning of the compost.

(test supervising, secondary research by sub-project partner UHOH, Dr. Germer)

Results after 6 months operation period

- Good function and acceptance can be confirmed.
- Further tests concerning compost quality are going on and user acceptance is documented.
- Many of the students prefer the dry toilet to the flush toilet (safe function, feel familiar, clean, no smell)
- Costs are equal to costs of a KVIP (€ 9.000 incl. labour)
- Cost savings, when built at a slope (€ 1.000).
- Cost savings, when not tiled (€ 1.000).
- Further savings by pre-fabrication and other construction materials possible.

Conclusions

1. Before starting a sanitation project, find an environmental sound solution for the final products in agriculture first;
2. Try to implement sanitation systems that have been experienced and proved in a developed country before;
3. Use local building materials and products as far as possible to develop local economy, handcraft and cultural identification;
4. Building design should respect changes and development of new toilet systems to be flexible for the future;
5. Make public toilets attractive for users and operators as well by raising the standard of comfort and maintenance;

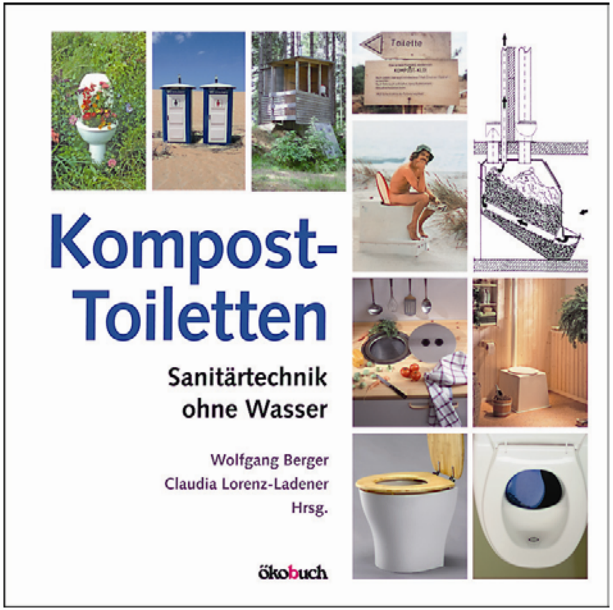
BERGER BIOTECHNIK GmbH

Sustainable Systems and Products for on site Biological Waste Treatment, Ecological Sanitation and Water Saving

Thank you for your attention!

Berger, W., Lorenz-Ladener, C.: Komposttoiletten – Sanitärtechnik ohne Wasser, 2008, ökobuch
ISBN 978-3-936896-16-9 (german)

(english version: Composting toilets – Sanitation without water, in preparation)



berger@berger-biotechnik.de
www.berger-biotechnik.com
www.uni-hohenheim.de/respta