



:metabolon – from a landfill to a competence center for sustainable resource management

**Bergische Waste Management Association
and
Cologne University of Applied Sciences**

Andreas Cronrath, Christian Wolf
Andreas.cronrath@fh-koeln.de
christian.wolf@fh-koeln.de

**Gummersbach Environmental
Computing Center**
Campus Gummersbach
Steinmüllerallee 1
51643 Gummersbach



- 1 **Landfill History**
- 2 The site
- 3 The :metabolon project
- 4 Project organization
- 5 Research – Concepts and Goals
- 6 Partners
- 7 Conclusion



Landfill History

- Household Waste Disposal since 1982
- EU Eco-Audit as the first landfill operation in Germany
- Waste Management Company
- Expansion for Waste Management Center
- End of Organic Landfill since 31.12.2004





- 1 Landfill History
- 2 **The site**
- 3 The :metabolon project
- 4 Project organization
- 5 Research – Concepts and Goals
- 6 Partners
- 7 Conclusion







The site and its unique features

- The disposal center Leppe is the first choice for the realization of a value chain.
 - Logistics of recycable materials on an industrial scale
 - Free Industrial Area
 - Human Capacity
 - Industrial Treatment Plants
 - Close research association with Cologne University of Applied Sciences and the GECO ► C work group at Campus Gummersbach





Leppe after 2010 – only grassland?





- 1 Landfill History
- 2 The site
- 3 **The :metabolon project**
- 4 Project organization
- 5 Research – Concepts and Goals
- 6 Partners
- 7 Conclusion

Subsequent use of central landfill Leppe

→ :metabolon





Interdisciplinary Research Group





Project Initiators



Fachhochschule Köln
Cologne University of Applied Sciences



Areal Implementation – Winning Design





Areal Implementation – Entrance Area





- 1 Landfill History
- 2 The site
- 3 The :metabolon project
- 4 **Project organization**
- 5 Research – Concepts and Goals
- 6 Partners
- 7 Conclusion



:metabolon

Project Manager: Ms. Lichtinghagen-Wirths
Technical Manager: Mr. Görtz
Public Relations: Ms. Hilgers

Spatial realization

I
Place of learning
outside school

Coordination and
development

Mr. Rösgen
Ms. Küsell

II
Place of learning
outside university

Coordination and
development

Ms. Dr. Hilgers
Ms. Dr. Haag

III
Leisure and
recreation

Coordination and
development

Ms.
Lichtinghagen-Wirths

IV
Theme-oriented
business park

Coordination and
development

Mr. Görtz



Place of learning outside school





:metabolon

Project Manager: Ms. Lichtinghagen-Wirths
Technical Manager: Mr. Görtz
Public Relations: Ms. Hilgers

Spatial realization

I Place of learning outside school	II Place of learning outside university	III Leisure and recreation	IV Theme-oriented business park
<p>Coordination and development</p> <p>Mr. Rösgen Ms. Küsell</p>	<p>Coordination and development</p> <p>Ms. Dr. Hilgers Ms. Dr. Haag</p>	<p>Coordination and development</p> <p>Ms. Lichtinghagen-Wirths</p>	<p>Coordination and development</p> <p>Mr. Görtz</p>



Leppe receives the official title: „European Teaching and Research Centre of the Cologne University“





:metabolon

Project Manager: Ms. Lichtinghagen-Wirths
Technical Manager: Mr. Görtz
Public Relations: Ms. Hilgers

Spatial realization

I
Place of learning
outside school

II
Place of learning
outside university

III
Leisure and
recreation

IV
Theme-oriented
business park

Coordination and
development

Mr. Rösgen
Ms. Küsell

Coordination and
development

Ms. Dr. Hilgers
Ms. Dr. Haag

Coordination and
development

Ms.
Lichtinghagen-Wirths

Coordination and
development

Mr. Görtz





:metabolon

Project Manager: Ms. Lichtinghagen-Wirths
Technical Manager: Mr. Görtz
Public Relations: Ms. Hilgers

Spatial realization

I
Place of learning
outside school

II
Place of learning
outside university

III
Leisure and
recreation

IV
Theme-oriented
business park

**Coordination and
development**

Mr. Rösgen
Ms. Küsell

**Coordination and
development**

Ms. Dr. Hilgers
Ms. Dr. Haag

**Coordination and
development**

Ms.
Lichtinghagen-Wirths

**Coordination and
development**

Mr. Görtz



Sustainable Business Park

- Companies in the field of waste management, the material conversion and the environmental technology
- Official Partner Site of the pilot project „Sustainable development of commercial area in NRW“ (MUNLV NRW)





- 1 Landfill History
- 2 The site
- 3 The :metabolon project
- 4 Project organization
- 5 **Research – Concepts and Goals**
- 6 Partners
- 7 Conclusion



Research concept :metabolon

- Waste2Energy
- Regional material flow management
 - use of unexploited energy sources





Project aim: Lighthouse – Knowledge Centre

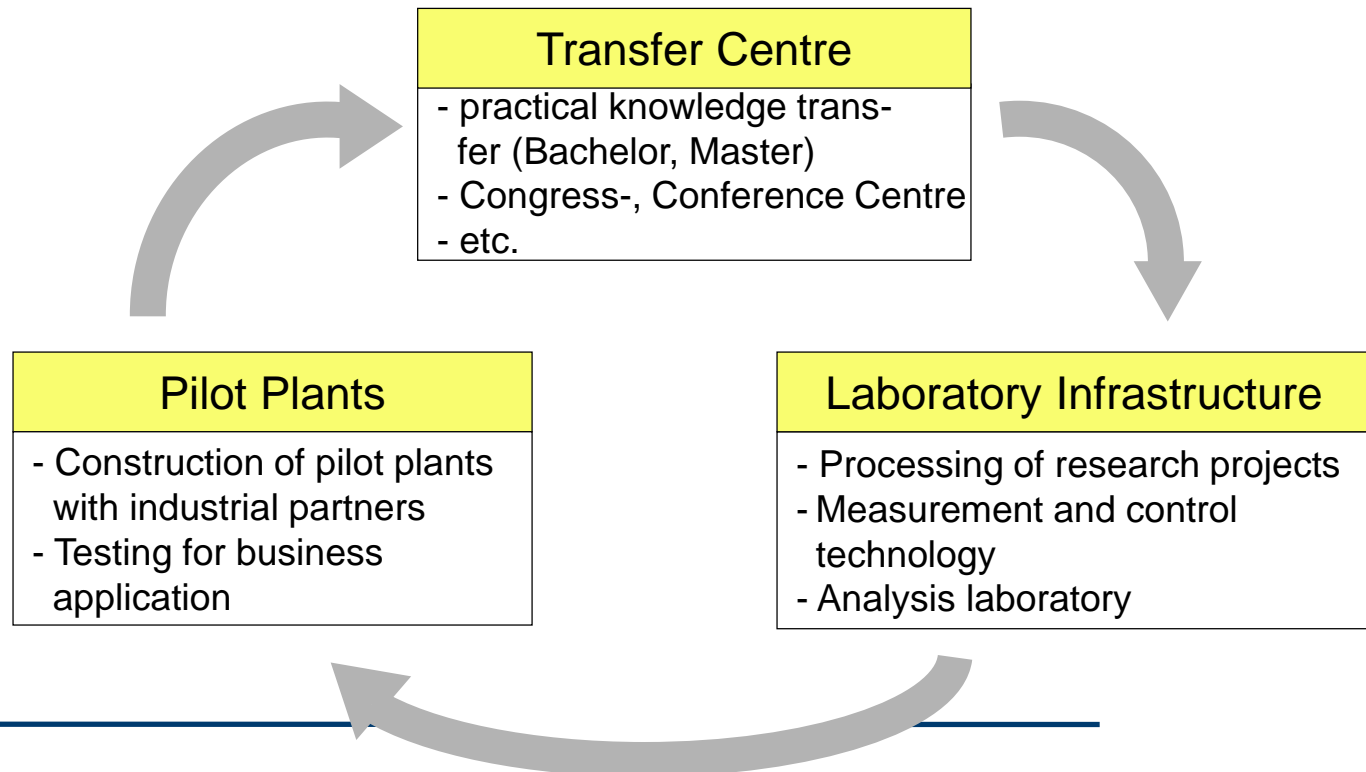
- Development and operation of an internationally accepted Center of Knowledge for treatment as well as the use and conversion of renewable energy.
 - Development of a cross-universitary “Place of research and learning outside university”
 - Development of innovative technical and structural solutions for the recycling of waste materials for natural resource conservation
 - Installation and operation of pilot plants for the transfer of research results into industrial practice
 - Accompanied by a scientific advisory board

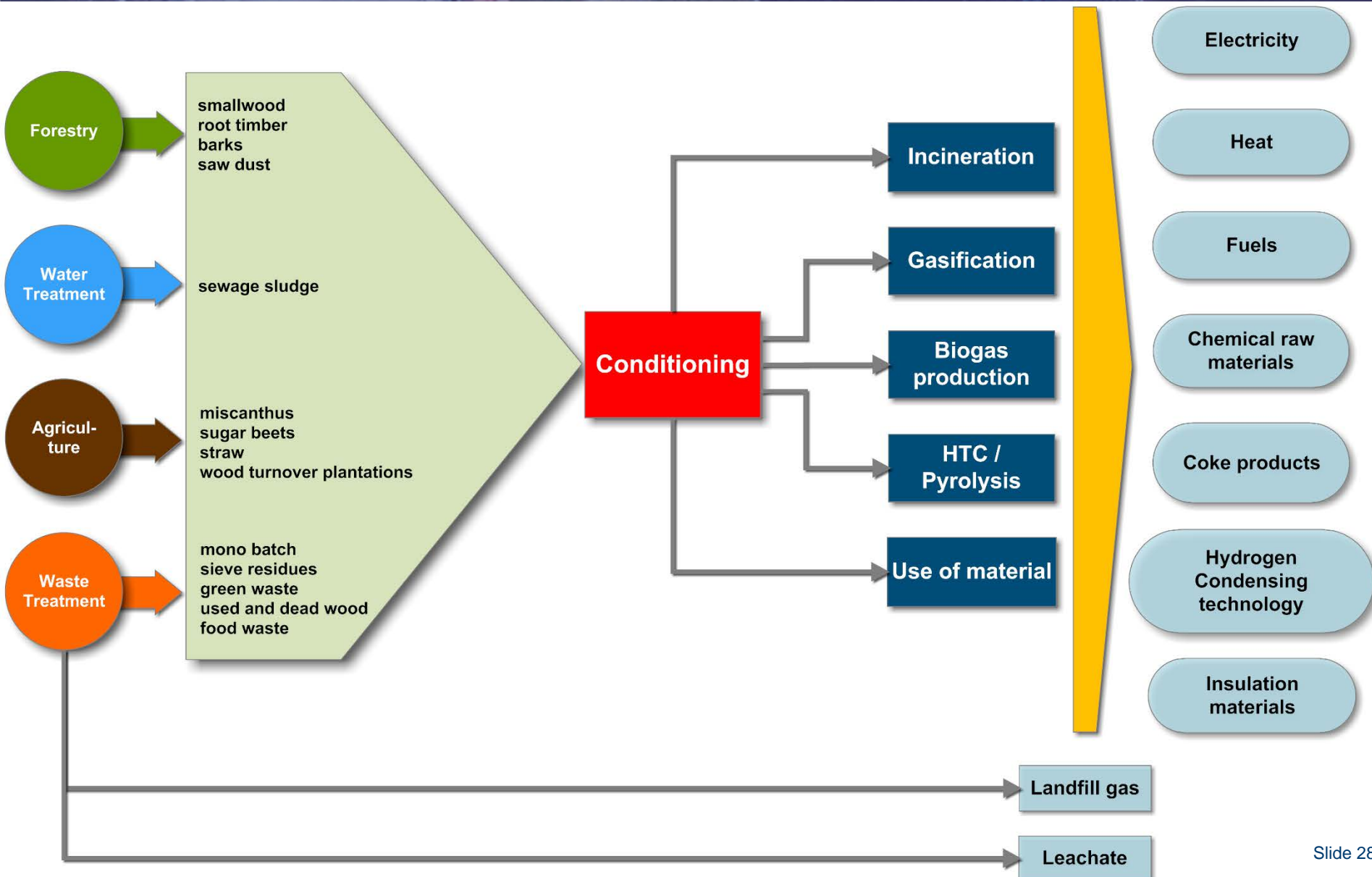


Project aim – Use of Synergies

- The strategy aims of the research project are interrelated, thus creating maximum synergies.

Synergy – Relation







Existing research areas

- Landfill research
 - Long-term behavior
 - Landfill gas / Landfill gas used by electrical power
 - Infiltration / Leachate

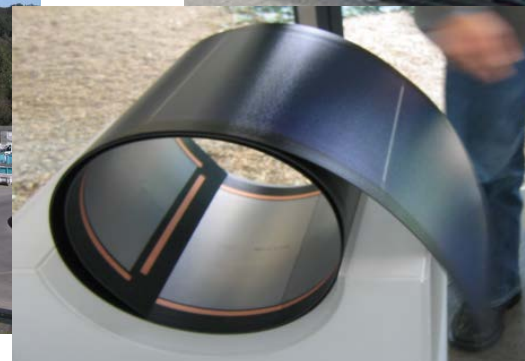




Existing research areas

- **Renewable Energies**

- Digestion and Composting
- Warming up of the fermentation substrate with waste heat
- Photovoltaic systems





Pilot-scale plant for biogas





Pilot-scale plant for leachate and wastewater treatment





Pilot-scale plant for carbonization





Laboratory for comprehensive chemical and physical analysis





New research areas

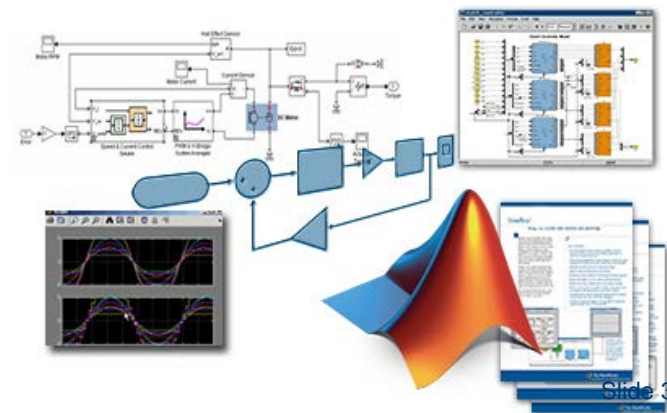
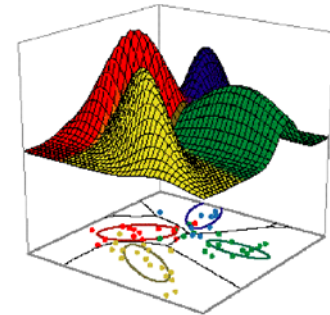
- :metabolon
 - Biogas production
 - Treatment of waste
 - Combustion
 - Material Flow and Energy Flow
 - Innovative Measurement Technology





What we can offer additionally

- Modeling & dynamic Simulation
- Optimization and Model-based Control
- Machine Learning, Data Analysis
- Process Optimization using Computational Intelligence
- Software Engineering
- Image Analysis
- Project Management





What we are looking for

- Research and SME partners for European projects
- Test cases for our pilot-scale plants



- 1 Landfill History
- 2 The site
- 3 The :metabolon project
- 4 Project organization
- 5 Research – Concepts and Goals
- 6 **Partners**
- 7 Conclusion



Partners from Universities




TUHH
Technische Universität Hamburg-Harburg

Herr Prof. Dr.-Ing. Rainer Stegmann



vTI
Johann Heinrich von Thünen-Institut

Herr Dr. Dietrich Meier




RWTH RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN

Herr Prof. Dr.-Ing. Thomas Pretz
Herr Prof. Dr.-Ing. Jürgen Heil



Fachhochschule Köln
Cologne University of Applied Sciences

Frau Prof. Dr. rer. nat. Christiane Rieker
Frau Prof. Dr. sc.agr. Dagmar Gaese
Herr Prof. Dr.-Ing. Michael Bongards
Frau Prof. Dr. Astrid Rehorek




FACHHOCHSCHULETRIER
Hochschule für Technik, Wirtschaft und Gestaltung
University of Applied Sciences

Herr Prof. Dr.-Ing. Gerhard Rettenberger
Herr Prof. Dr.- Ing. Manfred Schlich



TSB

Herr Prof. Dr.-Techn. Ralf Simon
Herr Prof. Dr.- Ing. Ulrich Glinka



TU Graz

Herr Prof. Dr. Michael Narodoslawsky



universitätbonn

Herr Priv.-Dz. Dr. Ralf Pude



UNIVERSITÄT SIEGEN

Hr. Prof. Dr.-Ing. Wolfgang Krumm



Partners from Universities





- 1 Landfill History
- 2 The site
- 3 The :metabolon project
- 4 Project organization
- 5 Research – Concepts and Goals
- 6 Partners
- 7 Conclusion



:metabolon

- transformation of Leppe landfill (Lindlar) into a learning and leisure area
- National and international knowledge transfer
- Development of a cross-universitary “Teaching and Research Centre”
- Regional material flow management for the use of unexploited energy sources





Thank You!

Dr. Christian Wolf, Andreas Cronrath
andreas.cronrath@fh-koeln.de
christian.wolf@fh-koeln.de

