

ECS  **SOLUTION**

W A S T E T O E N E R G Y

"I think having land and not ruining it is the most beautiful art that anybody could ever want." **ANDY WARHOL**

WASTE PROBLEMS

The major problems affecting solid waste management are unscientific treatment, improper collection of waste, and ethical problems. This in turn leads to hazards like environmental degradation, water pollution, soil pollution, and air pollution.

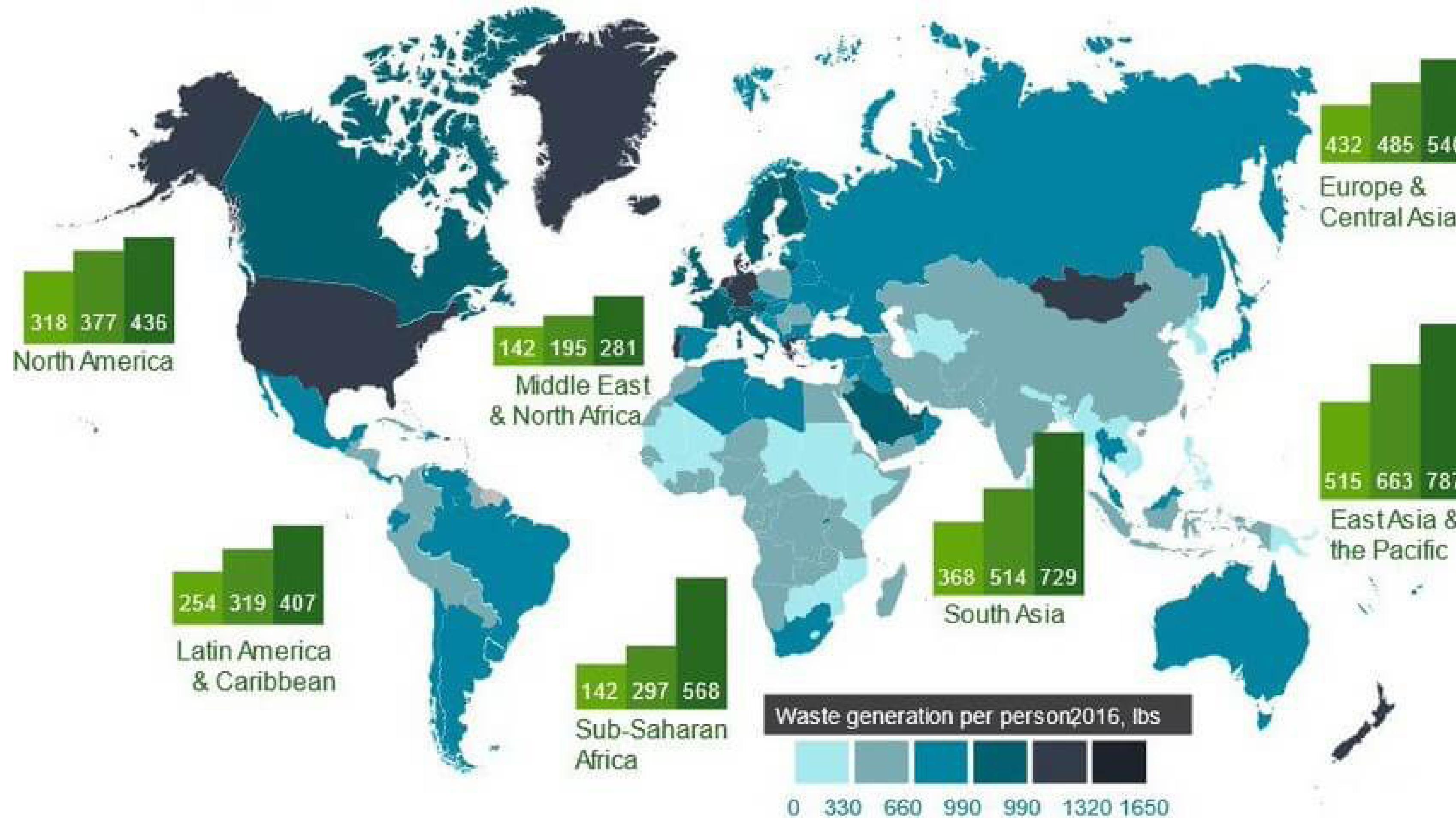
- 2.01 billion **tones** of municipal solid waste annually
- 33% of that is extremely conservatively and not managed in an environmentally safe manner
- Waste generated per person per day ranges from 0.11 to 4.54 kilograms
- High-income countries generate about 34 percent, or 683 million **tonnes**, of the world's waste
- Global waste is expected to grow to 3.40 billion tonnes by 2050
- Overall, there is a positive correlation between waste generation and income level. Daily per capita waste generation in high-income countries is projected to increase by 19 percent by 2050, compared to low- and middle-income countries



A THROWAWAY WORLD

Regional waste generation
US ton (millions)

2016 2030 forecast 2050 forecast



Waste generation per person 2016, lbs

0 330 660 990 990 1320 1650

OUR SOLUTIONS



- **ELIMINATE WASTE**

Through gasification process we eliminate waste with energy recovery or fertilizer products. Gasification is a process that converts organic based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide.

- **WASTE RECEPTION AND SORTING**

Preferable to reuse and recycle than throw away material including: metal, plastic, paper and cardboard, glass

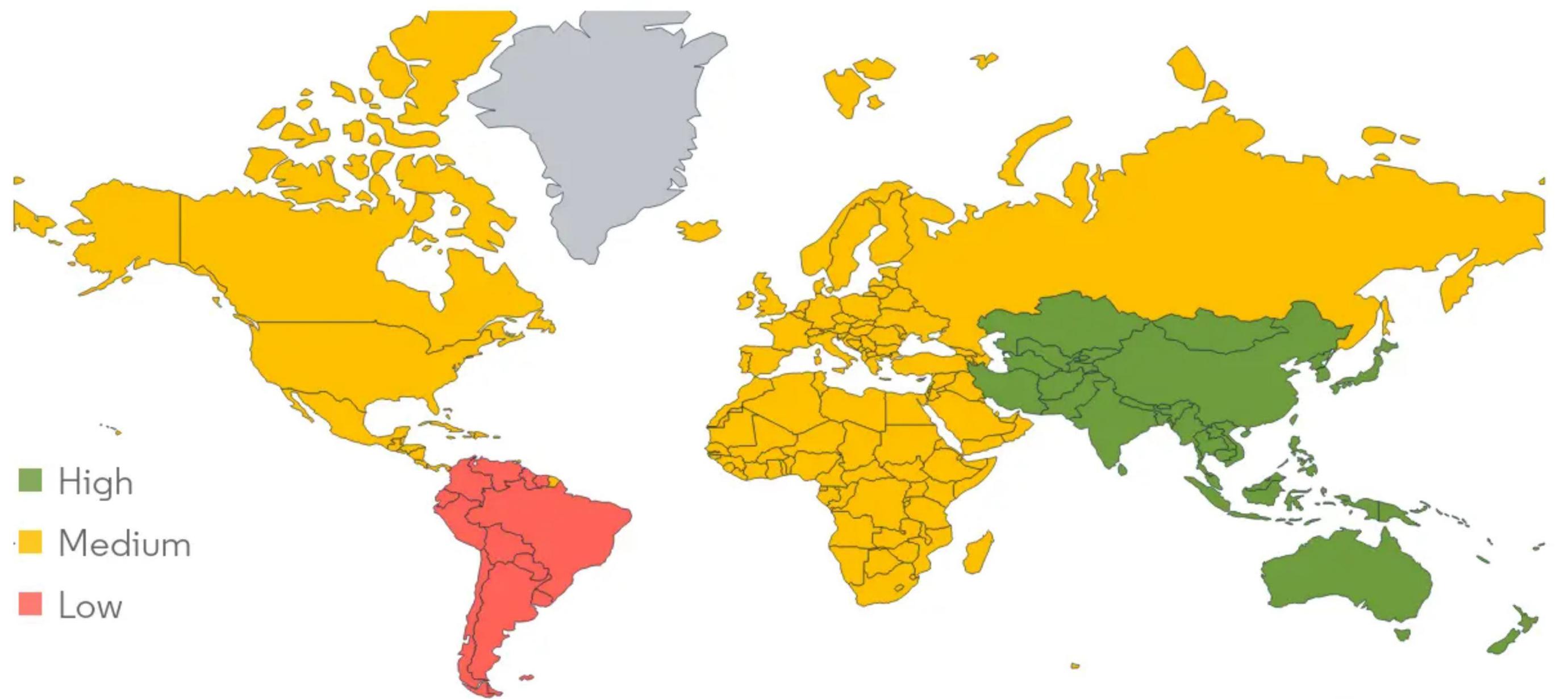
FIELDS OF APPLICATION

Energy recovery from:

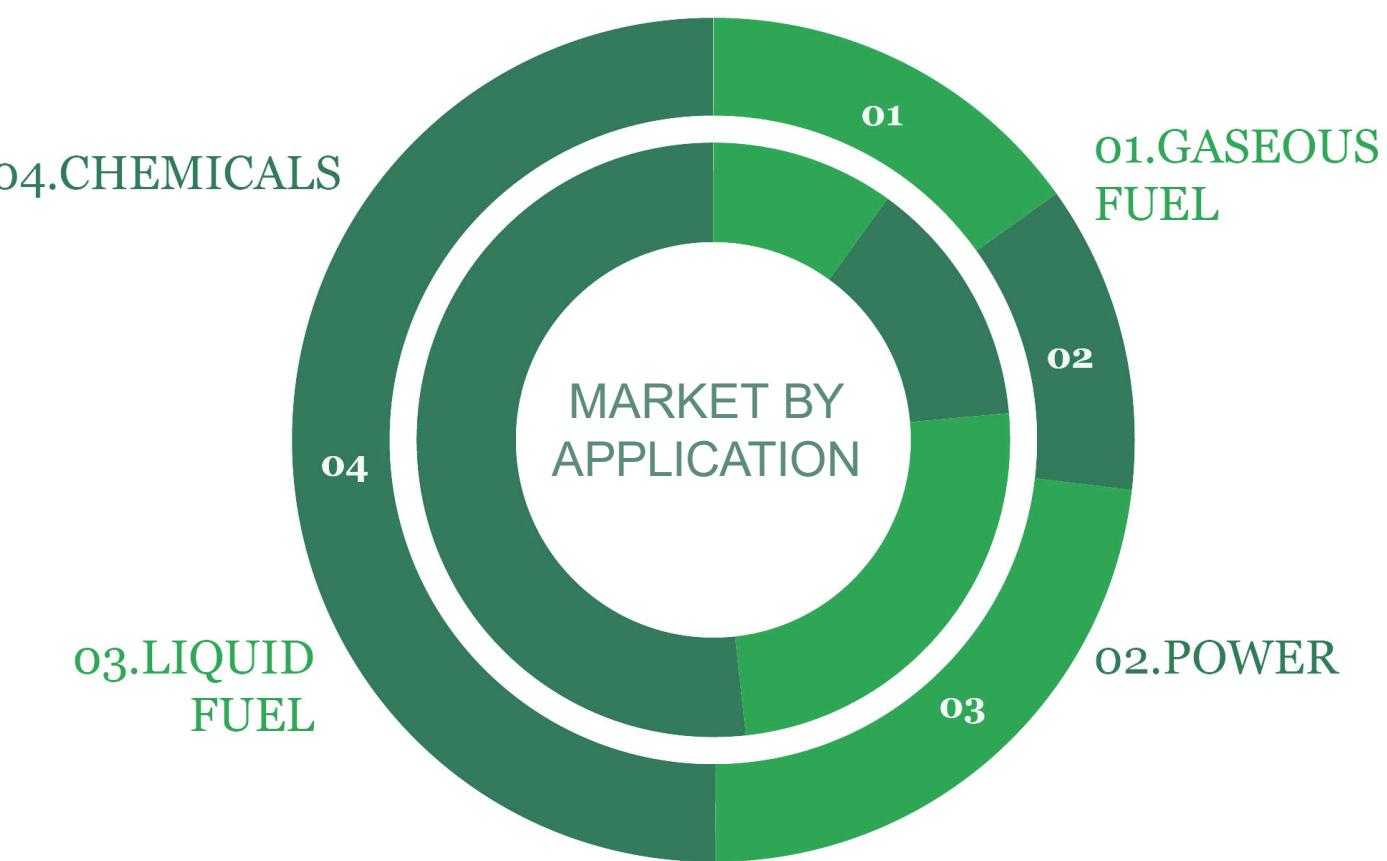
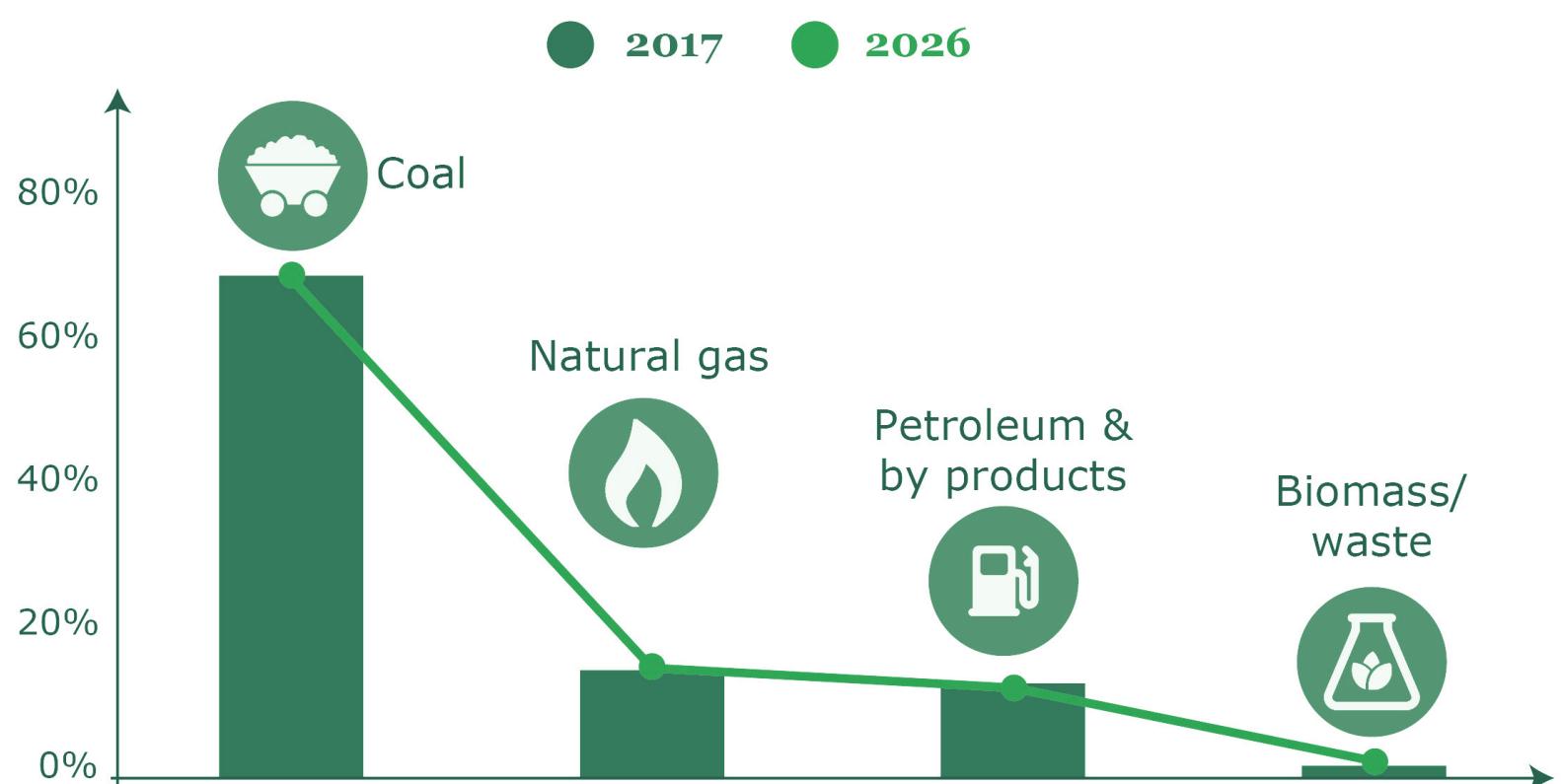
- waste resulting from sorting and recycling
- biomass, agricultural waste and forestry
- organic and dangerous biological waste
- treatment of gaseous pollutants
- municipal waste
- oil waste



SYNGAS MARKET - GROWTH RATE BY REGION, 2020-2025



MARKET BY FEEDSTOCK



Synthesis gas (Syngas) is the generic term for raw gas produced from feedstock hydrocarbon and consists of hydrogen (H₂) and carbon monoxide (CO) as primary components and carbon dioxide (CO₂), methane (CH₄), etc. as remaining components. It is also the generic term for raw gases used for the synthesis of ammonia, methanol, and oxo alcohol or the production of hydrogen. In addition to the application to these existing technology field, the application to the new energy related technology field, such as Gas-to-Liquid (GTL) which is based on Fischer Tropsch process, dimethylether (DME), or substitute natural gas (SNG) and also Chemical product related technology field, Gas-To-Chemical such as Methnoal To Olefins (MTO) or Methanol To Gasoline (MTG) are now drawing much attention to.

PROCESS BENEFITS

- Disposal of waste from municipal landfills (cf. EU Directives), respectively the cancellation of their negative effects (methane emission, generation of toxic decomposition compounds including dioxin, contamination of the environment with germs pathogens, unusable agricultural land);
- Generation of small amounts of slag residues in the process, from 2% to 5%, slag can be used as raw material in construction field;
- Electricity and heat generation (from renewable sources);
- Investment costs at $\frac{1}{2}$ compared to those required for a waste incineration plant, and reducing operating costs to $\frac{1}{5}$;
- Disposal of toxic waste tars;
- Zero CO₂ pollution in the sense that natural cellulosic carbon from waste (majority) is reintegrated into the atmosphere;
- Water recycling in the process, without environmental pollution;
- No fuel is consumed to destroy the waste;
- Processing costs well below EU waste disposal costs;
- Protection against final gas leaks provided by depressurization.



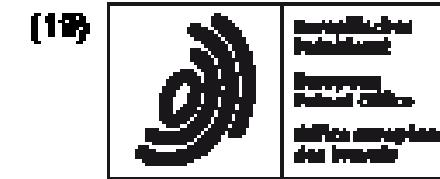
AND STRENGTHS



- The factory can be operative 24/7, 365 days per year;
- With regular maintenance the factory span is above 40 to 50 years;
- Huge variety of final products resulting from syngas, e.g. :
 - a. electricity production in concentration / trigeneration:
 - electricity (1.2 - 1.8MWh) from 1 ton trash
 - process steam
 - hot water
 - air/ hot water heating apparatus
 - cold ambient air for cooling
 - thermal energy (1.5 - 2Gcal from 1 tone trash)
 - b. petro chemical products:
 - Kerosene
 - gasoline/diesel
 - plastic
 - c. hydrogen (120/180Kgs of Hydrogen from 1 ton of trash)
 - d. syngas to fertilizer equipment supplied by Uhde:
 - e.g. the plant produces 650 Kg of urea and 450 Kg of CAN (ammonium nitrate) from 1 ton of waste
- All solution can be used individually or simultaneously in a any combination required

ECONOMIC FEASIBILITY STUDY OF THE PLANT BUILT

State	Population	daily waste t/day	total turnover	total licence fee
UE	507,852,885	609,423	€ 121,884,692,400	€ 3,656,540,772
UAE	9,771,000	11,725	€ 2,345,040,000	€ 70,351,200
Oman	4,975,000	5,970	€ 1,194,000,000	€ 35,820,000
Kuwait	4,207,000	5,048	€ 1,009,680,000	€ 30,290,400
Saudi Arabia	34,270,000	41,124	€ 8,224,800,000	€ 246,744,000
Yemen	26,910,000	32,292	€ 6,458,400,000	€ 193,752,000
Afganiatan	38,040,000	45,648	€ 9,129,600,000	€ 273,888,000
Pakistan	216,600,000	259,920	€ 51,984,000,000	€ 1,559,520,000
Iraq	39,310,000	47,172	€ 9,434,400,000	€ 283,032,000
Iran	82,910,000	99,492	€ 19,898,400,000	€ 596,952,000
Jordan	10,100,000	12,120	€ 2,424,000,000	€ 72,720,000
Egipt	100,400,000	120,480	€ 24,096,000,000	€ 722,880,000
Syria	17,070,000	20,484	€ 4,096,800,000	€ 122,904,000
Lebanon	6,856,000	8,227	€ 1,645,440,000	€ 49,363,200
Eritea	6,333,000	7,600	€ 1,519,920,000	€ 45,597,600
Sudan	42,810,000	51,372	€ 10,274,400,000	€ 308,232,000
TOTAL	1,148,414,885	1,378,098	€ 275,619,572,400	€ 8,268,587,172



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(04) PROCEDURE AND INSTALLATION FOR PLASMA HEAT TREATMENT OF A GAS MIXTURE

VERFAHREN UND ANLAGE ZUR PLASMAWÄRMEBEHANDLUNG EINES GASGEWINNSCHEN

PROCÉDÉ ET INSTALLATION POUR LE TRAITEMENT THERMIQUE PAR PLASMA D'UN MÉLANGE GAZEUX

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Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent. In accordance with the Implementing Regulations, Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 80(1) European Patent Convention).

