# FRAUNHOFER UMSICHT

## TECHNOLOGIES FOR GERMANY, EUROPE AND THE WORLD





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# Fraunhofer UMSICHT
## mission

Fraunhofer UMSICHT is a pioneer of a
sustainable energy and raw materials management
by providing and transferring scientific results
in business, society and politics.

Together with partners, the committed UMSICHT team researches and develops sustainable products, processes and services that inspire.

# Fraunhofer UMSICHT Sulzbach-Rosenberg

## Our services


From the idea ...

Consulting & studies

prototypes

Development & engineering

pilot operation

... to the product

...process implementation

Feasibility ● Economic viability ● Ecology ● Security ● Legal/political framework




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# Fraunhofer UMSICHT

institute director
**Prof. Dr.-Ing. Eckhard Weidner**


Head of Sulzbach-Rosenberg Division
**Prof. Dr. Andreas Hornung**

## Fraunhofer UMSICHT OBERHAUSEN 2017

| | |
|---|---|
| Staff | 411 |
| Budget EUR | 31.1 million |
| Technical Infrastructure | 4500 m² |

- Energy
- Processes
- Products

## INSTITUTE PART SULZBACH-ROSENBERG

| | |
|---|---|
| Staff | 100 |
| Budget EUR | 9,1 million |
| Technical Infrastructure | 2100 m² |

- Renewable Energy
- Recycling Processes
- Biological Process Engineering




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# The team in Sulzbach-Rosenberg





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# organizational structure
## Location Sulzbach-Rosenberg

**Fraunhofer UMSICHT**
**Sulzbach-Rosenberg Branch of the Institute**

Last update: 26.07.2018

Head Prof. Dr. rer. nat. Andreas Hornung
Deputy Director hon. Prof. Dr.-Ing. Matthias Franke, Samir Binder

### Renewable Energy

Dr.-Ing.

Robert Daschner

- Thermochemical processes
- Energy from biomass
- Thermal storage

### Recycling Processes

Prof. Dr.-Ing.

Matthias Franke

- Waste and resource strategies
- recycling technologies
- Input materials for additive manufacturing

### Biological Process Engineering

Dipl.-Wi.-Ing.

Fabian Stenzel

- Biogenic secondary products
- Analytics

### Administration

Dipl.-Ing.

Samir Binder

- Finance and Organization
- Strategic development and marketing
- Construction and workshop
- staff
- IT




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# Location Sulzbach-Rosenberg





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# Technologies for Germany, Europe and the world





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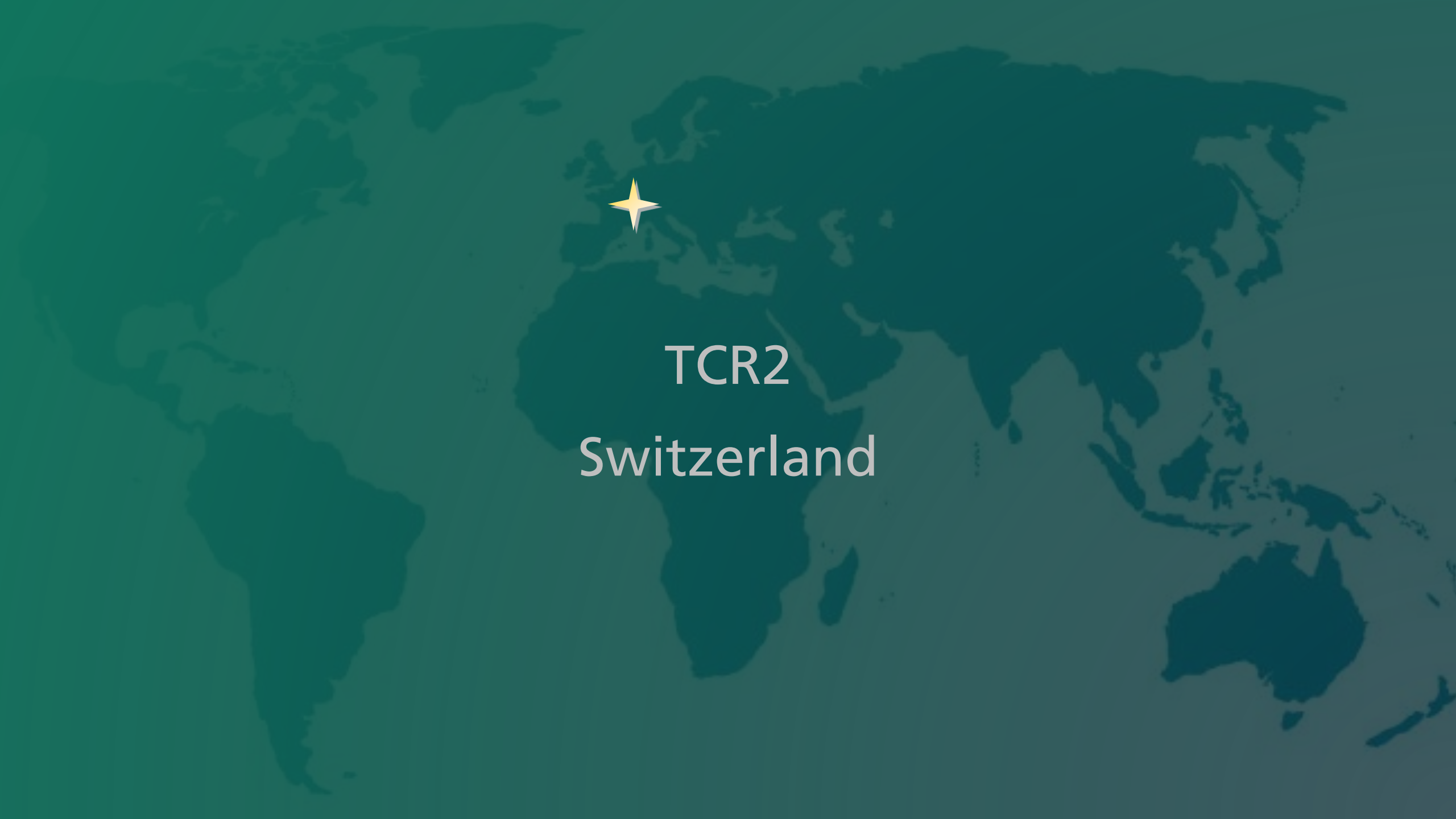

# TCR2

# Switzerland

# TCR 2 for FH Nordwest Schweiz for Sewage Sludge


**Project aim: Generation of TCR char from sewage sludge for academic investigations and staff training**

| | |
|---|---|
| Period: | III/2014 - II/2015 |
| Budget: | 65.000 EUR |
| Purchaser: | Susteen Technologies GmbH |
| Industrial project | |

# TCR 2 for FH Nordwest Schweiz for Sewage Sludge

- **Throughput:** 3 kg per hour
- **Heat supply:** Electrically heated
- **Application:** Research for FHNW Schweiz
- **Feedstock:** Mainly sewage sludge

Containerized Plant

Compact laboratory plant




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# SUWAMATU

Tunisia

# Project Overview
## SUWAMATU

**Analysis of current situation and conceptual design phase**





- Research based on available information
- Determination of model regions
- Workshops in Tunisia and Bavaria
- Visit of model regions and identification of gaps and needs
- Determination of necessary topics and waste streams for implementation projects
- Conceptual designs for implementation projects
- Research for funding next project phase

Duration: August 2018 - December 2018

Funding: State of Bavaria





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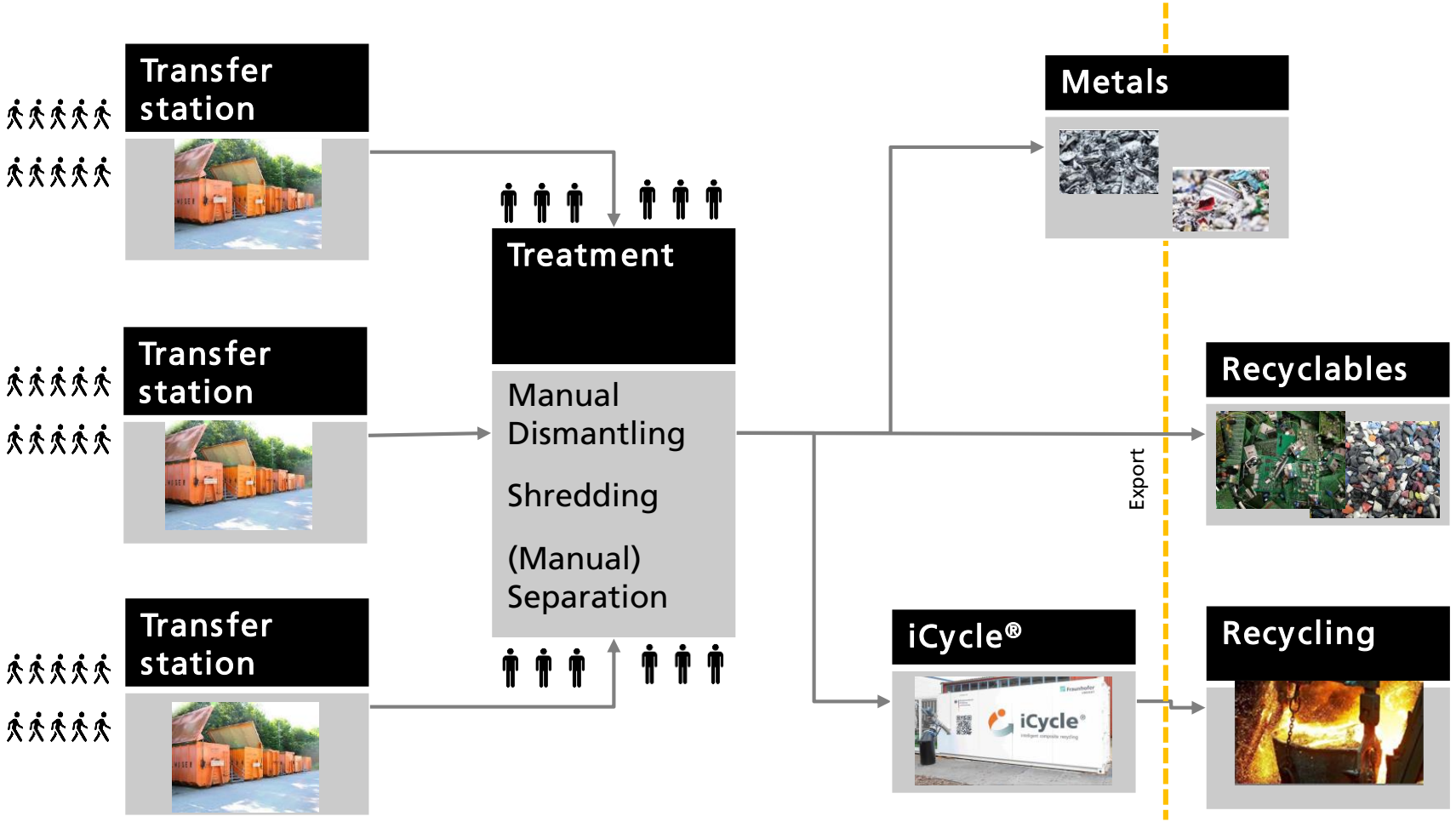
# Project Overview

## WEEE collection and treatment for Siliana, Tabarka, Douar Hicher







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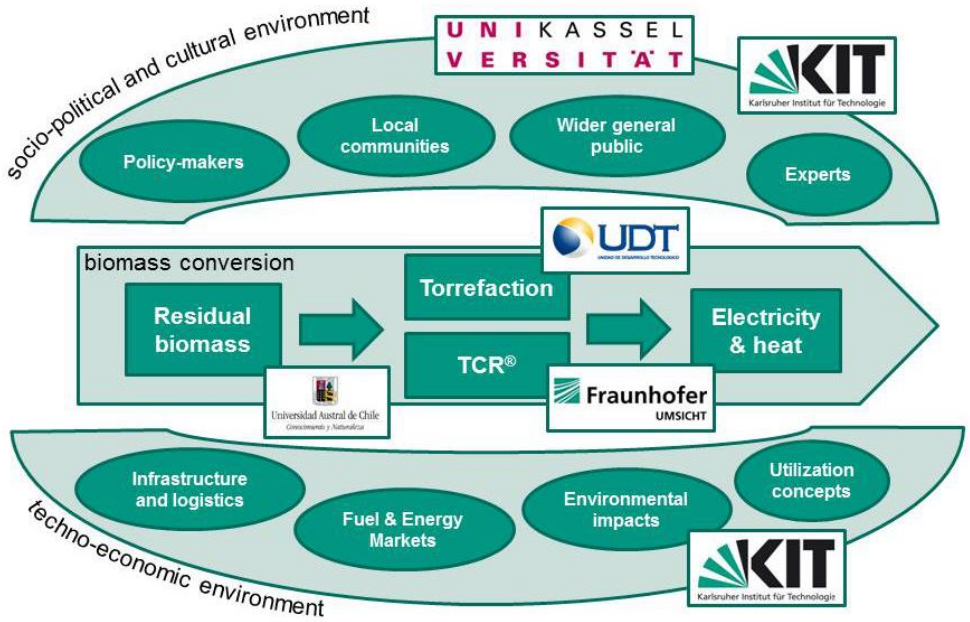
# SeMoBioEnergy Chile

# Research Project SeMoBioEnergy – Bioenergy application for Chile

- German-Chilean research project ‘Semi-Mobile Bioenergy from Agricultural and Forest Residues in Chile and beyond’ - ‘SeMoBioEnergy’.
- Funded by the BMBF, started in September 2015.
- ‘SeMoBioEnergy’ aims at developing feasible concepts for regional bioenergy chains using residues from agriculture and forest plantations.
- The central idea is to use mobile pre-treatment units (see picture) to densify biomass resources directly at the harvesting site.
- Through this innovative process, it will become possible to use residues more efficiently for energy production while increasing local value creation and reducing Chile’s dependency on energy imports.




Funded by:
Bundesministerium für Bildung und Forschung

# Research Project SeMoBioEnergy – Bioenergy application for Chile

- The TCR 2 plant was designed, built and commissioned at UMSICHT and transported to UDT in Chile.
- Several types of biomass have been tested sucessfully.
- Demonstration of the potential of the TCR process


TCR 2 at UDT in Chile

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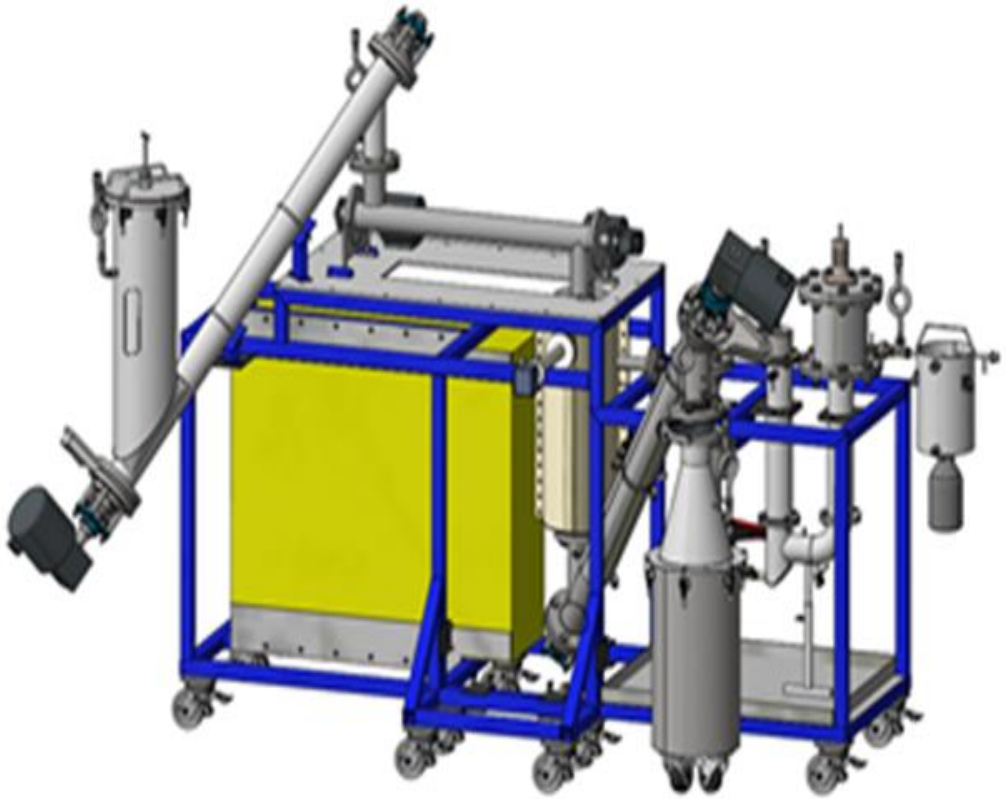
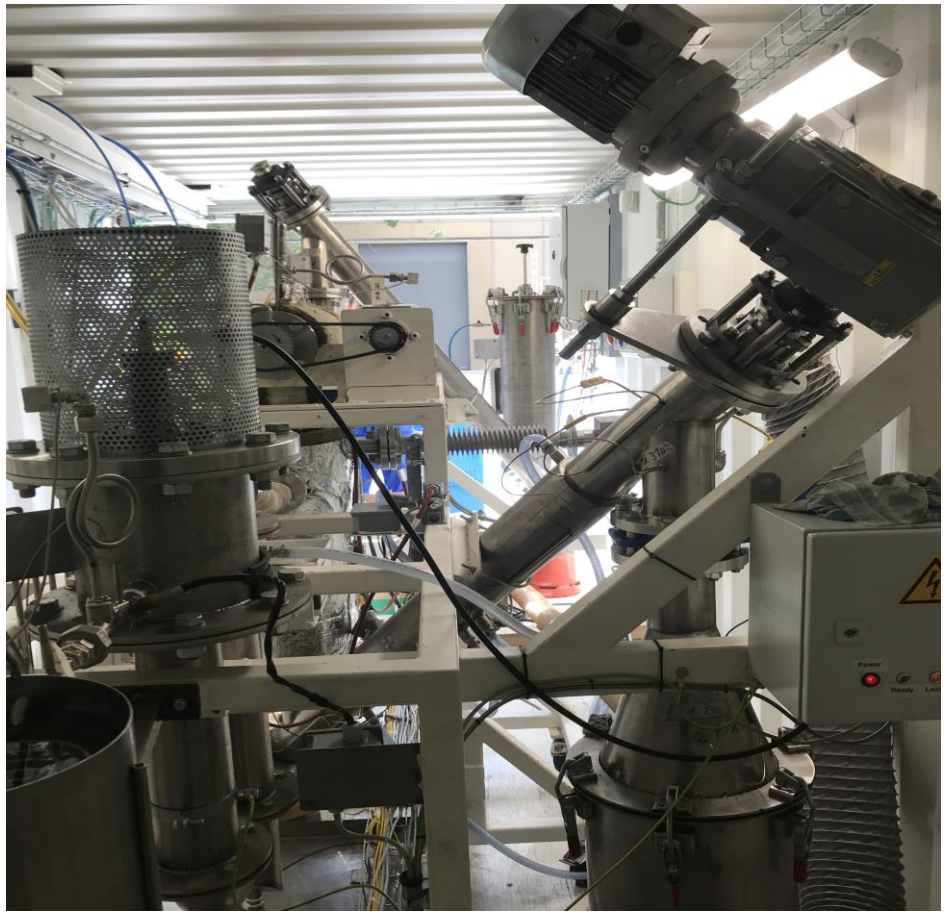
# Research Project SeMoBioEnergy – Bioenergy application for Chile

Containerization: Continuous operating semi-mobile TCR plant



From desk to reality



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# TCR80

Birmingham / UK

# Industrial Project TCR 80 for UK, Birmingham

Purpose:

- The delivery of a TCR 80 plus a TCR 2 to University of Birmingham
- Demonstration of conversion of biomass plus plastics to heat and power
- Purchaser: Susteen Technologies GmbH

TCR 80 @University of Birmingham




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# Biobattery Canada

# Biobattery – Decentralized production of fuel from waste

## The approach






TCR® technology


Bio-oil


Syngas


char / biochar


CHP


Gasification


Soil amendment

$H_2$

Green hydrogen


Power


Heat


Liquid fuels refinery




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# Biobattery – Decentralized production of fuel from waste

## Work package of Fraunhofer UMSICHT


TCR®2: is certified in accordance to Canadian standards and delivered

TCR®30: is still under construction and will be delivered in autumn 2019




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# Biobattery – Decentralized production of fuel from waste

## The consortium

Project lead by:

UNIVERSITY OF ALBERTA

Partners and sponsors:

Alberta Economic Development and Trade

ALBERTA INNOVATES

WESTJET

Fraunhofer UMSICHT


Workshop with staff of University of Alberta for training in TCR® operation


eMiskWaste
KUWAIT

# Surveying and Establishment of a Comprehensive Database for Waste Management in Kuwait eMISKWaste

## Current Situation in Kuwait





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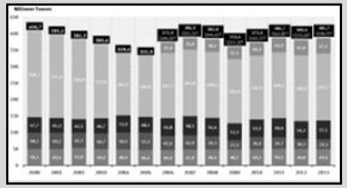
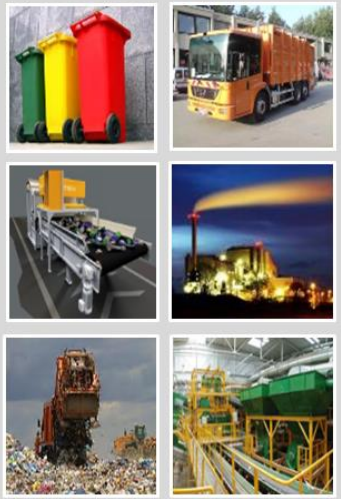
# Surveying and Establishment of a Comprehensive Database for Waste Management in Kuwait eMISK$_{Waste}$

## Aims, partners and duration



**Data collection and Survey**
- Waste Types and Amounts, Sources
- Collection and Transport
- Treatment and Landfills
- Legislation
- Finance

**eMISK$_{Waste}$**
- Geodatabase and Systems for Data Storage, Processing, Analysis and Presentation
- Basis for Decision Making
- Monitoring
- Web-Applications
- Beatona.net



**National Waste Management Strategy**
- Forecasts
- Goals, Indicators, Target Values
- Action Plans
- Treatment and Recycling Technologies
- Landfill Concepts
- Capacity Planning
- Finance Plans
- Legal Framework

### Partners:

envero, Universität Rostock, Blackforest Solutions, intecus, INFA, TOMM+C, RLK Ingenieurgruppe, bipro, NORDUM Akademie, DB Dar Al Bea'a, GISCON

### Project Duration:

January 2017 - December 2020

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# Surveying and Establishment of a Comprehensive Database for Waste Management in Kuwait eMISK$_{Waste}$

## Field works in Kuwait





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# Marine Litter Ecuador

# Marine Litter
## Ecuador

heute

Umweltsünde Plastikmüll

### Der Präsident, das Paradies und das Plastik

15.02.2019 11:25 Uhr

**Umweltschutz gehörte bislang nicht zu den Schwerpunkten von Bundespräsident Steinmeier. Eine Umweltsünde aber fällt ihm auf seiner Südamerika-Reise vor allem auf: der Plastikmüll.**

Galapagos-Inseln: Bundespräsident Frank-Walter Steinmeier und seine Frau Elke

Quelle: dpa

Quelle: https://www.zdf.de/nachrichten/heute/der-praesident-das-paradies-und-das-plastik-100.html; Abrufdatum: 25.06.2019




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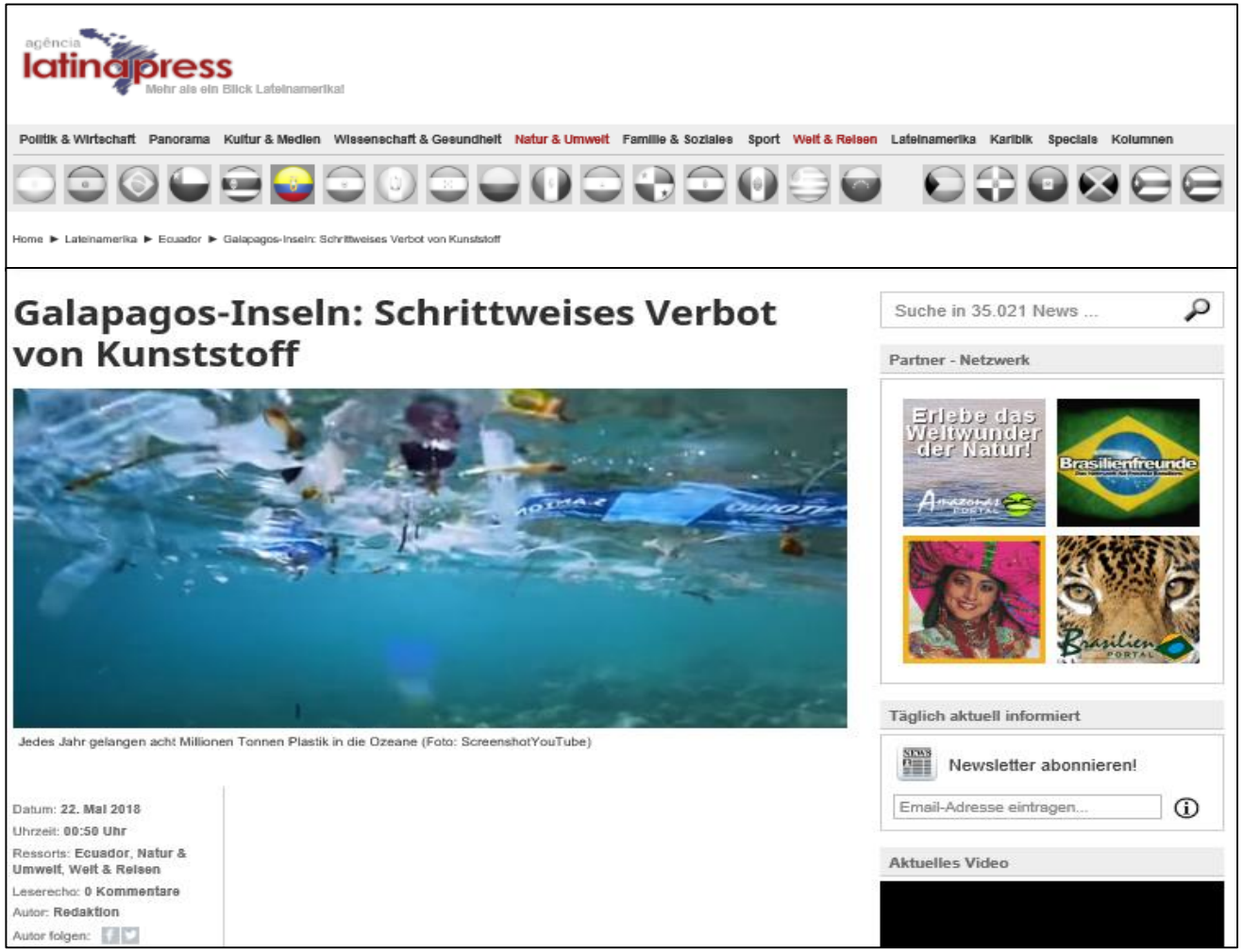
# Marine Litter
## Ecuador




Quelle: https://latina-press.com/news/250047-galapagos-inseln-schrittweises-verbot-von-kunststoff/; Abrufdatum: 25.06.2019

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# Marine Litter
## Ecuador


# Energy and Raw Materials from Waste China

# University of Birmingham and Fraunhofer UMSICHT
## Joint Research Platform




Fraunhofer UMSICHT

# University of Birmingham, Fraunhofer UMSICHT and JITRI

## Joint Development and Market Implementation

The Bridge


To Industry




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E-Scrap
Ghana

# E-Scrap
## Global Situation

- Global E-Scrap Recycling: **<20 %**
  - While its about **55 Bio. US-$**

- Is it **our** E-Scrap?
  - 77 % of E-Scrap in Nigeria from European Union
    - **...20 % from Germany**
- Illegal exports from Germany
  - **≈ 400.000 t**

***MISSION: IMPROVING E-WASTE SITUATION IN AFRIKA***




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# E-Scrap

## Solution for Ghana: Decentralized, safe, and economic treatment





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# Fraunhofer UMSICHT in Sulzbach-Rosenberg -

*a modern research and development partner for customers all over the world*

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INSTITUTSTEIL SULZBACH-ROSENBERG

# Technologies for Germany, Europe and the world





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