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Biogas production from organic part of municipal solid waste

UrbanBiogas Project

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Zagreb Holding – Waste Management Division



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INTELLIGENT ENERGY EUROPE
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Content


- *Biowaste – general characteristics*
- *Renewable Energy – biogas production*
- *Intelligent Energy Europe*

UrbanBiogas Project




3rd International Symposium on Environmental Management
October 26-28, 2011, Zagreb, Croatia






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Biowaste



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Biowaste


biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants

- source-separated collection: households
markets and shopping centres
restaurants and canteens




	Code
BIODEGRADABLE WASTE	20 02 01
EDIBLE OIL AND FAT	20 01 25
BIODEGRADABLE KITCHEN AND CANTEEN WASTE	20 01 08
WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING	02

Source: European Waste Catalogue



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Waste Management

City of Zagreb

- landfill: Prudinec Jakuševac
350 000 t/y
- composting plant
- landfill gas : CHP

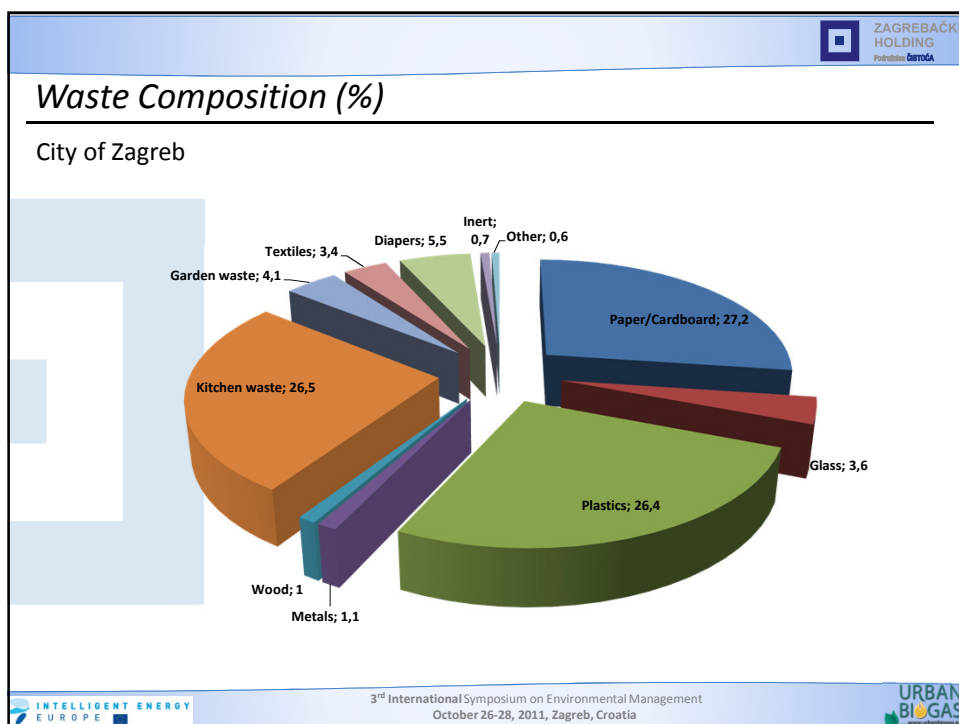





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Legislation – EU and Croatia

Climate package - 20-20-20 (2009/28/EC Directive on the promotion of the use of energy from renewable sources)

Waste directive (2008/98/EC)

- plan for each country for separate waste collection and its usage

Landfill directive (1999/31/EC)

- reduction of biodegradable waste on landfill to 35% until 2016.



Strategy for Waste Management (Official Gazette No 130/05)

- system for reduced and sustainable waste management

The Waste Act (Official Gazette No 178/04, 111/06, 60/08, 87/2009)

- usage of valuable waste

The Energy Act (Official Gazette No 68/01, 177/04, 76/07 and 152/08)


- usage of renewable energy is in the best interest for Republic of Croatia
- 20 % renewable energy until 2020. (10% biofuels in transport)

Landfill regulation (Official Gazette No 117/2007)

- ban for biodegradable waste and MSW with >35% of biodegradable fraction

Plan for Waste management in the City of Zagreb until 2015 (Draft)


- biological treatment of separately collected biowaste for biogas production





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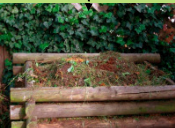





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Biowaste

Use of Organic Waste

(Municipal Solid Waste, Catering & Food Waste)

Landfill	Incineration Plant	Household Composting	Industrial Composting	Anaerobic Digestion
<ul style="list-style-type: none"> - Reduction necessary to comply with Directive 2006/12/EC - Landfill gas could be energetically used, but energy output is low - No use of nutrients is possible 	<ul style="list-style-type: none"> + Energetic use - "waste heat" is often un-used - No use of nutrients is possible - High investment costs and other barriers for new plants - Long transport ways due to centralised plants 	<ul style="list-style-type: none"> + Common practice in many cases + High-value end-product: closed nutrient cycle + No sophisticated logistics needed - No energetic output - Not all waste is suitable for private composts - Not possible in urban areas 	<ul style="list-style-type: none"> + Common practice in many cases + High-value end-product: closed nutrient cycle - No energetic output 	<ul style="list-style-type: none"> + High energetic output + High-value end-product: closed nutrient cycle → Still needs non-technical support

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Renewable Energy – biogas production

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Waste to Biogas Concept

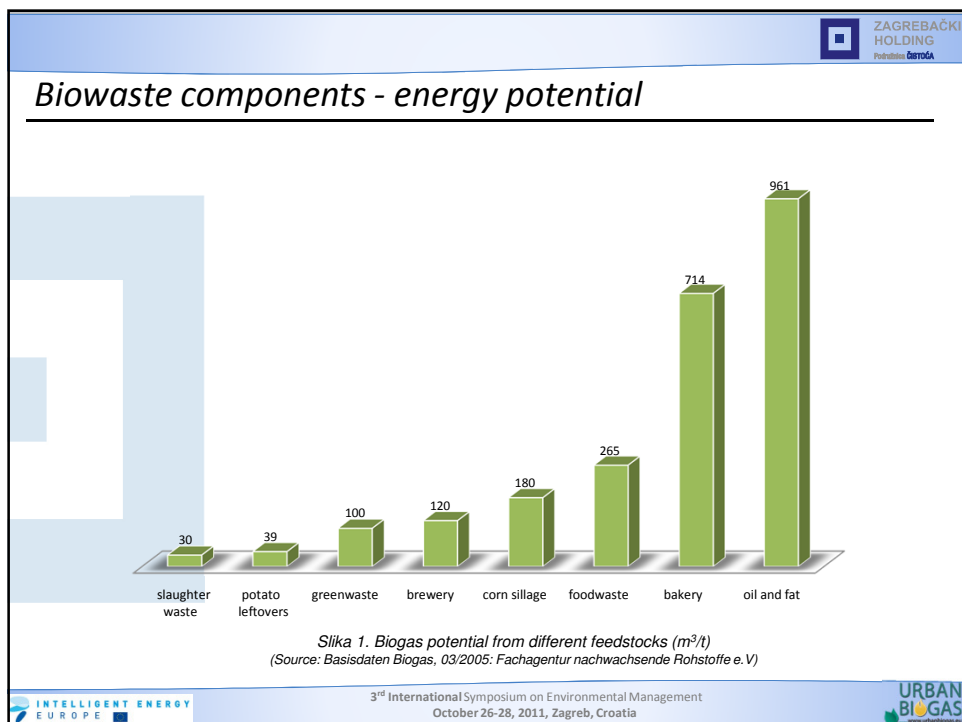
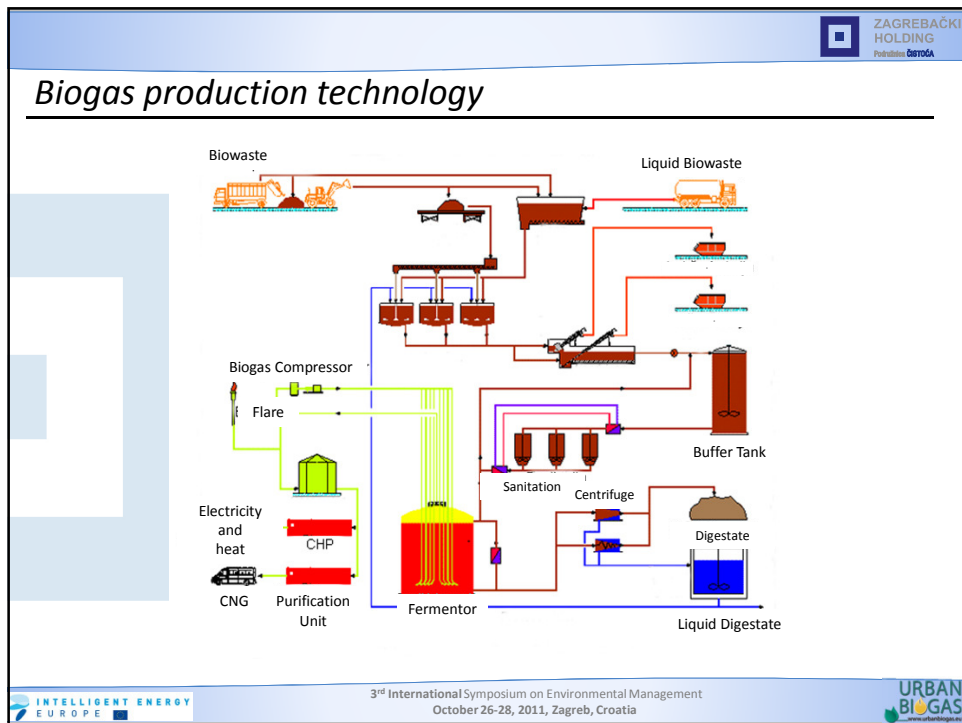
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graph TD; A[Biowaste] --> B[Anaerobic Fermentation]; B --> C[Biogas]; B --> D[Digestate];
```

The diagram illustrates the 'Waste to Biogas Concept' as a three-step process. It begins with a box labeled 'Biowaste' at the top. A downward arrow leads to a second box labeled 'Anaerobic Fermentation'. From this central box, two arrows branch out downwards to two separate boxes: 'Biogas' on the left and 'Digestate' on the right.

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City of Zagreb – Estimation of biowaste energy potential

- around 30% of biowaste in MSW
70 000 t/y -> 3MWh

- 1st phase : 20 000 tonnes/y (1MWh)

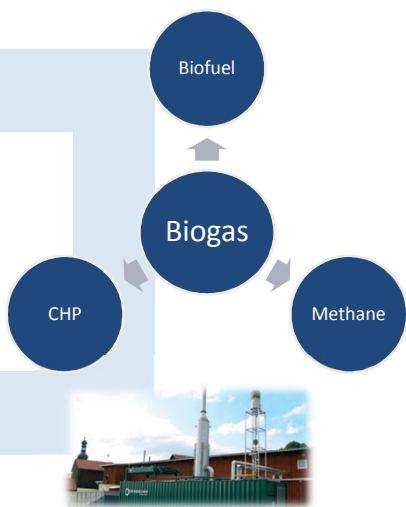
Feedstock	Amount (t/y)	Dry matter (%)	Biogas potential (m ³ /y)	Methane amount (m ³ /y)
Biowaste from households and shops	5 000	20	500 000	340 000
Biowaste from kitchen and canteens	10 000	20	1 000 000	600 000
Biowaste from markets	3 000	20	300 000	180 000
Industrial biowaste	1 000	20	100 000	60 000
Milk products and eggs	500	17	37 500	20 000
TOTAL	20 000		1 937 500	1 200 000

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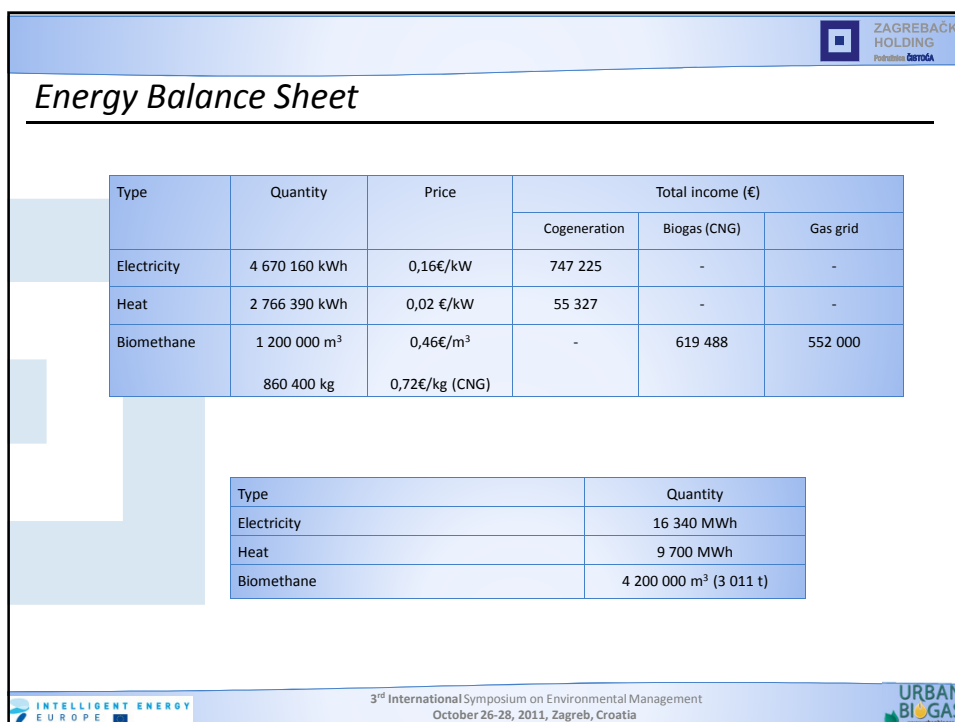
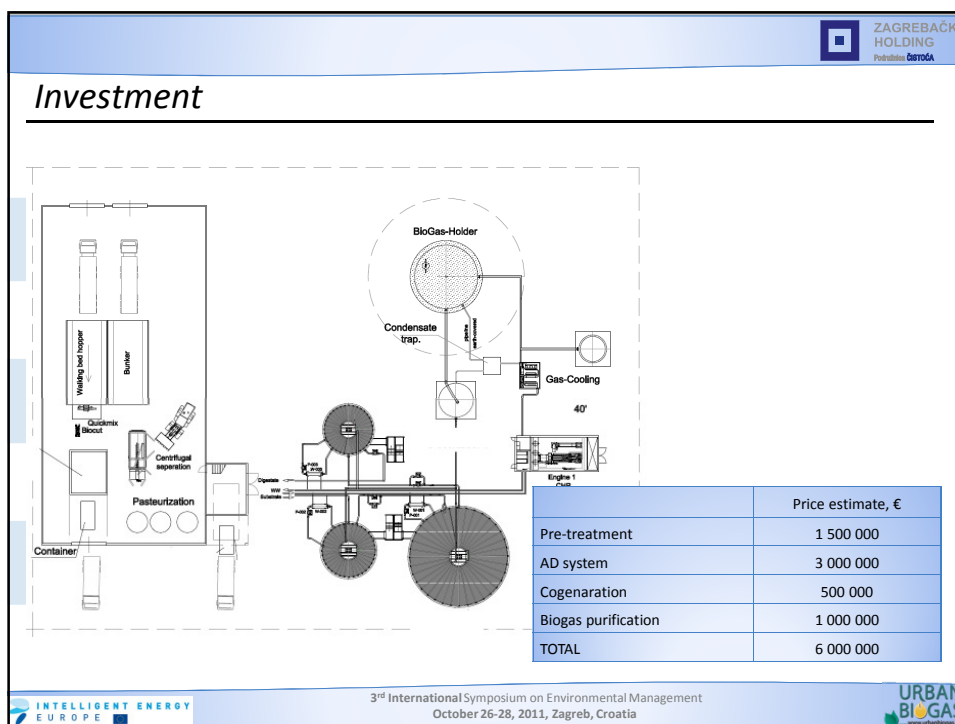
Biogas composition & usage alternatives



Biogas components	Fraction (vol %)
Methane	50-75
CO ₂	25-45
Vapour	2-7
Oxygen	< 2
Nitrogen	< 2
H ₂ S	< 2
NH ₃	< 1
H ₂	< 1

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Competitiveness and Innovation Framework Programme

Entrepreneurship and Innovation
2,170 bil. €




EIP



cip competitiveness and innovation
framework programme
2007-2013


Intelligent Energy Europe
730 mil. €



IEE

CIP


Information and Communication
Technologies Policy Support
730 mil. €




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IEE





Three main objectives:

- Promoting energy efficiency and encouraging the rational use of energy sources
- Increasing the use of new and renewable energy sources as well as encouraging energy diversification
- Stimulating energy efficiency and renewables in the field of transport



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IEE Call 2010 – ALTENER Bioenergy

UrbanBiogas

Urban waste for biomethane grid injection and transport in urban areas


Overall objectives


- to promote the use of the untapped fraction of organic urban waste for biogas production in order to inject biomethane in the natural gas grid and to use it in transport.
- concept of biomethane production in 5 target cities

Duration: 01.05.2011 – 30.04.2014


Three main groups:

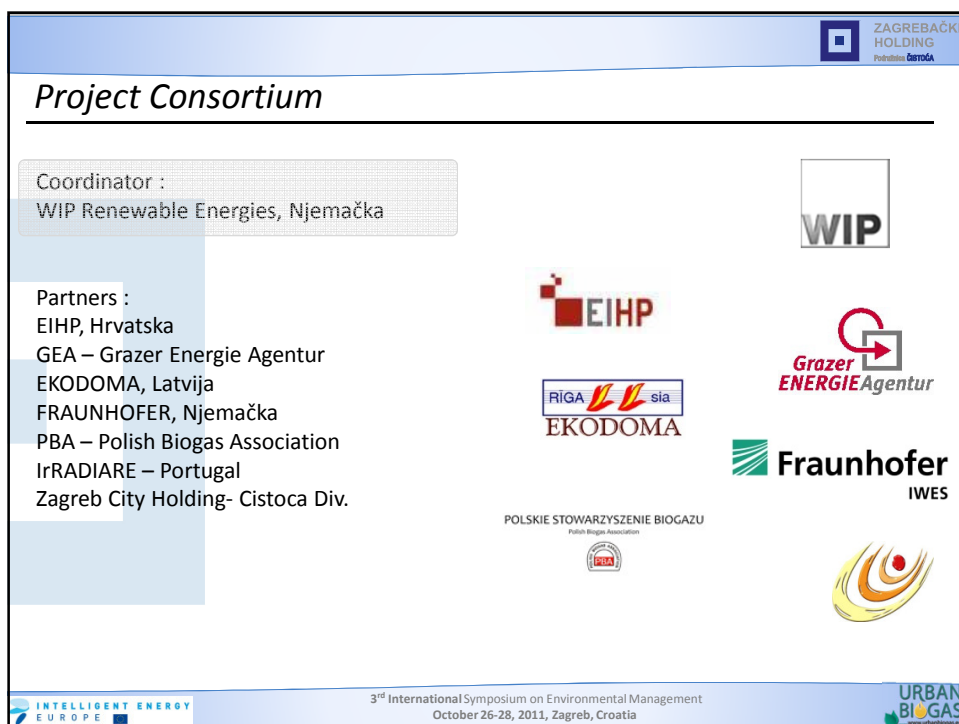
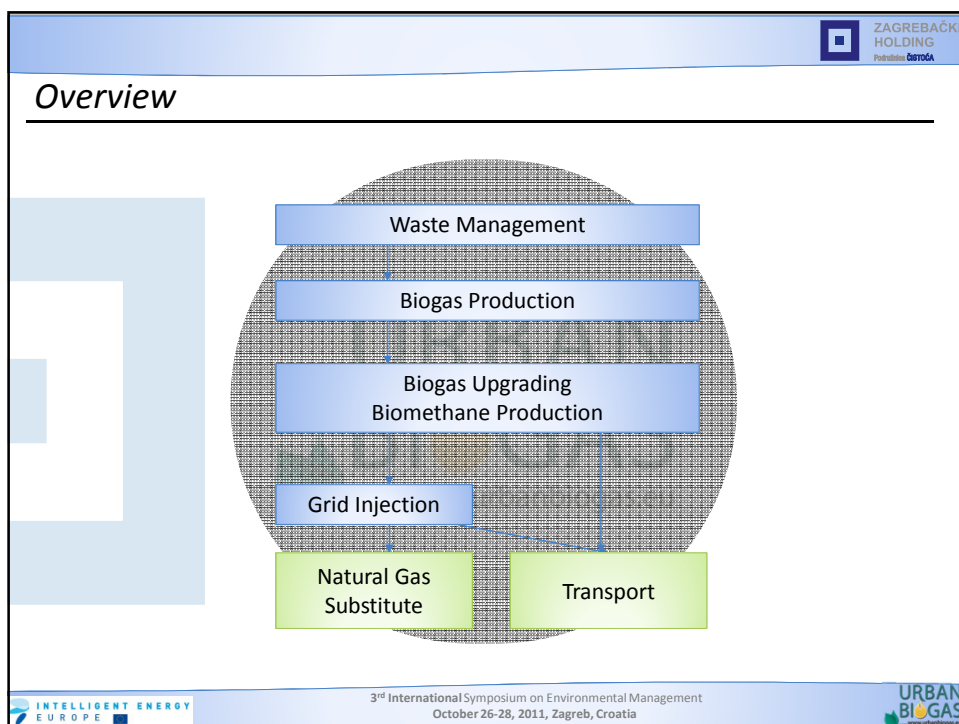
1. Separate biowaste collection
2. Biogas production
3. Biomethane usage as energy source or biofuel





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Target Cities

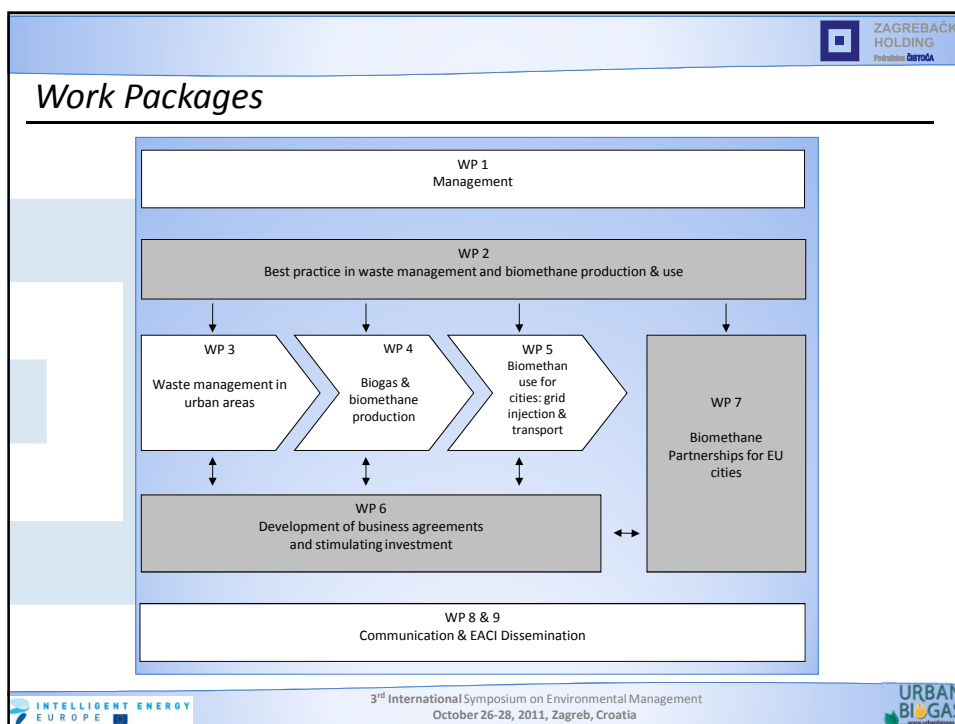
- City of Zagreb (Croatia)
- Municipality of Abrantes (Portugal)
- City of Graz (Austria)
- City of Rzeszów (Poland)
- North Vidzeme Region (Latvia)

Logos: ZAGREBAČKI HOLDING d.o.o., abrantes, P A E, ZAO, GRAZ

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Partner Cities

EUROPE

- Mainz
- Stockholm
- Lille
- Belgrade

CROATIA

Rijeka

Split

Osijek

Koprivnica

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Partnership certificate

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EUROPE

WIP Fraunhofer IGH INSTITUT ZA KORIŠĆENJE ENERGIJE EKODOMA ZAO ICHP PAE

Partnership Certificate

THE UNDERSIGNED PARTIES CONFIRM THE INTENT TO ACT AS PARTNERS IN THE PROMOTION OF THE URBANBIOGAS PROJECT ACTIVITIES.
PARTIES WILL PROMOTE THE USE OF BIOWASTE FOR BIOMETHANE PRODUCTION TO THEIR CITIZENS.
HENCE, THEY WILL INTERCEDE FOR CLEANER ENVIRONMENT AND SUSTAINABLE DEVELOPMENT THROUGH THE INJECTION OF
BIOMETHANE IN THE NATURAL GAS GRID AND TRANSPORT USE.

PARTNER CITY CERTIFIES THAT IT WILL CONTRIBUTE TO THE ACTIVITIES OF THE URBANBIOGAS PROJECT THROUGH SHARING OF EXPERIENCE,
KNOWLEDGE AND EXAMPLES OF BEST PRACTICE. URBANBIOGAS TARGET CITY CERTIFIES THAT IT WILL PROMOTE AND DISSEMINATE
THE URBANBIOGAS PROJECT, ALL ITS ACTIVITIES AND OBJECTIVES, IN THE PARTNER CITY.

IN WITNESS THEREOF, THIS CERTIFICATE IS SIGNED ON JULY 29th, 2012.

PARTNER CITY
City of Mainz

Jens Beutel, Mayor


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URBANBIOGAS TARGET CITY
City of Zagreb

Milan Bandić, Mayor

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Conclusion


TWO MAIN ASPECTS OF THIS APPROACH:


Separate biowaste collection:

- environment protection
- decrease of waste landfilling
- utilization of useful waste properties


Production of biogas:

- production of energy from renewable resources
- substitution of fossil energy sources
- decrease of greenhouse gases emissions
- production of biocompost





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Thank you for your attention!





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