

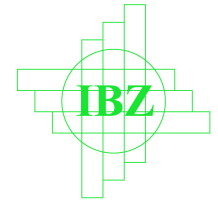
S94 - W2E in Cruise Shipping

6th Meeting of the Steering Group

Copenhagen



IBZ Hohen Luckow e.V. (Lead Partner)



Innovations- und Bildungszentrum
Hohen Luckow e.V.



IBZ premises



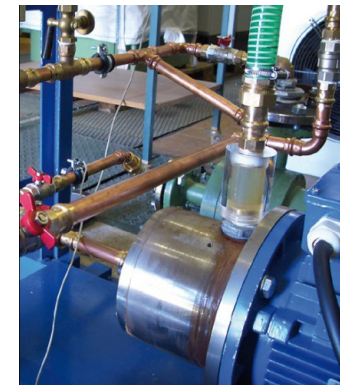
Hohen Luckower Bioenergy-Seminar



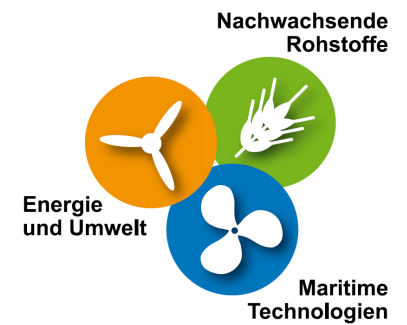
Photovoltaic-plant on the roof of IBZ building



Test bed for rotor blades of smart wind turbines



Cavitation test stand for ballast water



IBZ Hohen Luckow e.V. (Lead Partner)

Biogas Expertise:

- Consulting of practice biogas plants
- Support of the biological process control
- R&D projects (applied research)
- Investigations to optimize the biogas process
- Batch-investigations to generate the gas potential of different substrates
- Analysis laboratory



Experimental plant for investigations in step with practice

The Idea

- In 2013 elaboration of a feasibility study for the cruise company AIDA
- Aim:
 - To analyze the biomass accruing of one ship
 - To identify the potential energy output
 - To show consumption possibilities for biogas on board
- Result:
 - The biomass amount and the energy yield is enormous
 - Different possibilities to use the gas on board
 - Different challenges to improve the actual disposal system
 - Difficult requirements to implement biogas concepts for ship waste
- For the cruise company the energy utilizing is not focused
- They are more interested in alternative disposal concepts to comply with the strict environmental requirements



Motivation

The Seed Money project “W2E in cruise shipping” and the underlying main project (Transforming waste to energy on cruise ships) aims on Clean shipping

- Cruise shipping is a rising economic sector worldwide
- In 2014 there were 22 Billion passengers on a cruise trip worldwide
- New cruise ships will have capacities up to 5,000 passengers (“small floating towns”)
- The accruing waste and sewage and their energetic contents are enormous
- In contrast there is high energy demand on board

Motivation

- The Baltic is one of the most attractive destinations for cruise shipping
- The countries in the BSR are visited by ca. 10 % of the world's cruise tourists
- There are approximately 350 Cruise trips on the Baltic Sea every year
- The cruise shipping industry in the Baltic Sea is evolving and of major importance for various ports around the Baltic Sea

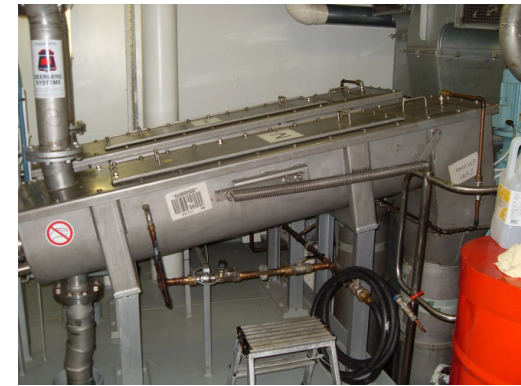
So the Baltic is one of the most stressed sea environments

Idea: Avoiding waste and utilizing waste as a source of energy on cruise ships
The implementation leads to cleaner shipping by avoiding pollution
One building block for a Model region to contribute the aims of the EUSBSR

Challenges on Board

What is actually the state of play?

- Food waste and sewage sludge is collected in a special tank
- Primly to processing (dewatering unit, dryer) and burning in the incinerator
- But on Baltic there exists a prohibition of incineration (needles technology)
- Dried bio sludge has to be stored (limited capacity, fire risk) and give ashore (expensive)
- The steam dryer has a high energy demand and leads to odor emissions
- **Alternative the food waste can still be thrown overboard (MARPOL ANNEX V)**



Dewatering Unit (IBZ Hohen Luckow e.V.)

Advantages of Energetic Utilization

- To provide residues and waste as source of energy
- To reduce the energy demand on board for treatment systems
- To prevent the fire risk during storage
- To avoid emission
 - Nutrient inputs into Baltic
 - Gas emissions by using renewable energy instead of fossil fuels
 - Odor emissions during drying process
- To reduce disposal costs
- Maybe to generate proceeds by the sale of the gas, power or heat
- To make a contribution to a sustainable renewable energy supply and to the environmental and climate protection

Preparatory Works

Taking from aboard, processing ashore

- Compliance with hygienic rules
- Gas / energy production on demand

Storage on Board



Storage



Hydrolysis



Reactor

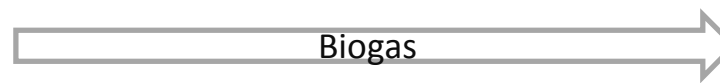


Pyrolysis



Coal

Utilization

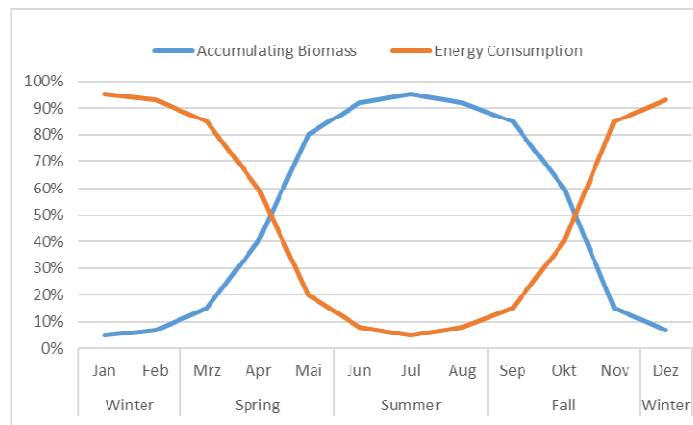


Biogas

Utilization

Temporal Storage

On shore processing (Schematic)

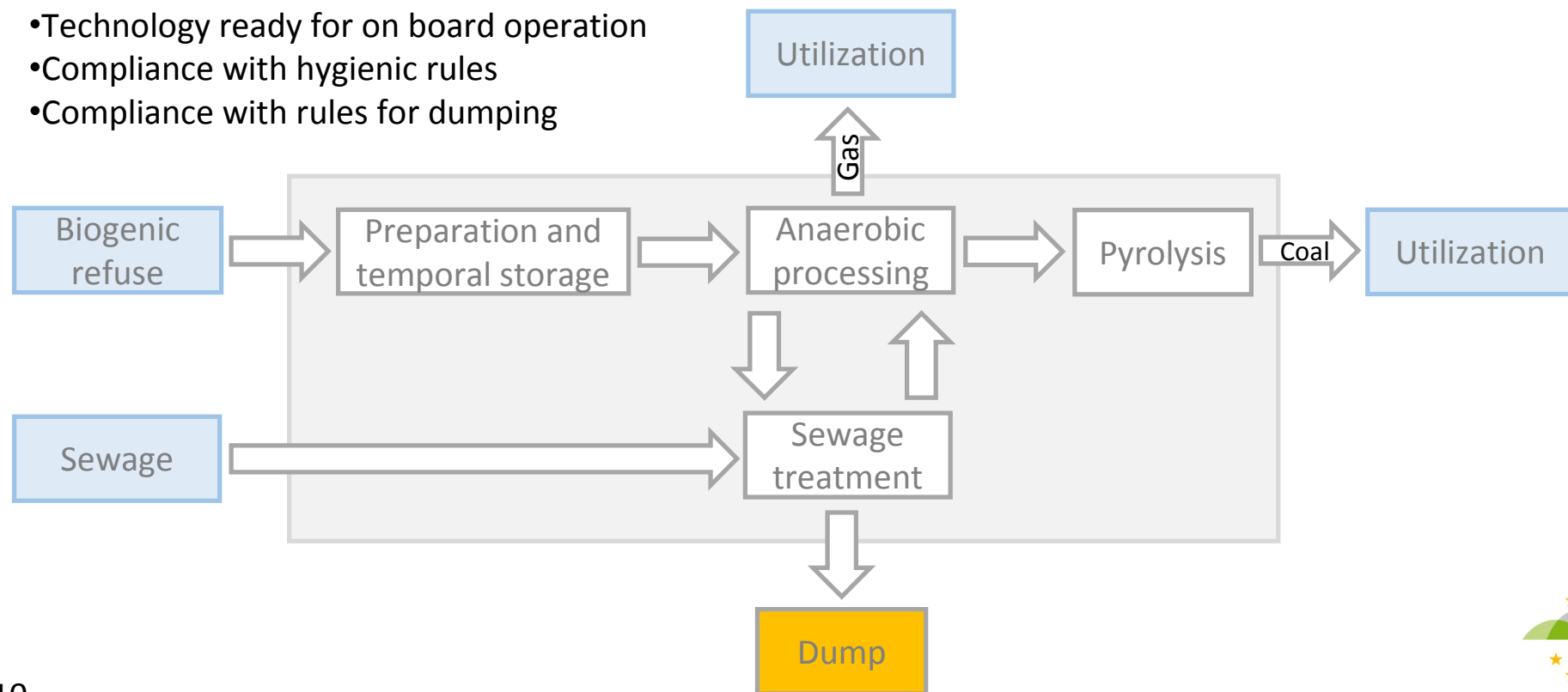


Preparatory Works

Processing on board

- Technology ready for on board operation
- Compliance with hygienic rules
- Compliance with rules for dumping

On board processing (Schematic)



Preparatory Works



Cooperation Network

„Biogas Maritime – Biogas Technologies for Energetic Use of Maritime Waste“

- 12 Network Partners (Companies)
- 4 supporting institutions
- First R&D projects are in preparation (primly for German applications)
- But cruise shipping is an international business, so it's necessary to spread the ideas and technologies and to connect international actors

Funded by



aufgrund eines Beschlusses
des Deutschen Bundestages

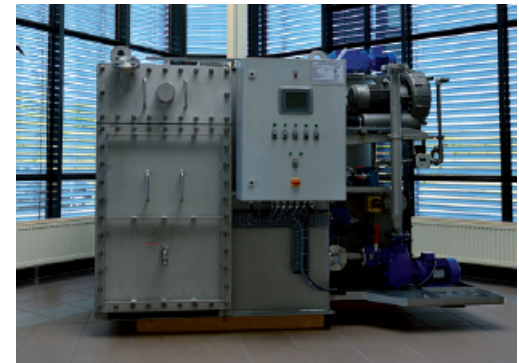


Questions and Preparatory Considerations

- What are typical waste and refuse on cruise ships?
 - What mass of waste is collected per day, per week .. ?
 - What is the average energy content of cruise ships waste?
 - How many ships are cruising yearly on the Baltic?
 - Are there seasonal differences of the accruing biomass collected in ports?
-
- Research, interviews, analysis, evaluation
 - Building networks

Questions and Preparatory Considerations

- What **technologies** are available?
 - What are their advantages and their disadvantages (energy demand, space requirements, material flow, emissions, ...)?
 - Which are ready to operate and which have to be developed or adapted?
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- Research, interviews, analysis, evaluation
 - Building networks



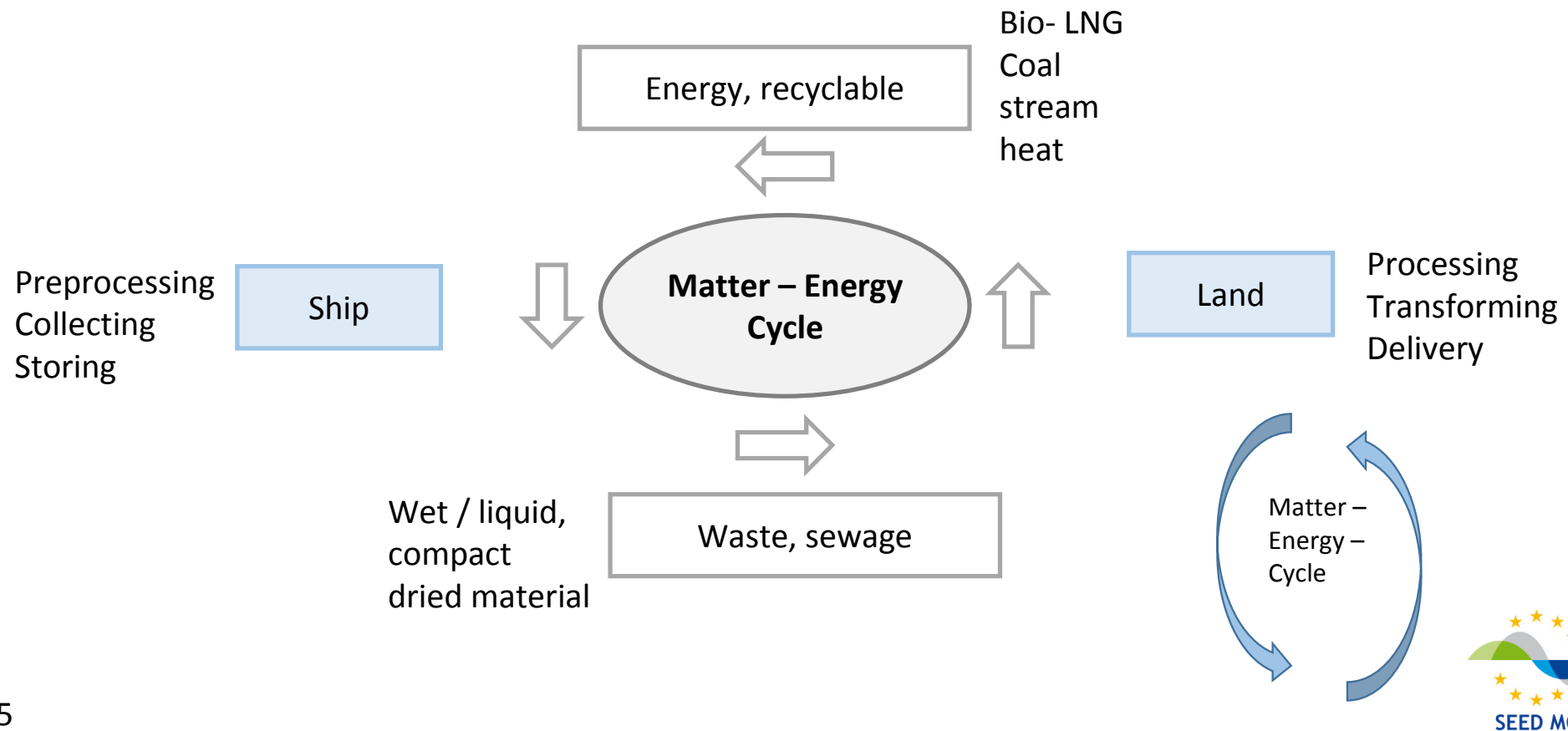
MBR-Plant (Martin Membrane Systems AG)

Questions and Preparatory Considerations

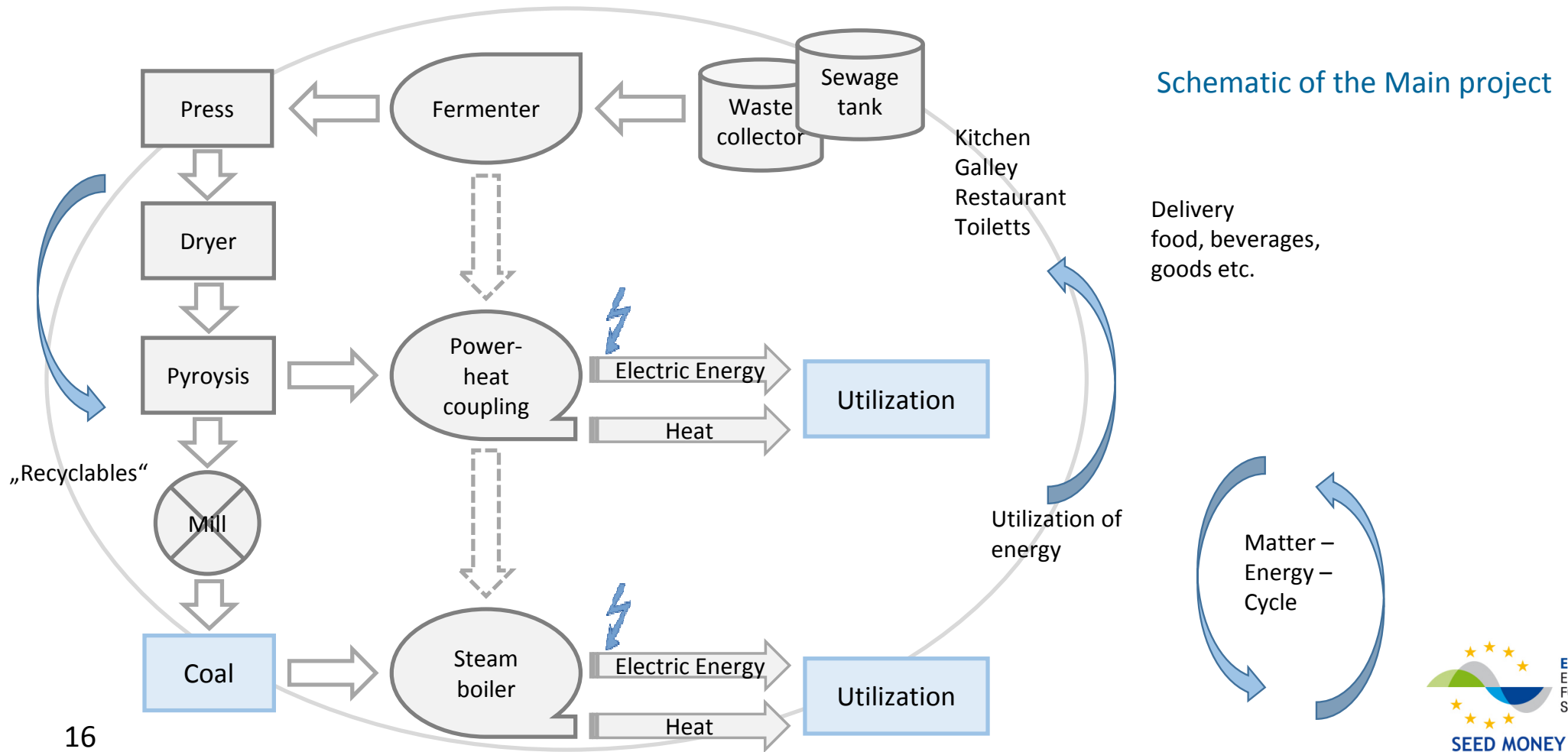
- What are the requirements for plants ashore?
- Which changes have to be realized on port reception facilities?
- Which adaptations are necessary on Board for new disposal systems?
- What are the requirements on ship operated plants?
- Which adaptations are necessary on existent ships?
- What are the costs for investment and operations?
- What are the costs of different disposal systems now and by using new solutions?
- Who are the stakeholders and how they work together?
- Research, interviews, analysis, evaluation
- Building networks

Idea and Aims of the Main Project

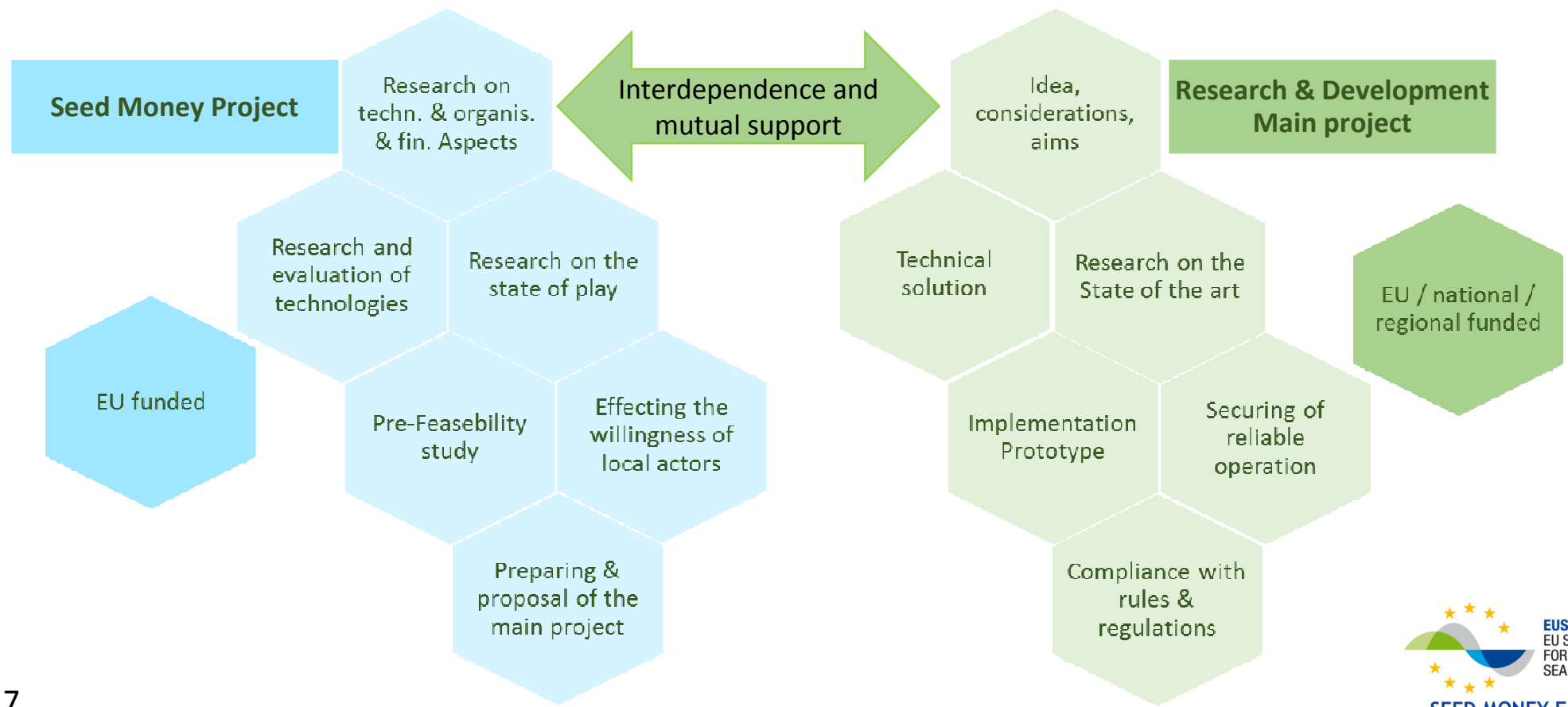
Aim of the Main project (Schematic)



Idea and Aims of the Main Project



Seeding the Main Project



Seed Money Project - Focus

- Elaborating of preconditions for implementation of the main project with focus to the pre-feasibility-study
- Creating awareness and willingness of actors in BSR for an environment friendly waste management and winning the minds of them:
 - Port authorities and port operators
 - Cruise shipping companies
 - Shipping/maritime authorities
 - Cities with cruise terminals/ports
 - Tourists authorities/association
 - Environmental authorities
 - Waste management companies/operators
- Influencing on existing and upcoming regulations for shipping

Seed Money Project - Pre-feasibility Study

- The pre-feasibility study aims on necessary prerequisites to implement the main project successfully
- It is proposed to define
 - Possibilities and requirements for implementation of the idea
 - Technical, Operational but also infrastructural aspects and requirements
 - Estimations for investment needs, efforts and benefits
 - work steps for R&D and implementation
 - Needed resources: material, work force and financial
 - Suitable funding possibilities

Partnership



IBZ Association for Innovation and Education



IEL Electrotechnical institute / Gdansk Branch

TURKU AMK  **TUAS** Turku University of Applied Science

Thank you for your Attention

