WXF Bio-Energy

A Green, Sustainable Waste to Energy Process

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The Problem

Landfills fail to meet the triple bottom line

1. **Environmental:**

   Repeated occupancy of the land

1. **Social:**

   Ineffective treatment of leachate and landfill gas contributing to pollution

1. **Financial:**

   Financially unsustainable

Environmental: Lack of Space

- Due to steady increases of population and other social factors, waste increases rapidly and now many cities are facing the reality that their landfill may need to be transported elsewhere

Social: Green House Effect

- The greenhouse effect and its causes must be kept under control
- Treatment of leachate and landfill gases
- Landfills contribute to this pollution through landfill gas for about 5% of total Greenhouse Gases (GHG), which contains methane and CO_2

Financial: High Costs

- Treatment and Maintenance-Landfill sites produce both liquids and gas wastes that are toxic and must be treated. Unfortunately this treatment is extremely expensive
- Transportation-Because many sites are over capacity, waste needs to be transported somewhere, adding to costs
- No economic benefit-Based on open rather than closed system model

Lack of Money

What If?

What if we can turn this:

Into this:

Ch_3OH

AND

H_2O

?

And Profit!

Introducing…

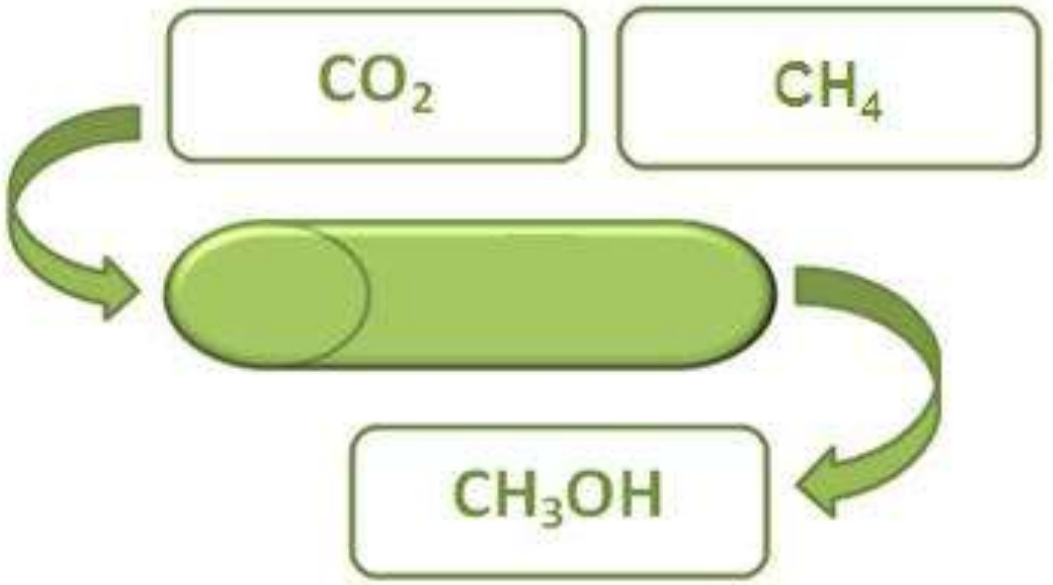
- W&Y Environmental International Inc., a Canadian-owned company incorporated in Ontario in 2001. Solutions transcend the scope of any single economic sector, creating benefits and opportunities in:

  - Renewable Energy Generation
  - Innovative Waste Management
  - Sustainable Production of Alternative Fuels
  - Effective Utilization of GHG

W&Y Company Locations

Our newest product:

- We have created a new process that utilizes methane and CO2 to produce methanol or ethanol, a high-demand product and an important source of renewable energy
- Convert municipal, industrial and agricultural waste to gas by modified landfill and or modified anaerobic digester technology and then utilize the gas produced to produce methanol.



Process Summary

CH_4

CO_2

H_2

O_2

Energy

CH_3OH (purity：98.3％）

H_2O

CO2

Comparison of Technical Parameters:

- Utilizes both methane and CO2 to produce methanol instead of conventional Fisher-Trip Process which relies 100% on fossil fuels
- The only by-products are CO2 and H2O
- Releases 60-80% less CO_2 compared to other methanol producing methods
- Consume more CO2 than it releases- helps combat global warming
- Uses 20-40% less methane to produce identical amount of methanol

Patent Status

Country	Patent number	Status
United States	11/962,206	Complete
Canada	2,616,265	Complete
China	200710017205.0	Complete
Japan		In Progress
EU		In progress
Russia	-	In progress

Note: Europe includes Germany, France and UK etc..

Pollutions

Landfill sites produce two main hazards:

- **Landfill Gas** – an explosive, flammable combination of gases including methane and carbon dioxide, both strong contributors to the greenhouse effect. Methane contributes approximately 20 times more to greenhouse effect as carbon dioxide.
- **Leachate** – liquid resulting from rain and accumulated waste washing through and fermenting with the materials it flows through. Large volumes of leachate are produced every year and are extremely expensive to treat

Production of Landfill Gas

Landfill gas generation is complicated process Its bio-chemical process has not been studied in detail but can be outlined as follows:

Phase I —— Aerobic decomposition of oxygen entrained at time of waste placement.

Phase II —— CO_2 and some hydrogen gas is produced as result of above fermentation.

Phase III —— CO_2 production begins and increases to 50% in 3 months, if landfill was wet.

Phase IV—— CO_2 production remains steady for approximately 20-30 years before decreasing

Landfill Gas Composition

Source	Landfill Gas	% of Total by Volume
Product of Bio-degradation	Methane	50-70
	Carbon Dioxide	30-50
	Hydrogen	<5
	Mercaptans	0.1-1
	Hydrogen Sulfide	<2
Contaminants in the Municipal Sludge Waste	Toluene	0.1-1
	Benzene	0.1-1
	Disulfates	0.1-2
	Others	traces

Release of Methane by the Landfill

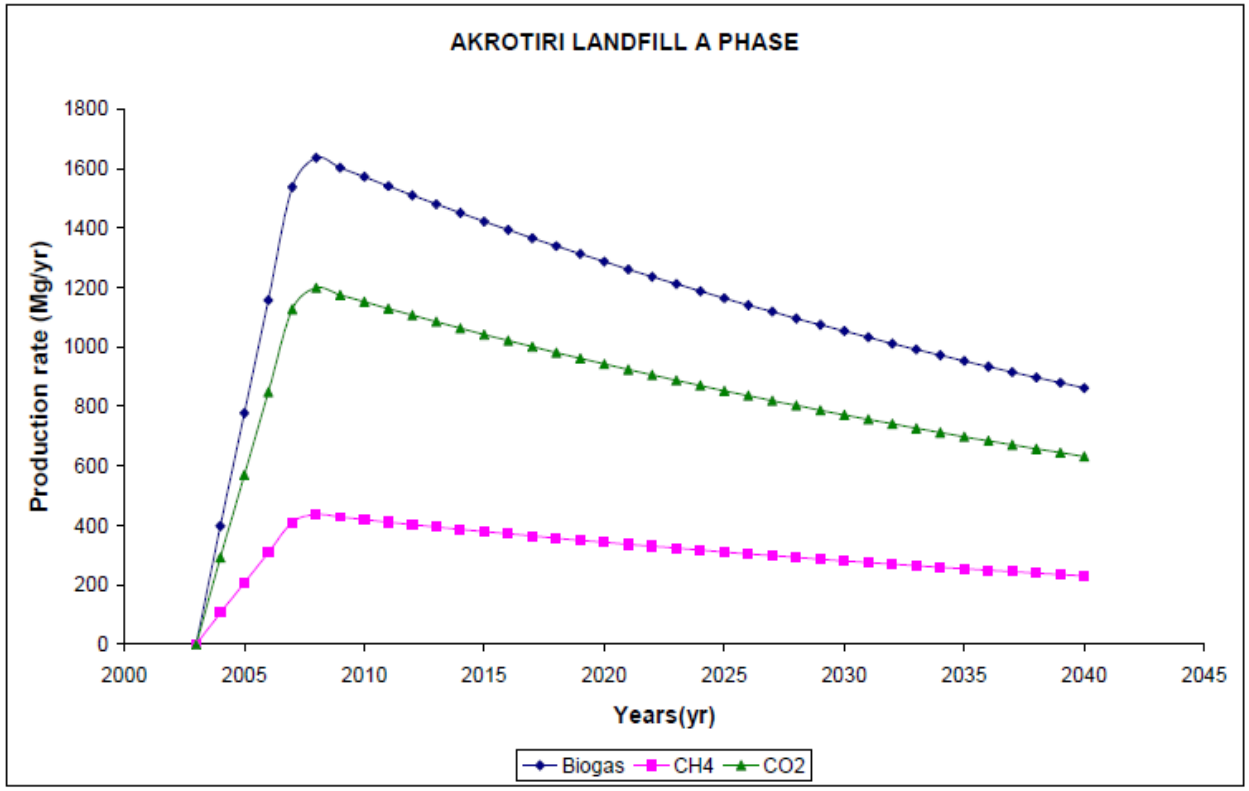


Figure 3. Annual emission rates (Mg yr^{-1}) of biogas, CH_4 and CO_2 for the Akrotiri landfill A phase (2003-2007)

Release of Methane by the Landfill

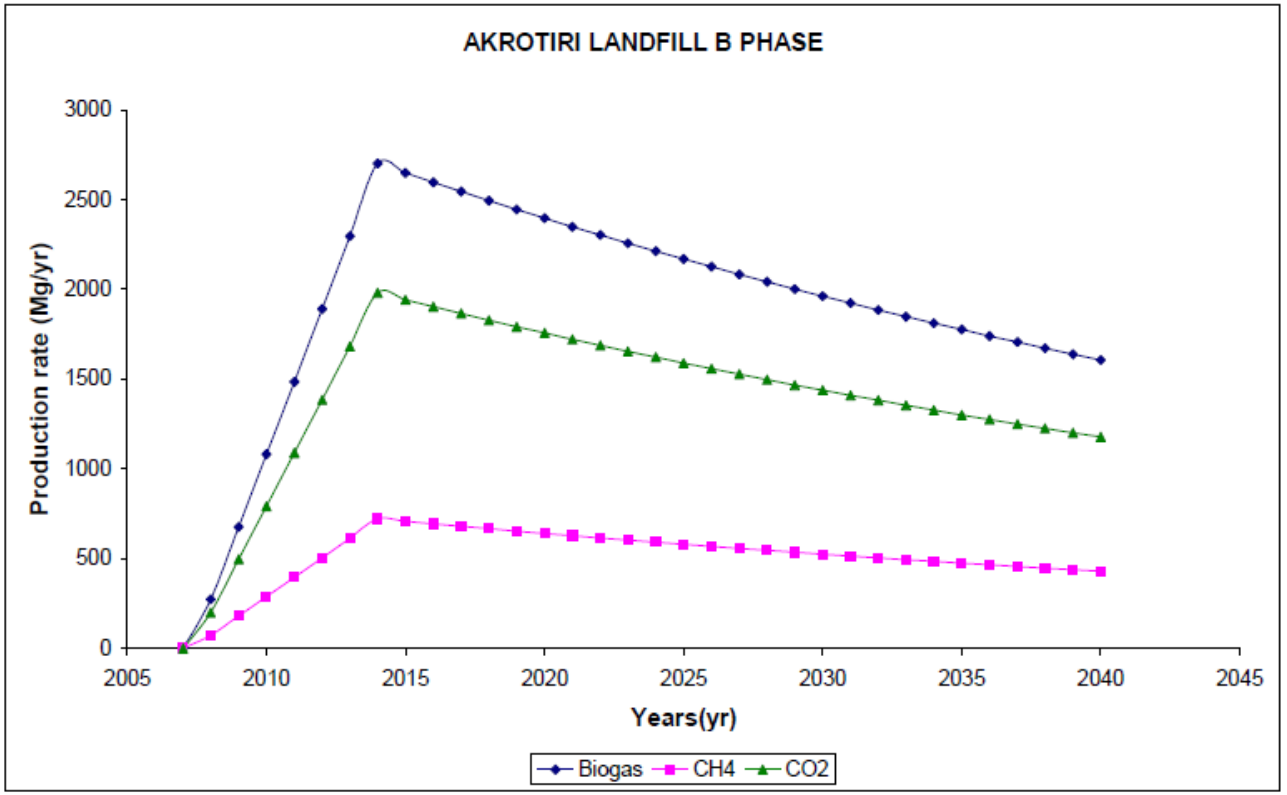
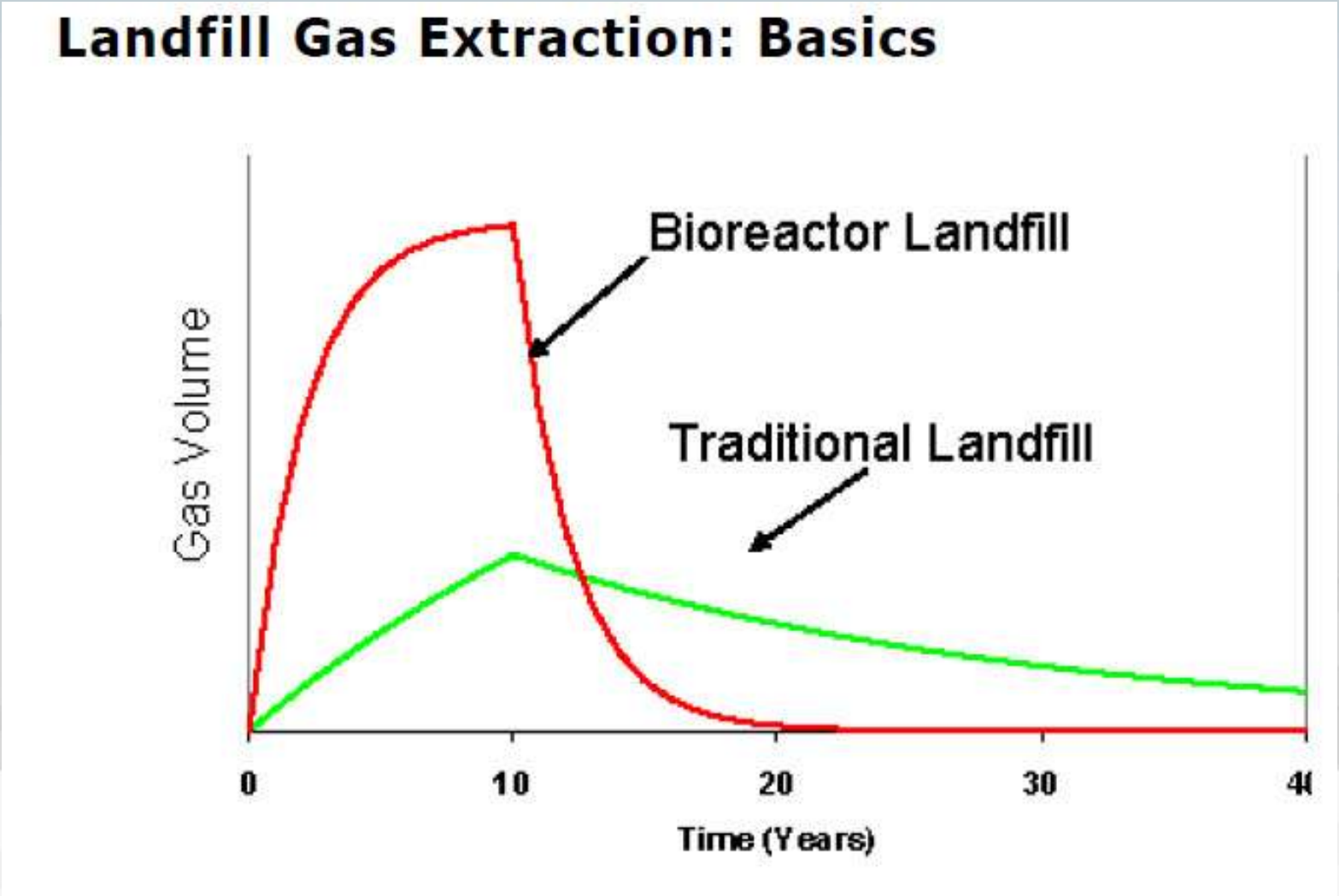


Figure 4. Annual emission rates (Mg yr^{-1}) of biogas, CH_4 and CO_2 for the Akrotiri landfill B phase (2007-2013)

Release of Methane by the Landfill



Rate of Production of Landfill Gas from Urban Municipal Waste (CO_2+CH_4):

Source	L/Kg
Typical U.S. municipal refuse; theoretical estimate	520
Bio-degradable organic components; theoretical estimate	100-300
Anaerobic digestion of refuse with sewage sludge;	210-260
Lysimeter or closed container; varying success in obtaining CH_4;	0.5-40
Full-size landfills projected from existing short-term data	50-400

Current Methods I

1.)Allow to accumulate:

Cons：space consuming, leachate toxic and landfill gas flammable, and explosive.

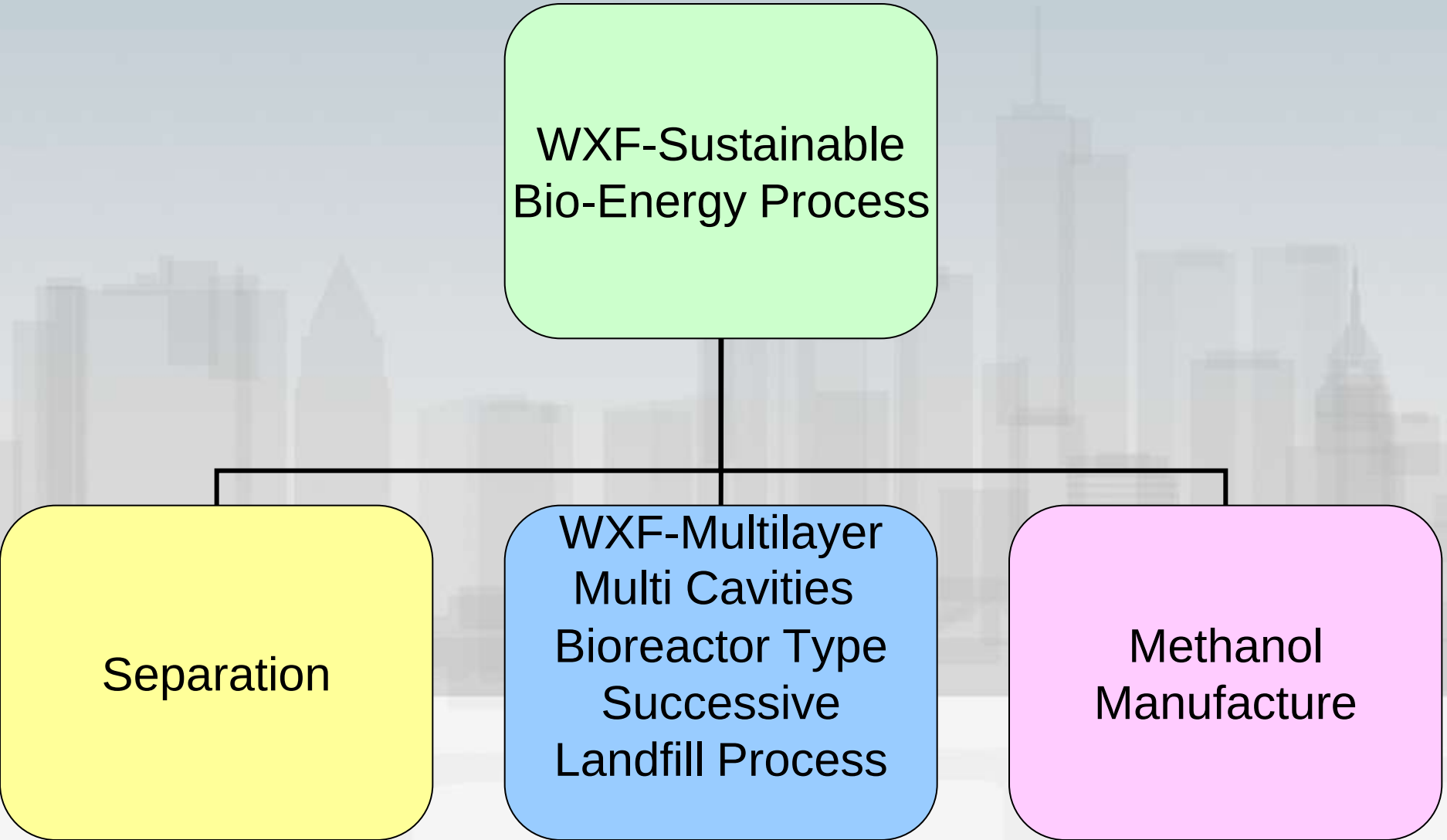
2.)Collecting system: Collect landfill gas and combust.

Cons：eliminates fire and explosive hazards but does not capitalize on it as a resource and also generates greenhouse effect

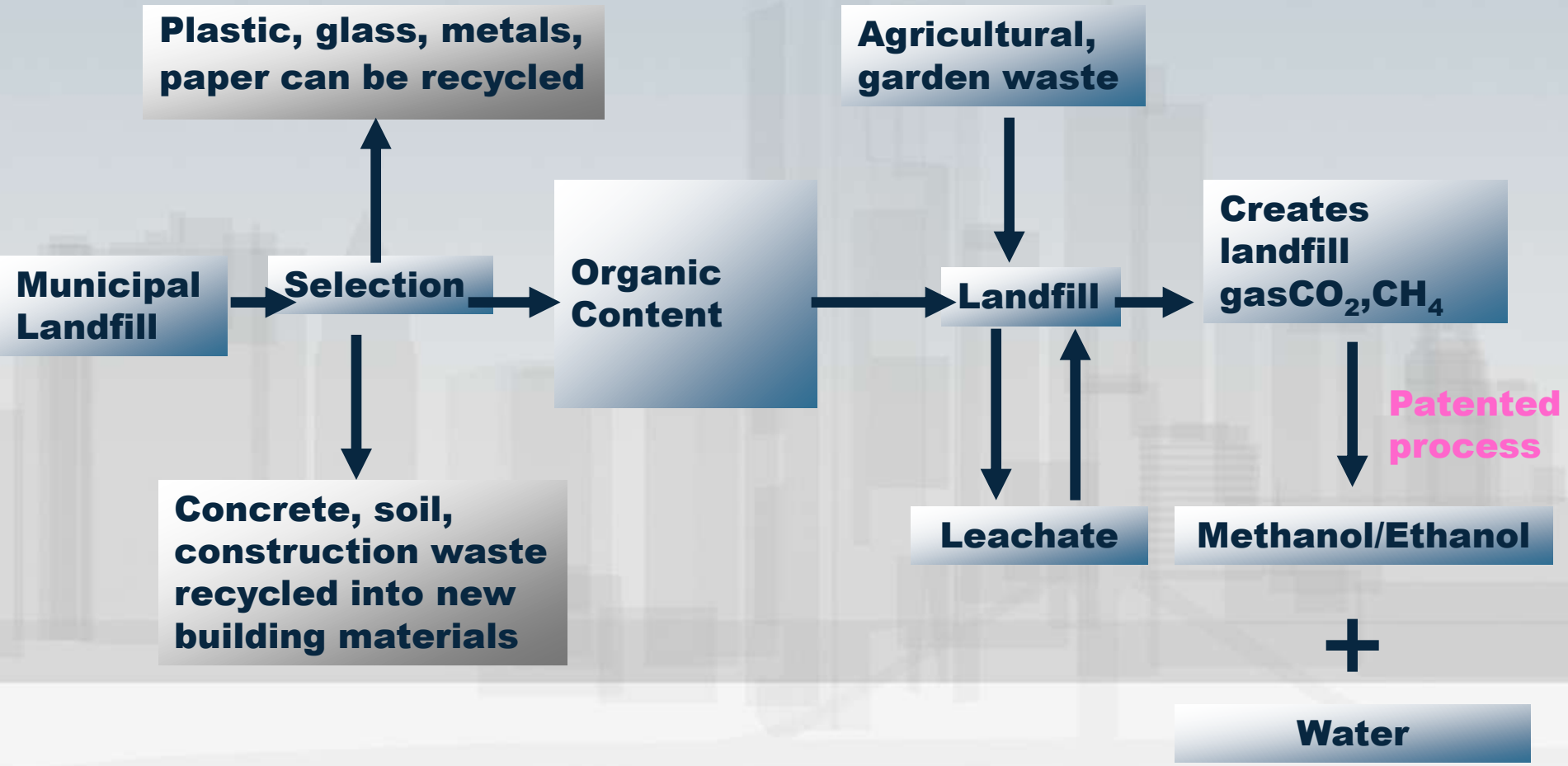
Current Methods II

- 3.)Combust methane for thermal or electric generation.
  - Cons： Although economic benefits exist that capitalize on methane, process only uses 50% of released methane, and none of CO2 (In fact, even more carbon dioxide is produced).. More importantly, since amount of methane produced from landfill is inconsistent, output of thermal and electric energy is also inconsistent, making it difficult to market because it is an unreliable source.

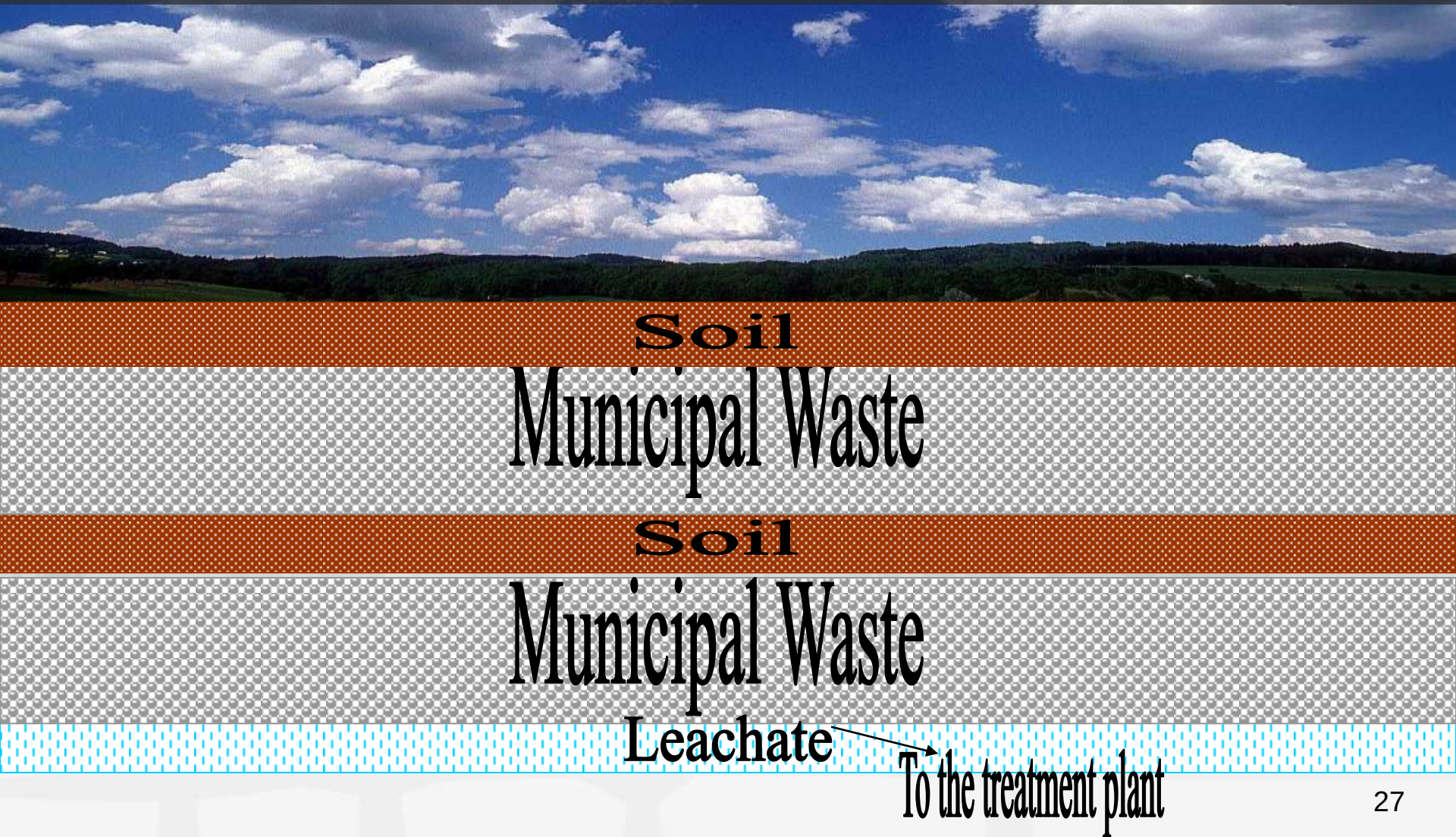
WXF-Sustainable Bio-energy



Process Flowchart



Current Sanitary Landfill Process



WFX Bio-Energy Landfill Process

Soil

Agricultural and Garden Waste

Selected Organic Waste

Leachate

Advantages I

- **Recycling Using Landfill Site**
- **Avoid Land Occupation and Landfill Site Construction Repeat. Free Up The Land For Other Usage**

Advantages II

Agricultural/Landscape Waste Are Used to Treat Leachate

So far, method of elimination is through combustion which produces not only carbon dioxide, but other toxins obtained through additives used in the cultivation of these agricultural materials. Ash is also another difficult-to-treat by-product

Advantages III

Recycling what can be recycled use what can't.

The Received Trash can be Sorted to:

- **Reusable**
- **Recyclable**
- **Biodegradable**
- **Toxic and Hazardous**

Advantages IV

- Capitalize on methane and carbon dioxide from **landfill gas** to produce Methanol, a sustainable source of renewable energy. Also, because the product can be stored, output to consumers can be steady/constant

Advantages V

Reduce Green House Gas Release

Carbon Credit Trade

Advantages VI

Leachate Recycling:

- Recycling Leachate, Limited Expensive Treatment Process,
- By Doing That has Increased Organic Content,
- Increase Moisture of Landfill Bed,.
- This will Speed Up Biodegradation Then Speed Up Gas Production

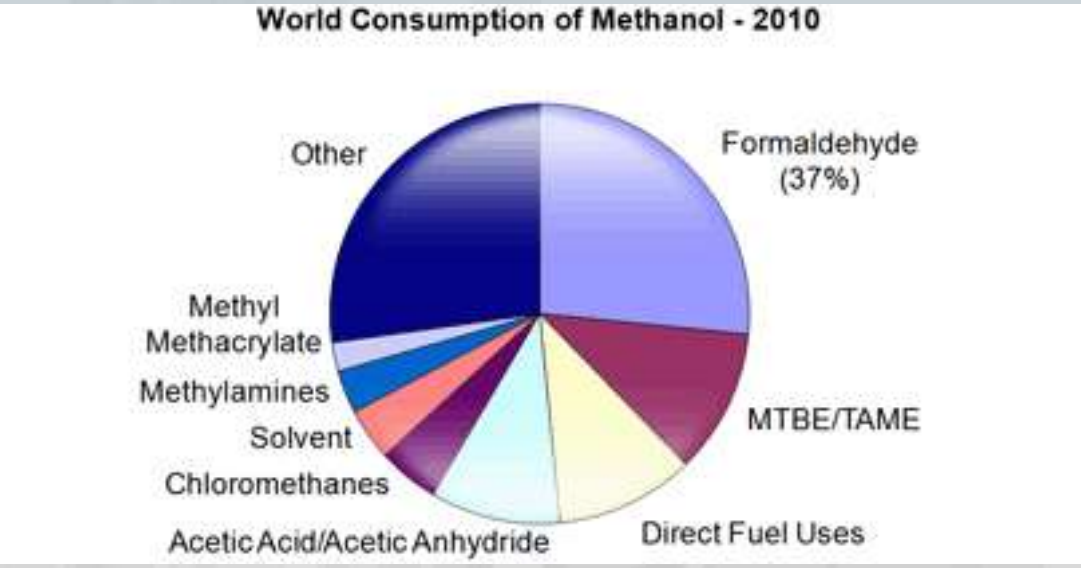
Methanol

Methanol Sales:

- Methanol is a product with many applications, 50 million tonnes of methanol were consumed in 2011 in the world.
- Mainly produced by natural gas or coal; some by heavy oil.
- Utilization of methane and CO2 from landfill sites not only eliminates landfill gas and leachate but also provides the raw materials needed to make this high demand product

Methanol Demand

Methanol demand has the potential to grow. Because it is recognized as a sustainable source of renewable energy, It can be developed to use as a low-cost, and extremely clean fuel. Many other chemicals can also be created from this versatile chemical



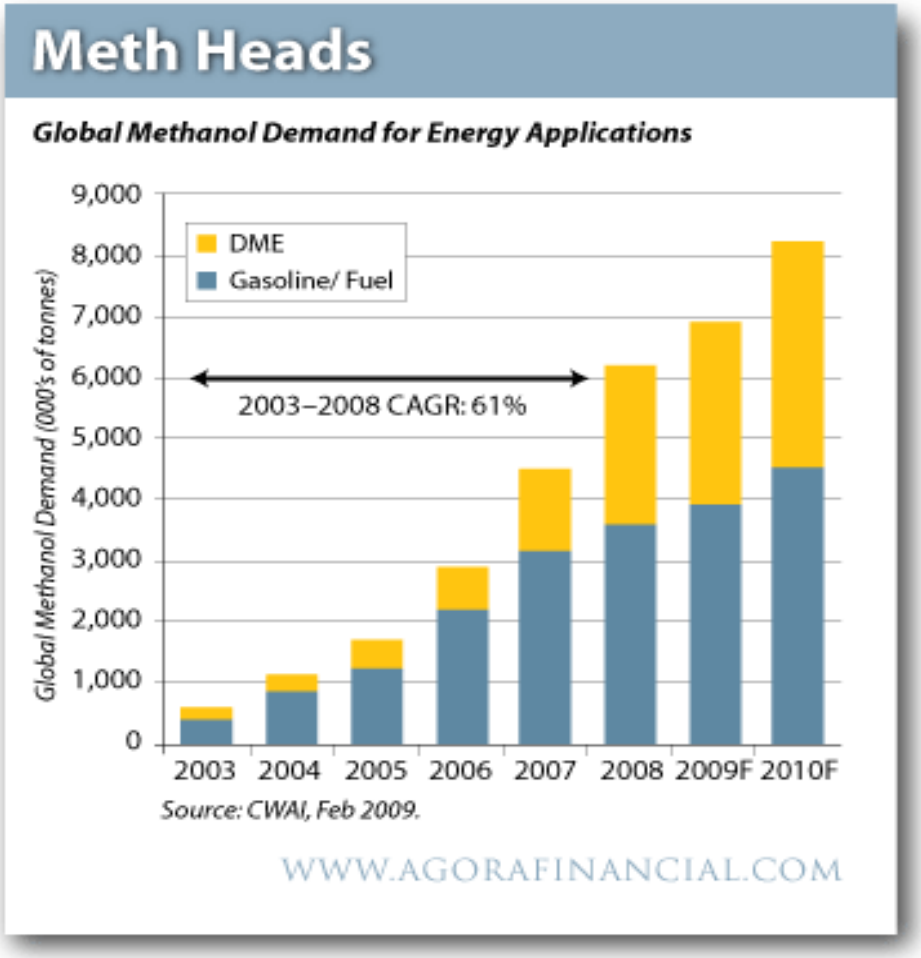
PRINCIPAL USES OF METHANOL

METHANOL

Formaldehyde	Adhesives for Wood Industry - eg. Plywood, Particle Board and Laminates;Resins for treatment of Paper Products; Thermosetting Plastics
Methyl Tertiary Butyl Ether (MTBE)	Octane Booster for Unleaded Gasoline Oxygenate used in Reformulated Gasoline
Acetic Acid	Acetates for use as solvents in Paints and Adhesives
Dimethyl Terephtalate (DMT)	Polyester Fibers and Fabrics for Clothing and Carpeting
Methyl Methacrylate (MMA)	Acrylic Plastic Sheets for Signs, Lighting etc.
Methylamines	Pesticides, Solvents for the Textile Industry
Fuel	Direct use as Fuel in Automobile Engines Direct Blending with Gasoline (M85)
Antifreeze Applications	Windshield Wiper Fluid

Energy Applications

- Methanol can used as fuel to power automobiles by an ICE or a fuel cell.
- Heat homes, power small appliances etc as costs drop even more

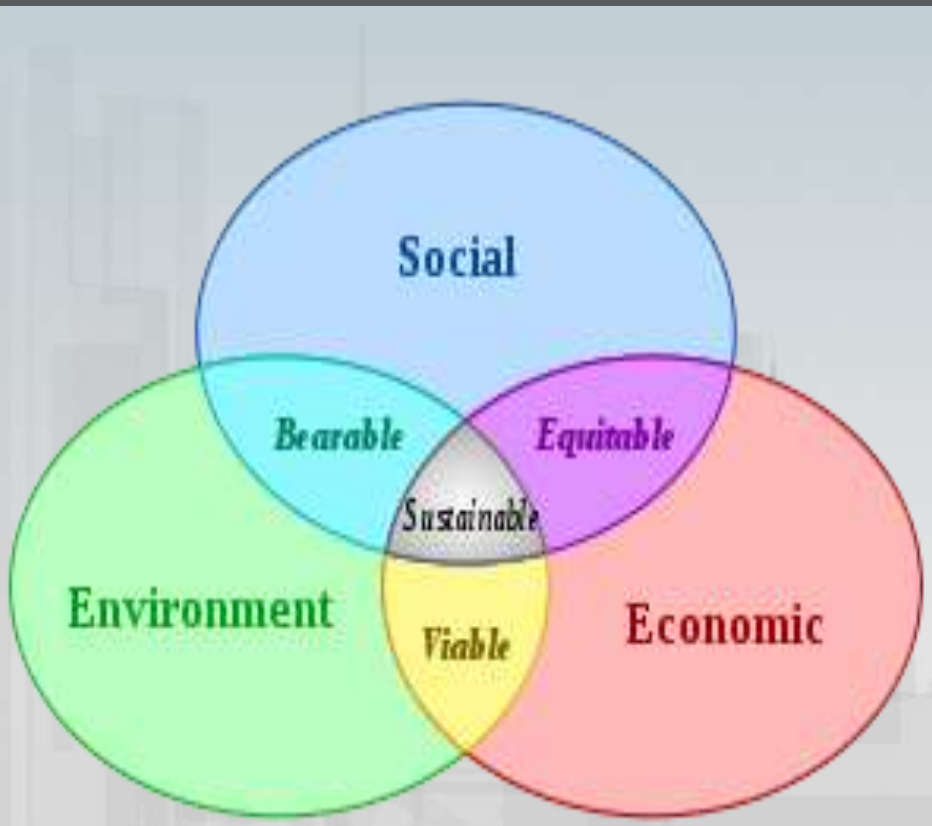


Economic Benefits I

- **Eliminates cost of transportation. Since each city can have its own generating station**
- **Sale of Carbon Credit. Every tonne of Methanol Made, 11 tonne of Carbon Credit Produced**

Conclusion

- Successfully Resolved the long term Un-Solved Problems of Municipal Solid Waste Treatment
- First Technology Can Treat Pollutions and At Same Time Create Huge Profits
- Turn A Social Benefit Project to A Sustainable Development Project



Landfill Site Can Be A Park

封场园路与小广场近景照片

凉亭效果照片

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Your time and consideration is appreciated!