The CLARA Simplified Planning Tool

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

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Capacity-Linked water and sanitation for Africa's peri-urban and Rural Areas

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CLARA

Capacity-Linked water supply and sanitation improvement for Africa's peri-urban and Rural Areas

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a Collaborative Project
within the EU 7th Framework Programme
Theme "Environment (incl. Climate Change)"
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CLARA consortium

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12. Arba Minch Town Municipality, Ethiopia
13. 'Engan New Mayet' Compost Production Association, Ethiopia
14. 'Wubet le Arba Minch' Solid Waste Collectors, Ethiopia
15. Arba Minch Health Center, Ethiopia

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Summary

- **CLARA Simplified Planning Tool (SPT)**
  - For **comparing SYSTEM alternatives** during pre-planning
  - Only alternatives that fulfil the legal requirements can be considered → cost comparison
- The CLARA SPT is available for download for free from
  - the CLARA website (**http://clara.boku.ac.at/**) and
  - within the SSWM toolbox (**http://www.sswm.info/home**)
- Moroccan and Burkina Faso versions also in French
- Other results from CLARA: see Issue 19 of the SSP journal (**http://www.ecosan.at/ssp**)

Content

- **WHY** is it needed?
- **WHAT** can you do with the tool?
- **HOW** did we do it?
- **Example**

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Why?

Background 1

- **Systemic decisions** in water supply and sanitation usually have a **long term impact** due to the lifespan of the related investments.
- If therefore investments in one particular water supply and sanitation system (or a combination thereof) have been made it is unlikely that this decision is revoked for a long term, at least the lifespan of the investment.
- It makes therefore sense to thoroughly analyse different water supply and sanitation systems at a **very early stage of the planning process** for water and sanitation infrastructure and select the most appropriate system for future investments.

Why?

Background 2

- Frequently planning approaches limit themselves to consider relatively small planning areas, say parts of a town or village, which neglects that **certain systems are requiring a minimum size to become effective and efficient**.

- Or **systemic decisions**, e.g. centralised or decentralised, water-borne or dry, etc., are already **taken before the planning process starts** and set as a pre-condition for this very planning process.

For what?

- Purpose of the SPT is therefore to provide planners with a software tool which not only allows but even encourages the **comparison of fundamentally different water and sanitation systems at a very early planning stage**, requiring a limited amount of effort from the side of the planner, respectively creating minimal cost for the client.
- The tool shall - for given framework conditions - identify the most appropriate water and sanitation system, appropriate being defined as legally compliant, fulfilling clients' requirements and having the lowest NPV. This means that **the identified solution fulfils all pre-defined criteria in the most cost effective way**.

How?

Technologies implemented

Water sources
Extraction from spring
Groundwater extraction
Riverwater extraction

Water purification
Surface water treatment
Flocculation and Sedimentation
Chlorination

Water distribution
Water tank surface
Water tank elevated
Pumping station
Water transport main
Water distribution network
House connections (Supply)

Waste Collection
A) Water borne system
Cesspit
Collection of (faecal) sludge
Sewer
Sewage pumping station
House Connection (Sewer)

B) Dry sanitation system
UDDT chamber
Composting chamber toilet
Collection of urine
Collection of faeces
Collection of Solid Biowaste

Waste Treatment
Septic tanks
Imhoff tank
Screen
Buffer tank
SBR
ABR
HF CW
VF CW
Sludge drying reed bed
Urine storage
Struvite production
Composting
Waste stabilisation pond
UASB reactor
Phosphorus-Precipitation
Mechanical sludge dewatering
Sludge thickener

Reuse
Struvite use
Compost use
Irrigation water
Urine use

How?

From technologies to systems

Combinations of technologies include collection and treatment schemes for

- **dry sanitation alternatives** (with UDDTs and composting toilets, respectively),
- **water-borne sanitation alternatives without sewer** (e.g. cesspits for blackwater, faecal sludge treated with sludge drying reed bed and treatment of greywater with HF CWs), and
- **water-borne sanitation alternatives with sewer** and wastewater and sludge treatment (for both technical and natural treatment options).

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How?

Cost functions

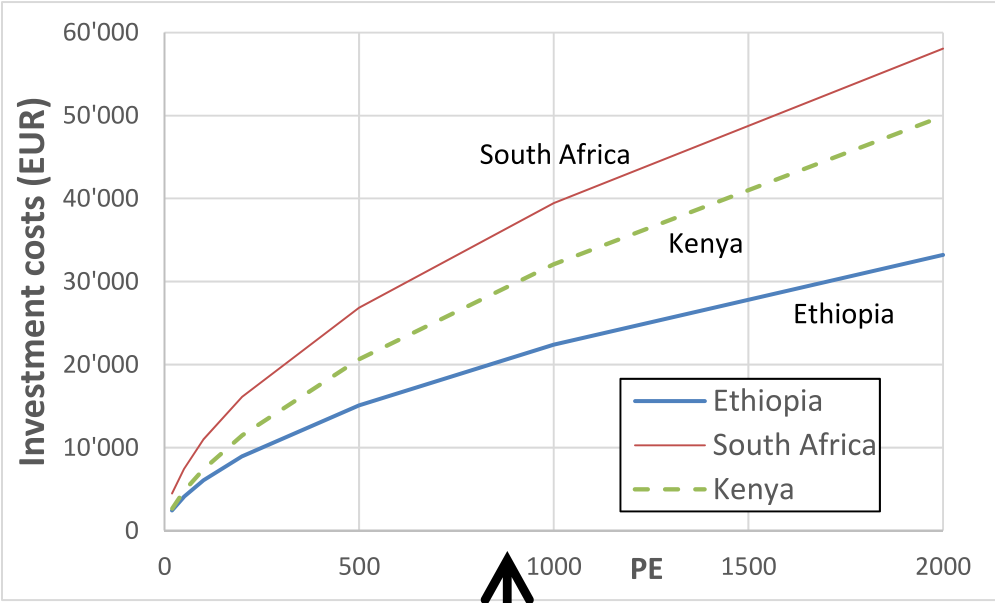
Example: technology "**Septic tank**"

Assumption

1) Design:
Hydraulic Retention time (HRT) = 24h
De-sludging interval: 12 months (for ≤ 20 PE) and 6 months (for > 20 PE), respectively
Sludge accumulation: 60 L/PE/a

2) Lifespan:
25 years for all parts

3) Operation and maintenance:
Inspection of septic tank: twice a month
Sludge removal once per year (for ≤ 20 PE) and twice per year (for > 20 PE), respectively
Maintenance costs: 1 % of investment costs



Bills of Quantities ↑

Standard design for different sizes

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Example

Case study town: **10'000 people**
Period of consideration: 50 years
net interest rate 3 % and expected annual growth 4 %.

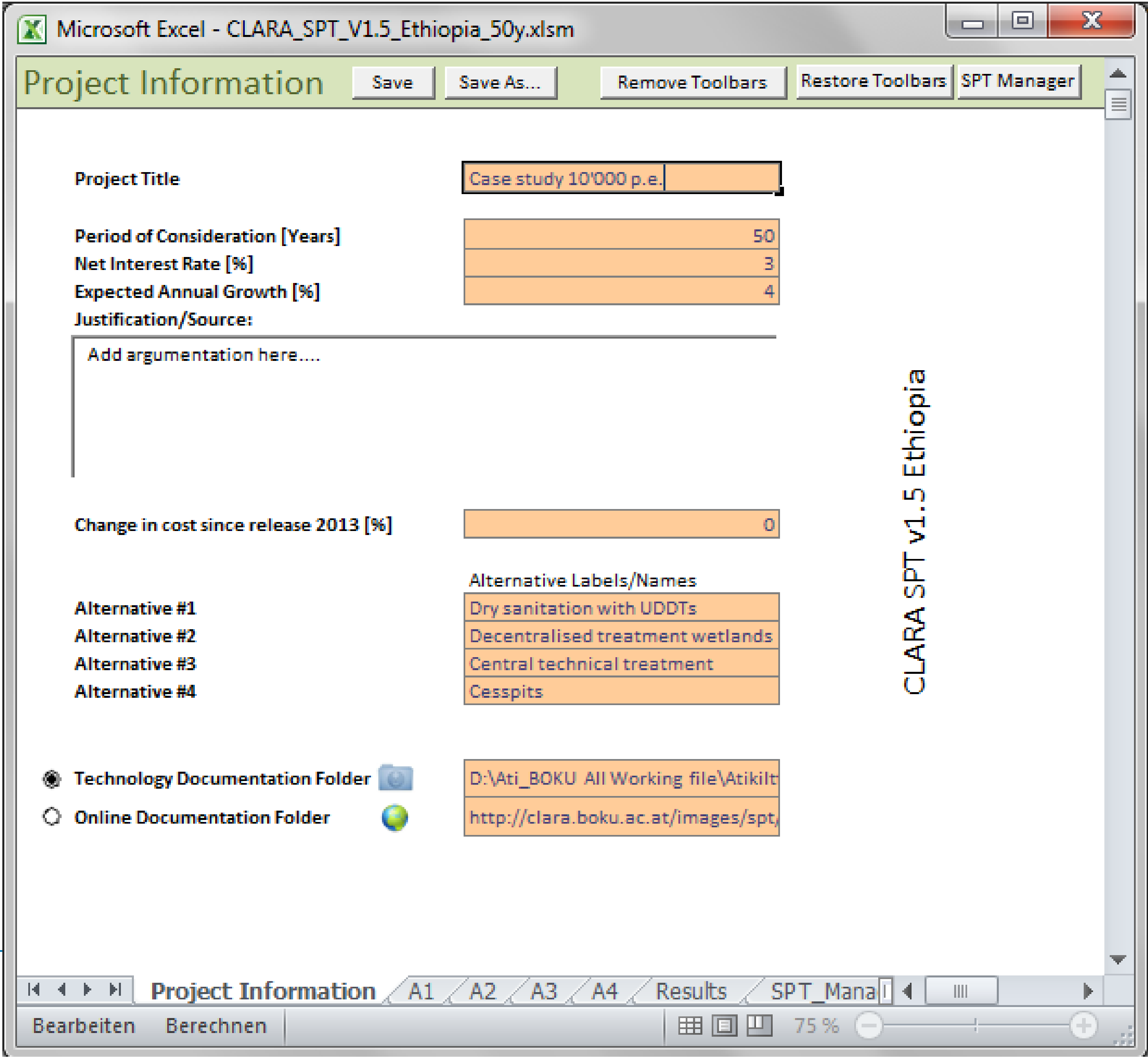
Alternatives

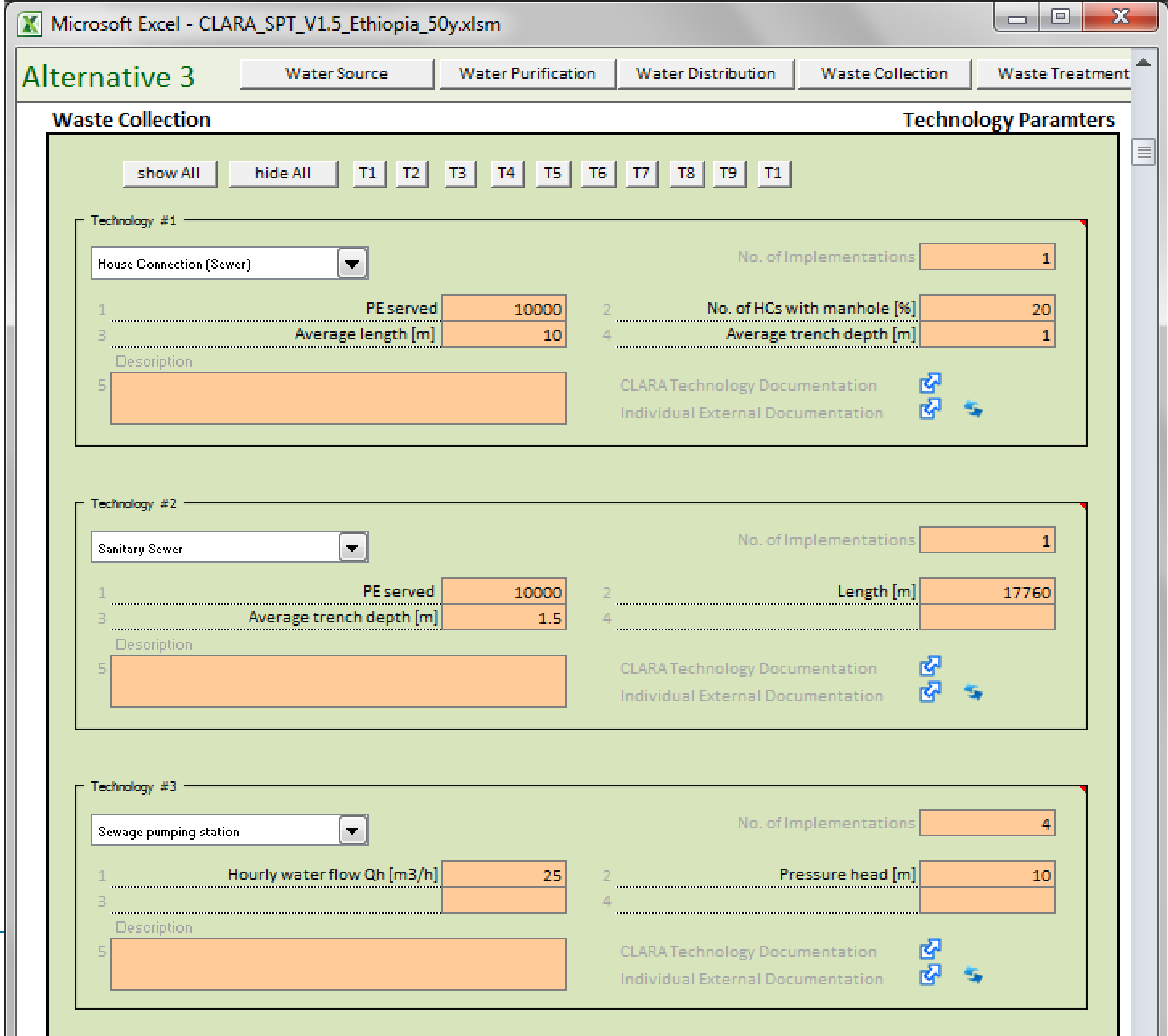
***A1:* Dry sanitation with UDDTs**: shared UDDTs, collection and transport of urine and faeces to a central treatment unit as well as treatment of greywater in 50 small HF CWs.

***A2*: Decentralised treatment wetlands**: wastewater treated in 50 small treatment plants comprising septic tank, VF CWs and sludge drying reed beds.

***A3*: Central technical treatment**: wastewater treated in a central technical plant.

***A4*: Cesspits**: blackwater collected in cesspits and transported to central sludge drying read beds whereas greywater treated in 50 small HF CWs.


Microsoft Excel - CLARA_SPT_V1.5_Ethiopia_50y.xlsm
Project Information
Save
Save As...
Remove Toolbars
Restore Toolbars
SPT Manager
Project Title
Case study 10'000 p.e.
Period of Consideration [Years]
50
Net Interest Rate [%]
3
Expected Annual Growth [%]
4
Justification/Source:
Add argumentation here....
Change in cost since release 2013 [%]
0
Alternative Labels/Names
Alternative #1
Dry sanitation with UDDTs
Alternative #2
Decentralised treatment wetlands
Alternative #3
Central technical treatment
Alternative #4
Cesspits
Technology Documentation Folder
D:\Ati_BOKU All Working file\Atikilt
Online Documentation Folder
http://clara.boku.ac.at/images/spt/
CLARA SPT v1.5 Ethiopia
Project Information
A1
A2
A3
A4
Results
SPT_Mana
Bearbeiten
Berechnen
75 %


Microsoft Excel - CLARA_SPT_V1.5_Ethiopia_50y.xlsm
Alternative 3
Water Source
Water Purification
Water Distribution
Waste Collection
Waste Treatment
Waste Collection
Technology Paramters
show All
hide All
T1 T2 T3 T4 T5 T6 T7 T8 T9 T1
Technology #1
House Connection (Sewer)
No. of Implementations 1
1 PE served 10000
2 No. of HCs with manhole [%] 20
3 Average length [m] 10
4 Average trench depth [m] 1
Description
5
CLARA Technology Documentation
Individual External Documentation
Technology #2
Sanitary Sewer
No. of Implementations 1
1 PE served 10000
2 Length [m] 17760
3 Average trench depth [m] 1.5
4
Description
5
CLARA Technology Documentation
Individual External Documentation
Technology #3
Sewage pumping station
No. of Implementations 4
1 Hourly water flow Qh [m3/h] 25
2 Pressure head [m] 10
3
4
Description
5
CLARA Technology Documentation
Individual External Documentation

Technology #2

Sanitary Sewer

No. of Implementations: 1

1	PE served	10000	2	Length [m]	17760
3	Average trench depth [m]	1.5	4		

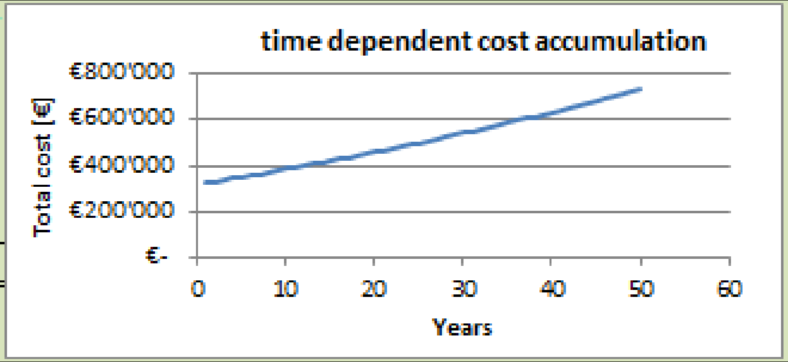
Description

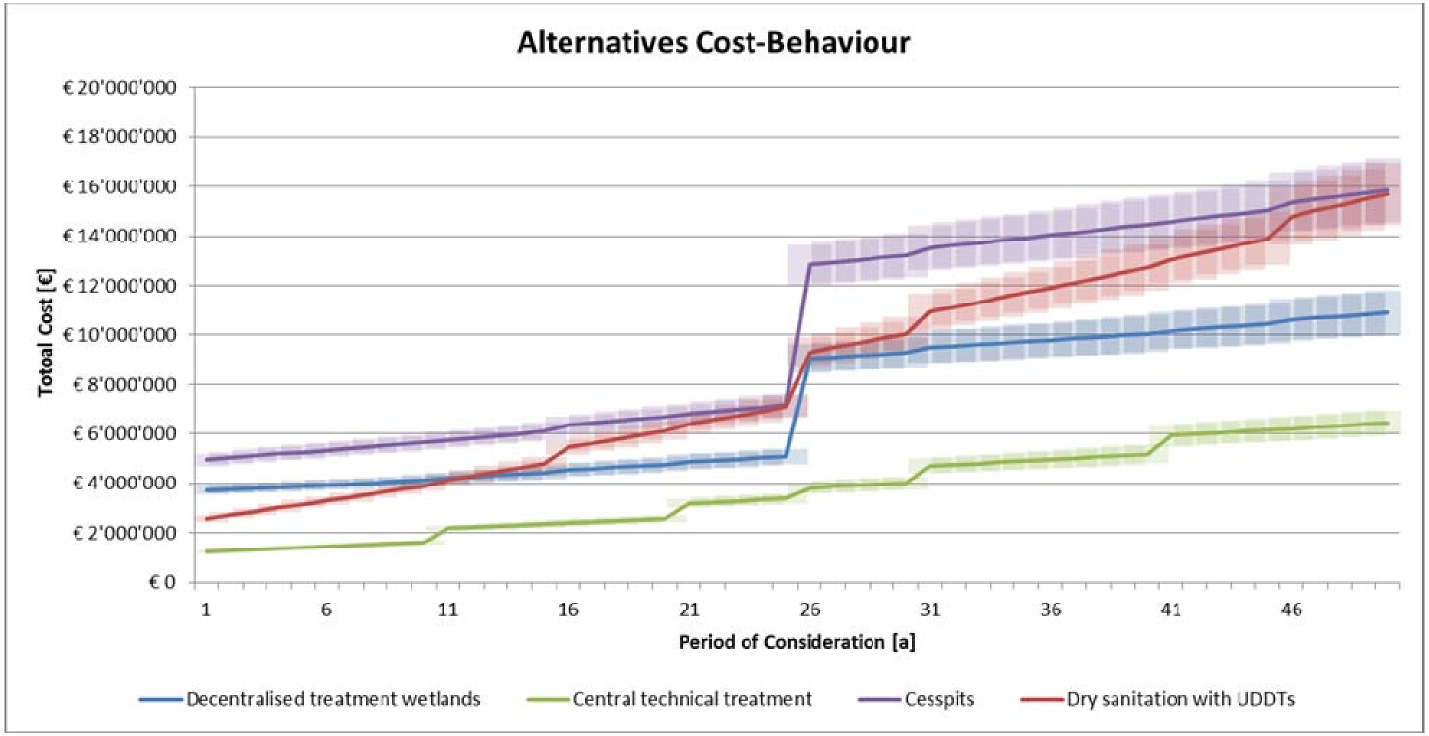
5

CLARA Technology Documentation

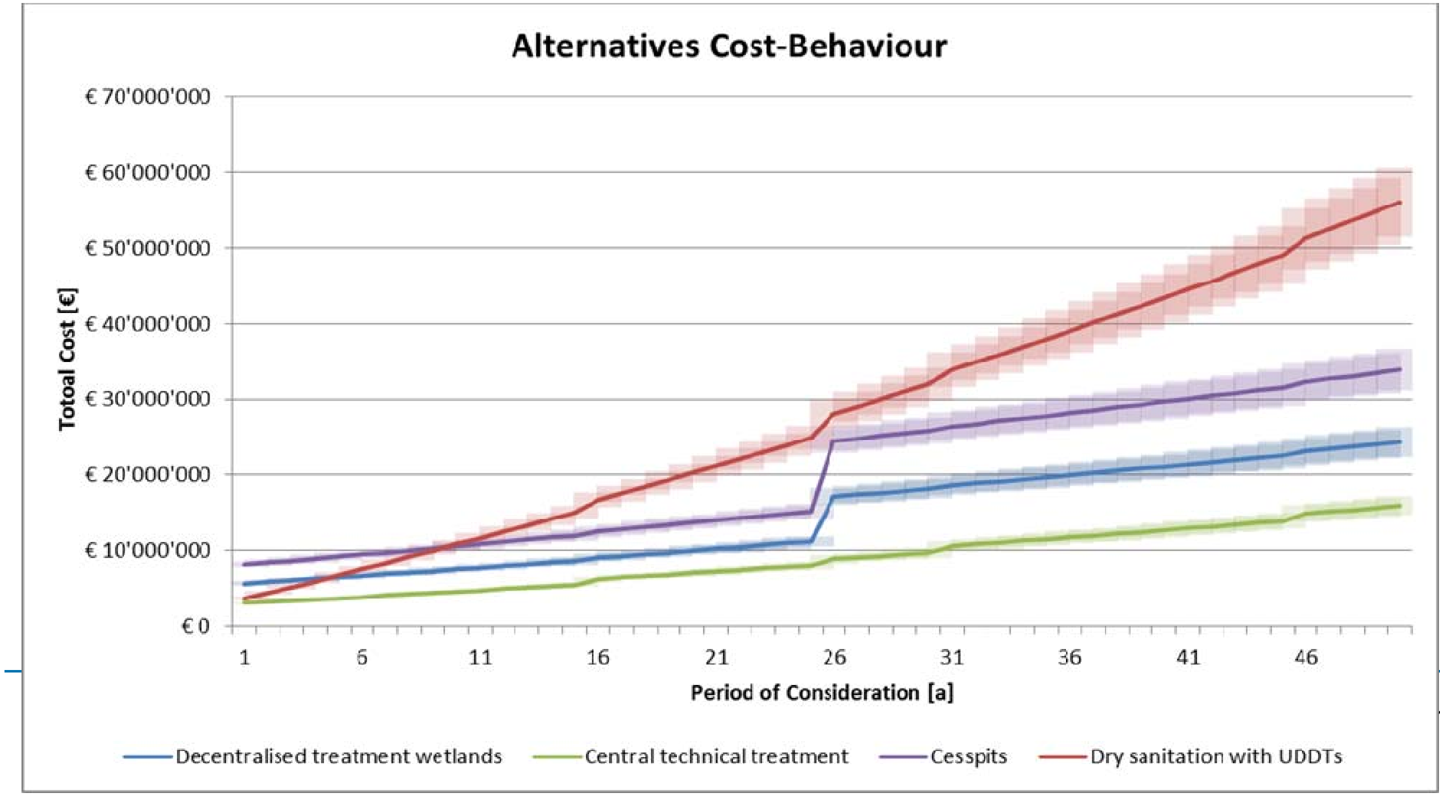
Individual External Documentation

Cost Decrease/Increase		Results	Sanitary Sewer
Investment	0%	Investment Costs	-€ 324'177
		Σ OM Costs (NPV)	-€ 418'790
Reinvestment	0%	Σ Reinvestment (NPV)	€ 0
		Σ Revenues (NPV)	€ 0
OM	0%	Residual Value	€ 1'479
		Total Cost	**-€ 741'488**
Revenues	0%		





Ethiopia



South Africa

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CLARA SPT

Advantages

- Allows comparing full costs of different WatSan system alternatives with only little amount of input data
- Resources-oriented WatSan system solutions are included
- Assumptions made described
- Available free of charge
- Available for 5 African countries
- Adaptation to other countries possible

Disadvantages

- MSExcel® 2010 or later required
- Cost functions based on BoQs and not real project costs
- Comparison of systems with different performance is possible
- Simplifications result in uncertainties of cost estimates
- Adaptation to other countries requires some efforts

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The use of the CLARA SPT in the project

Work in the pilot communities in 5 African CLARA countries

- Decision on pilot community
- Stakeholder involvement on different levels
- Collection of baseline data
- Pre-planning of systems alternatives
- **Testing the CLARA Simplified Planning Tool**
- **Providing feedback on using the SPT**
- Decision on next steps with stakeholders
- Preparation of application documents based on work carried out

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