Waste Management and Environment-Integrating Management

National Plan for the Management of Sewage Sludge from Municipal Wastewater Treatment Plants in Bulgaria

The National Sludge Plan and its implementation adapted to model regions

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Waste Management and Environment-Integrating Management

Content

1. Prognosis of Sewage Sludge Generation until 2020 and further Planning Aspects

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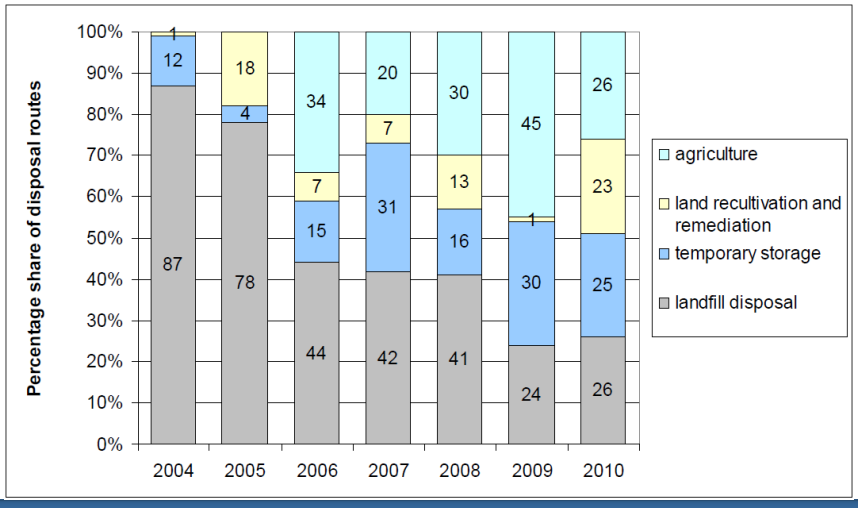
Sewage Sludge Generation - Prognosis

- Contrasting Figures depending on source of prognosis
  → High insecurities in estimations
- Status 2010 (ExEA):
  - 55 WWTPs
  - 52,893 tons DS
  - 49 % Utilization rate on land (agriculture or re-cultivation)

Development of sludge recycling in Bulgaria in the period 2004-2010



Prognosis Assumptions

- Wastewater system expansion (agglomerations with more than 2,000 until end of 2014)
- Improved wastewater collection in the rural areas beyond 2014
- Population decline of more than 3 % each five years in average until 2020 (concentration of the population in urban areas)
- Efficiency enhancement of the wastewater treatment plants and thus contributes to an increase of sewage sludge generation

Parameter settings used as the frame for the different scenarios of the prognosis

Scenario	Frame parameters		
	Expansion of the wastewater system	Population development *(as per projections of the NSI4)*	Efficiency of WWTPs
Minimum scenario	• fulfilling the statutory provisions of the Wastewater Treatment Directive until 31/12/2014 • connection rate to wastewater collection systems 87 % in 2015 and 2020 • no further development	2015: 7,134,282 inh. 2020: 6,889,786 inh.	• no enhancement of efficiency • sludge generation declines from 16 kg/inh.*yr. in 2010 to 15 kg/inh.*yr. (lower efficiency because of starting installations) in 2015 and remains constant from 2015 to 2020 on this level
Realistic scenario	• fulfilling the statutory provisions of the Wastewater Treatment Directive until 31/12/2014 • connection rate to wastewater collection systems 87 % in 2015 and 90 % in 2020	2015: 7,141,859 inh. 2020: 6,914,155 inh. • increasing concentration of population in urban areas	• enhancement of efficiency takes place • sludge generation grows from 16kg/inh.*yr. in 2010 to 17 kg/inh.*yr. in 2015 and to 20 kg/inh.*yr. in 2020
Maximum scenario	• fulfilling the statutory provisions of the Wastewater Treatment Directive until 31/12/2014 • connection rate to wastewater collection systems 87 % in 2015 and 90 % in 2020	2015: 7,157,396 inh. 2020: 6,963,808 inh. • increasing concentration of population in urban areas	• strong enhancement of efficiency • sludge generation grows from 16 kg/inh.*yr. in 2010 to 20 kg/inh.*yr. in 2015 and to 25 kg/inh.*yr. in 2020

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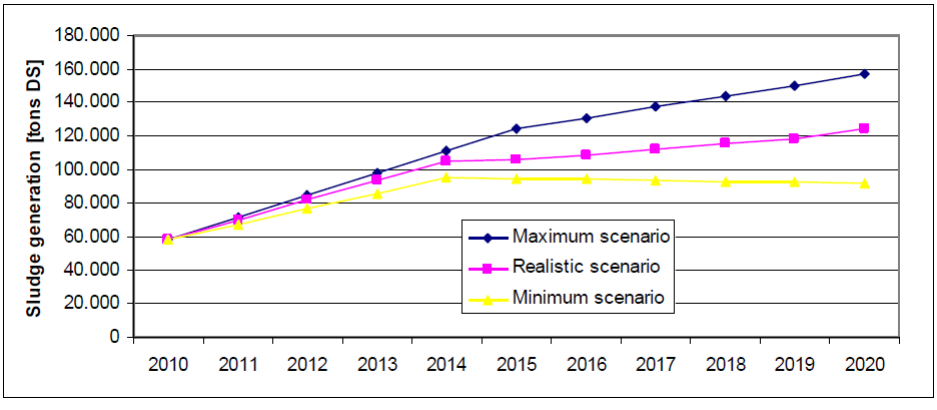
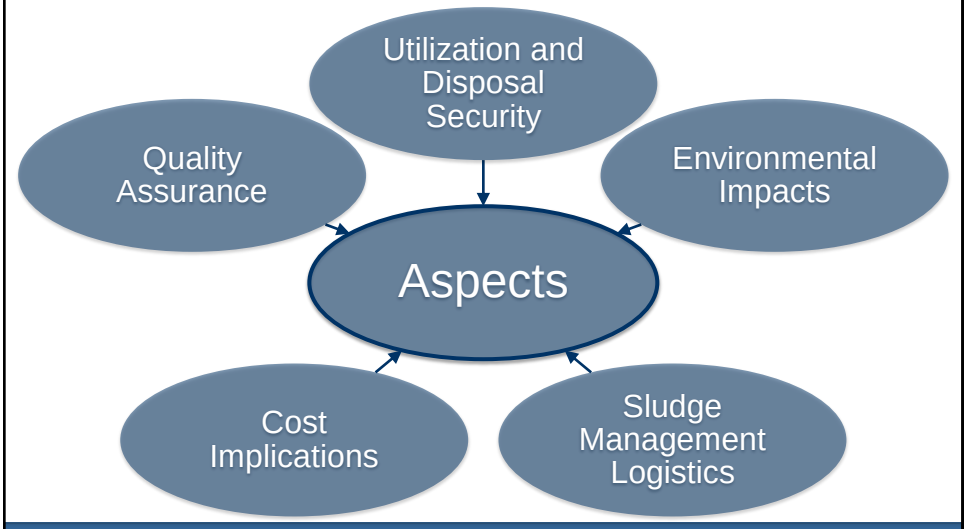
Sludge generation prognosis for Bulgaria until 2020



Further Planning Aspects - I

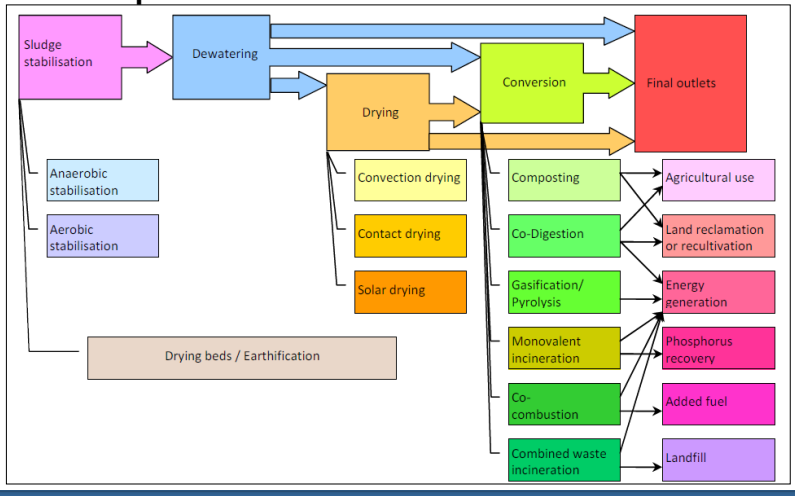


Further Planning Aspects - II

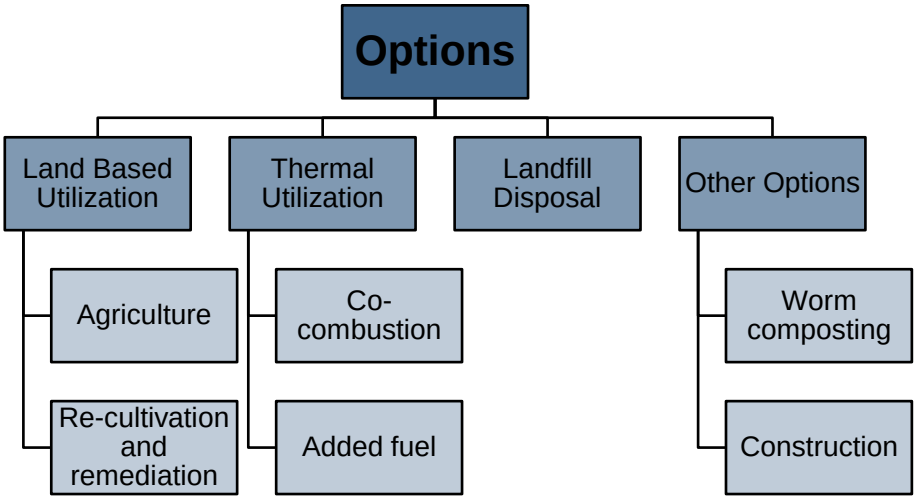
Utilization and Disposal Security	Environmental Impacts	Sludge Management Logistics	Cost Implications	Quality Assurance
• 10 years horizon for WWTPs • Reliability of alternative uses • Provision of utilization options • Legal Issues	• Hazardous components (Heavy metals, toxins, pathogens etc.) • GHG out of degradation	• Oriented on utilization on land • Consideration of different kinds of WWTPs • Reduction of transported mass and volume • Transport via road / railway	• Biggest cost factors: treatment and disposal of sludge • Increased env. standard → increased costs	• Integral to successful implementation • Consistent data required • EMS in indespensable
Attention Areas: • Technical Availability • General Disposal Security	Attention Areas: • Soil Protection • Water Protection • Emissions			

2. Sewage Sludge Management Options

Generally available options for conditioning, phase separation and conversion of sludge



Usage Options



3. Utilization Potentials in Bulgaria

Outcome of assessment of disposal options

Factor weight: C 60%, DS 20%, EP 20%
Use in agriculture
Use in recultivation
MBT+landfilling
Specialized monovalent incineration
Co-combustion in power plants
Co-combustion in cement kilns
Other thermal utilization options
Disposal via waste incinerators
Factor weight: C 60%, DS 20%, EP 20%
Use in agriculture
Use in recultivation
MBT+landfilling
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Other thermal utilization options
Disposal via waste incinerators

Factor weight: C 20%, DS 20%, EP 60%
Use in agriculture
Use in recultivation
MBT+landfilling
Specialized monovalent incineration
Co-combustion in power plants
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Other thermal utilization options
Disposal via waste incinerators
Factor weight: C 40%, DS 40%, EP 20%
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Disposal via waste incinerators

C – Costs
DS – Disposal Security
EP – Ecological Performance

First best option *Second best options* *Third best options*

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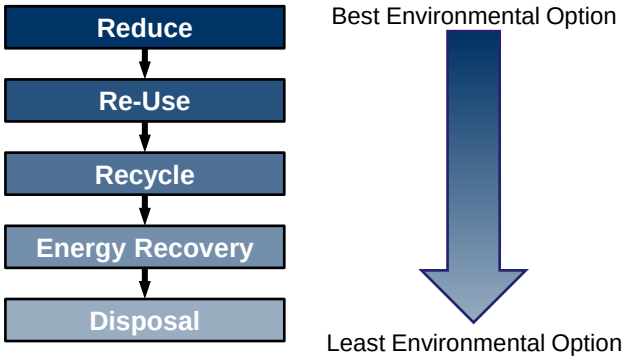
4. Implementation of the NSMP and its outcome

General Approach and Priorities

Waste Framework Directive Main Objective

→ This also applies to Sewage Sludge



Objectives - I

- General Objectives:
  - to comply with the national and international legislation and environmental protection standards;
  - to safeguard public health and protect the environment by improving the sludge management;
  - to improve the technological standards of sludge management;
  - to reduce drastically the quantity of sludge deposited in landfills;
  - to increase the quantity of recycled and reused sludge at affordable tariffs;
  - to strengthen the technical and managerial capacity in developing regional strategies and concepts for sludge management.
- The objectives for the sludge management interface with long-term objectives from other environmental activities:
  - Clean Water Resources.
  - Land Restoration.
  - Reduction of the Use of Natural Resources,
  - Sustainable Development.

Objectives - II

- Detailed Objectives
  - Establishment of an **institutional framework** for a sustainable sludge management
  - Provision of a **sufficient data base** for sludge management planning using chemical analysis of the sludge from all WWTPs
  - **No landfill disposal** and non **target-oriented interim storage** of sludge by 2015;
  - 100% of the total **sludge volume utilized by 2015**
  - At least 20% of the sludge amount generated in 2015 and 35% of the amount in 2020 made available **to re-cultivation and land reclamation**;
  - At least 10% of the sludge amount generated in 2015 and 30% of the amount in 2020 **energetically used**
  - Establishment of a **qualified system for agricultural use** by 2015
  - Development of a **professional profile and training content** for WWTP workers;
  - Strategic **nation wide planning** of sewage sludge management
  - Establishment of **monitoring and controlling system**

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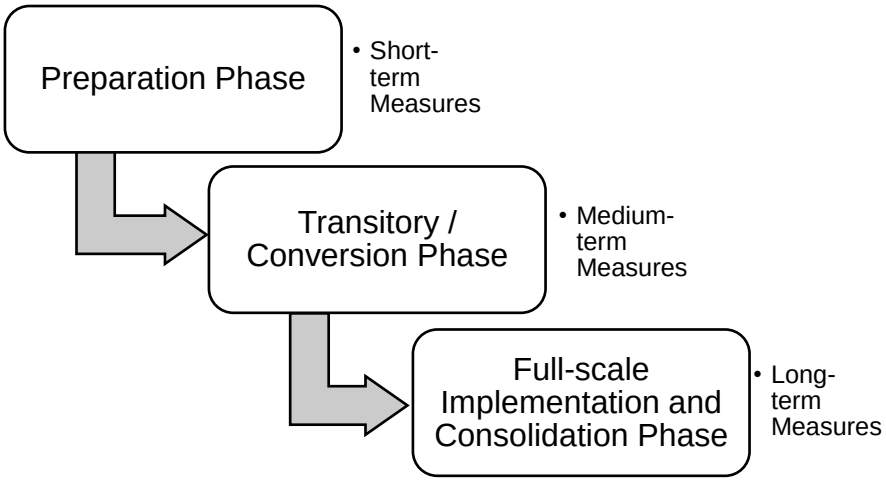
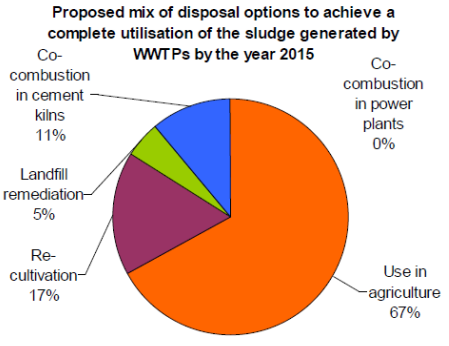
Implementation Phases

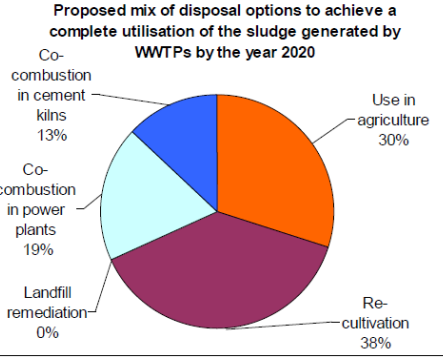


Implementation Outcome

- Physical Results

  → Sludge disposal in comparison

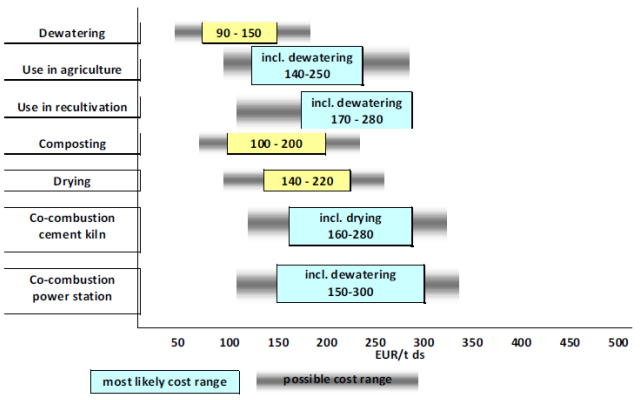




Implementation Outcome

- Cost Implication

  → Price Review



Additional Needs

Action Estimated	Estimated work efforts / costs	Main responsible actors
Short-term Measures		
Adapting/further enhancing the legislative framework	about 6 month's	MoEW
Evaluation of risks of interim storages	about 1 month per affected WWTP	WWTP operators
Preparation of sludge management plans	about 2 month's per WWTP	WWTP operators
Establishment and maintenance of a network of certified laboratories	EUR 6-10 million	MoEW
Establishment and maintenance of quality assurance procedure and creation of independent organisation for it	approx. EUR 100,000 for procedural development; up to EUR 1 million with institutional settings	MoEW, WWTP operators
Increasing the capacity for composting	about EUR 5 million	
Training and publicity	about EUR 1-2 million for the whole country	MoEW, WWTP operators
Establishment of pilot projects	about EUR 100,000 each (without technical investments)	MoEW, WWTP operators
Clarification of framework conditions for sludge use	n.a.	MoEW, sludge users
Medium-term Measures		
Establishment of an Environmental Management System pursuant to DIN ISO 14001 from each WWTP	about EUR 3,000-5,000 per WWTP	WWTP operators
Put in practise the monitoring and the GIS system, continue the register	about EUR 50,000-80,000	MoEW
Continuation of pilot projects	about EUR 25,000 per case (without technical investments)	MoEW, WWTP operators
Further trainings + public awareness campaigns	approx. EUR 1 million	MoEW,
Increasing capacities for drying and composting	about EUR 2-5 million	WWTP operators
Gradual elimination of sludge kept in interim storage	n.a.	WWTP operators
Long-term Measures		
Maintenance of the monitoring and the GIS system	about EUR 10,000-15,000	MoEW
Conferences/symposiums on accomplishments and to exchange on experiences and further measures	about EUR 10,000-20,000	MoEW
Regular training for the responsible persons in charge with the Quality, Environmental and Safety Management Systems	about EUR 1,000 per WWTP (and training measure)	MoEW, WWTP operators
Establishment of a Safety Management System pursuant to DIN ISO 18001 for each WWTP	about EUR 2,500 per WWTP	WWTP operators
Additionally recommended: Research into the adoption and adjustment of internationally developed recovering methods for nutrients, especially phosphorus from the sludge	about EUR 100,000	

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5. Evaluation, Action Plan and Monitoring

SWOT-Analysis

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Action Plan

- Extraction:

Activity	Responsible	Date				
		2012	2013	2014	2015	Long- term
Disseminating/promoting National Sludge Management Plan and guidelines for preparation of sludge management plans	MOEW	XXX	XXX	XXX		
Preparing/putting right the legislative framework for sustainable sludge management	MOEW	XXX	XXX			
Establishing institutional framework for controlling and audit	MOEW	XX	XXX	XX		
Determination of principal requirements and conditions for sludge use in talks between the environmental authorities and potential sludge users	MOEW, Sludge users	XXX	XXX	XXX		
Establishing a network of certified laboratories for sludge analysis and an independent organisation for quality assurance	MOEW	XXX	XXX	XXX		
Provision of a sufficient data base for sludge management planning using chemical analysis of the sludge from all WWTP's and of the soil	Operators, Sludge users	X	XX	XXX	XXX	
Preparation of training on proper sludge handling and usage for WWTP operators and farmers	MOEW *(using the help of consultants)*	XXX	XXX	XXX		
Provision of an analysis if it is possible to establish co-operative solutions	MOEW *(using the help of consultants)*	X	XX	XXX		
Option analysis and risk assessment for interim storages	Operators *(using the help of consultants)*	XXX	XXX	XX		
Partnership agreement between WWTP's for collective use of treatment installations	Operators	XX	XXX	XXX		

Monitoring

- Purpose:
  - Assurance of effectiveness
  - High degree of efficiency
  - Assessment of functioning and management
- Performance indicators
  - Number of WWTP's with sludge management concept;
  - Number of certified laboratories carrying out quality tests in compliance with requirements;
  - Percentage of recycled sludge versus disposed sludge;
  - Intensity/Frequency of training;
  - Percentage of WWTP's having established management systems (quality management systems, environmental management systems, safety management systems)

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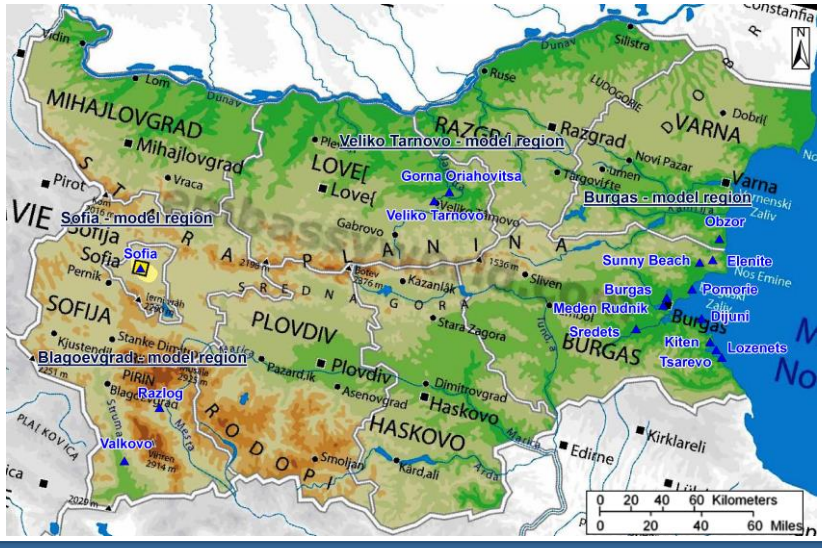
6. The NSMP in the Modell Regions

The Model Regions



Selection Criteria

- Survey Participation
- WWTP Capacity
- Planned Capacity Extension over the coming Years
- Year of Entry of Operation (before 1990)
- Lack of Possibilities for Sludge Disposal in the Future
- Fluctuating Waste Water Volumes (Summer/Winter – Due to Tourism)
- Geographic Specificities

Scenarios

- „Business-as-usual“ Scenario
  - Examnination of consequences of continuing the current trends
- Best Available Techniques Scenerio
  - Best practible options (from NSMP)
  - Compilation of:
    - Technical guide on the treatment and recycling techniques for sludge from municipal wastewater treatment with references to Best Available Techniques (BAT)
    - Preparation for decision-making in the field of sewage sludge disposal - Recommended proceedings for WWTP operators

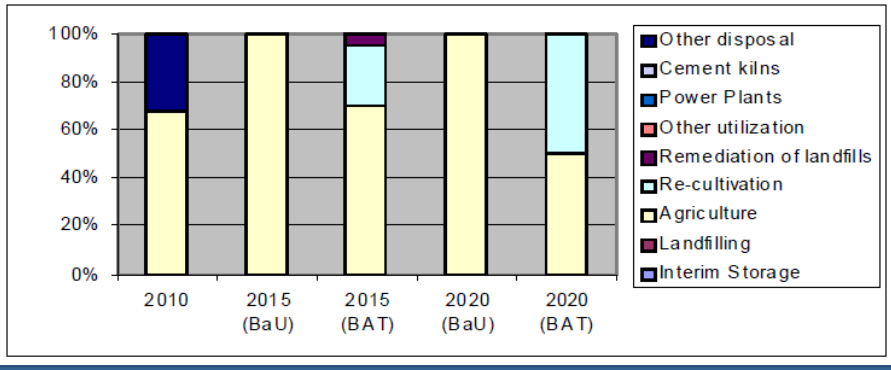
Model Region Sofia

- Status 2011

WWTP Sofia (Kubratovo)	
Inhabitants connected	1.3 Mill.
Amount of sludge generated [tons dry substance DS²/a]	approx. 20,000 t/a
Sludge treatment	sludge is undergoing anaerobic treatment, followed by drying at open beds for 12 months
Water content after treatment	75 %
Sludge quality	no chemical analysis available yet
Availablity of sludge analysis	no
Current disposal	100 % in agriculture, for the farmers free of charge
Future planning	planning until 2025 exits, to save transport costs a modernization of sludge drying was planned for 2012 to ensure a DS of 80-90 %

Model Region Sofia

- Comparison of the prospective shares of “Business as usual”- (BaU) and “Best available techniques”- (BAT) solutions in 2015 und 2020 with the status quo in the Sofia model region



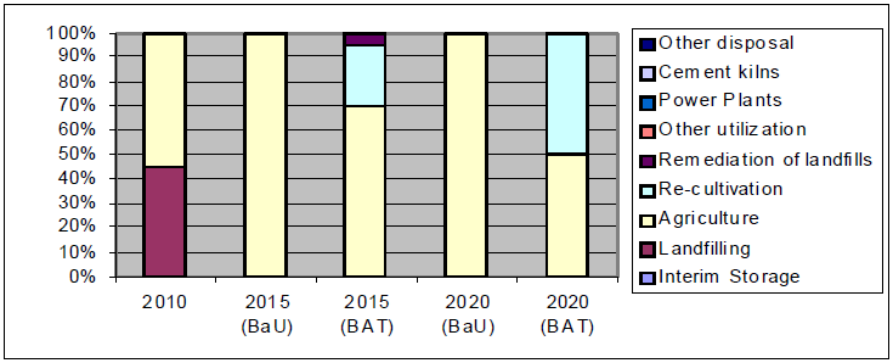
Model Region Burgas

- Status 2012

WWTP	Number of connected inhabitants (normally)	Number of connected inhabitants (summer season)	Amount of sludge generated in 2010 [tons DS per year]
Burgas	154,858	154,858	1,862
Meden Rudnik	43,400	43,400	485
Pomorie	14,565	64,800	577
Tsarevo	9,760	16,650	0
Sredets	6,123	18,000	0
Kiten	4,570	25,874	0
Dijuni	3,500	5,000	0
Elenite and St.Vlas	2,533	10,200	0
Obzor	2,200	40,000	0
Lozenets	600	5,000	0
Sunny Beach		74,200	455
Sum	242,109	457,982	3,379

Model Region Burgas

- Comparison of the prospective shares of “Business as usual”- (BaU) and “Best available techniques”- (BAT) solutions in 2015 und 2020 with the status quo in the Burgas model region



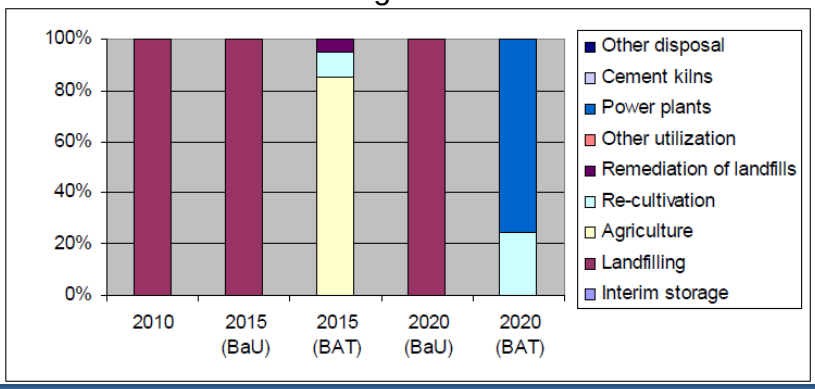
Model Region Veliko Tarnovo

- Status 2012

WWTP Veliko Tarnovo	
Inhabitants connected	77,512
Amount of sludge generated	484 tons/a
Sludge treatment	thickening, anaerobic stabilization in open beds, dewatering by plate filter press, interim storage on WWTP in drying beds
Water content after treatment	46-48 %
Sludge quality	not suitable for agricultural utilization because it is exceeding the hygienic limits
Availablity of sludge analysis	no
Current disposal	landfill
Future planning	sludge quality can be improved by the planned new installation for 149,063 inhabitants, future disposal is unclear
WWTP Gorna Orjachowiza	
Inhabitants connected	45,000 (capacity is 102,000)
Amount of sludge generated	1,617 t/a
Sludge treatment	thickening, anaerobic stabilization in digesters with methane catchment, dewatering by plate filter press
Water content after treatment	70 %
Sludge quality	no chemical analysis available yet
Availablity of sludge analysis	no
Current disposal	interim storage at separate cell at landfill
Future planning	future disposal is unclear

Model Region Veliko Tarnovo

- Comparison of the prospective shares of “Business as usual”- (BaU) and “Best available techniques”- (BAT) solutions in 2015 und 2020 with the status quo in the Veliko Tarnovo model region



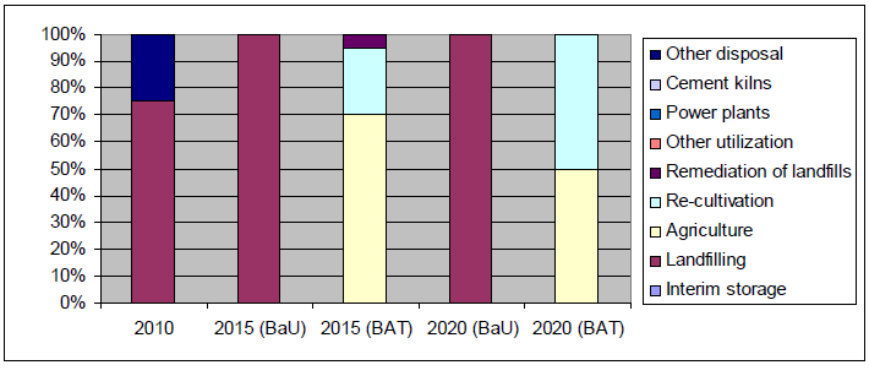
Model Region Blagoevgrad

- Status 2012

WWTP Blagoevgrad	
Inhabitants connected	78,158 (capacity is 87,000) including Valkovo
Amount of sludge generated	3,500 t/a
Sludge treatment	thickening, anaerobic stabilization in open lagoons, dewatering at plate filter presses, interim storage in open beds
Water content after treatment	80 %
Sludge quality	declared as non-hazardous, but hygienic parameters were not analyzed – consequently new analysis for assessment is needed!
Availablity of sludge analysis	no
Current disposal	use for daily cover at non-sanitary landfill
Future planning	future disposal is unclear
WWTP Razlog	
Inhabitants connected	13,405 (capacity is 18,880)
Amount of sludge generated	372 t/a
Sludge treatment	thickening, aerobic stabilization, dewatering at filter press and drying at open beds (4 months)
Water content after treatment	not analyzed
Sludge quality	no chemical analysis available yet
Availablity of sludge analysis	no
Current disposal	use for daily cover at a non-sanitary landfill (to be closed in the near future), sludge is used in private garden plots
Future planning	future disposal is unclear

Model Region Blagoevgrad

- Comparison of the prospective shares of “Business as usual”- (BaU) and “Best available techniques”- (BAT) solutions in 2015 und 2020 with the status quo in the Blagoevgrad model region



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