



# Foodie City Investment Fund

A private equity fund incentivizing transformation of food waste

## Challenge – huge gap between treatment capacity and increasing waste

- In 2016, China generated 43M tons of food waste. By 2020, it is estimated that the number will reach 60M tons per year with a growth rate of 6% per year<sup>1</sup>.
- Currently, the amount of food waste being generated is enough to feed 140M people a year, or the entire population of Russia.
- However, China currently only has 118 waste treatment plants, with a total capacity to treat 7.8m tons of waste per year. Unfortunately, many of these plants run below capacity and actual capacity is just 5.5M tons, or just 12.8% of total waste produced.
- The government plans to have 242 treatment plants with a total capacity of 27M tons operational by 2020. However, due to prohibitive costs of construction and maintenance, the government is seeking public / private partnerships to lessen the government's capital expenditures.
- The waste which does not get treated predominantly ends up in landfill, leading to land salination and the production of the greenhouse gas methane as food decomposes. Other waste ends up being incinerated at poorly maintained plants, contributing to China's growing air pollution problems.
- Compounding the problem is illegal waste recycling, notably of oil. Illegal waste disposal companies buy waste food oil from restaurants and process it into gutter oil which is then used again in restaurants or for pig fodder, resulting in heightened concerns over food security.

## Opportunities:

- In order to help close the gap between treatment capacity and increasing food waste, the Chinese government is providing subsidies to support the development of the private food waste treatment industry by giving USD 16/ ton of waste for transportation and USD 24/ ton of waste to treatment plants.
- There are alternative treatment methods being optimized that can effectively transform food waste into valuable resources. For instance, waste oil can be turned into biodiesel through transesterification; anaerobic digestion can break down food waste and generate biogas; and aerobic composting processes food waste into fertilizer of agricultural value.
- There is strong market demand for the biodiesel being created from these alternative treatment methods. The government is working to increase biodiesel production in order to increase energy independence as well as increase environmental sustainability. In its latest Five Year Plan announced in 2016, China announced they wanted to produce 2M tons of biodiesel by 2020<sup>2</sup>.
- The food waste necessary to supply these biodiesel plants will be supplied by restaurants, which are looking to establish secure and legal means for waste disposal. This is driven by the government, which is looking to eliminate illegal waste disposal market by 1) establishing a waste disposal system that requires restaurants to report their food waste generation 2) raiding illegal waste transportation.

## Addressing the challenge:

Foodie City views there as being 3 core areas which need to be addressed to meet this challenge:

### 1. Providing funding and partnerships to project companies to increase available treatment capacity

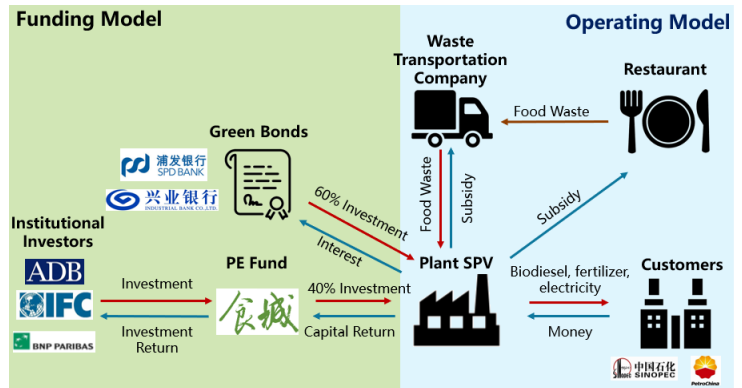
By providing initial funding and partnerships with financial institutions and downstream networks for buyers of fertilizer, biogas and biodiesel, Foodie City allows scalable projects to be realized more quickly, and works to accelerate the government's ambitions to scale up waste treatment. The initial investment of USD50M is sufficient to support 8 treatment plants with total annual capacity of 584,000 tons.

### 2. Incentivizing transportation companies and restaurants to ensure consistent quantities of high quality food waste supply

1. Subsidies will be paid to logistics companies to encourage them to bring waste to Foodie City plants
2. Foodie City will offer restaurants payment for wasted oil
3. Subsidies will be provided to restaurants to encourage them to provide a steady supply of food waste

### 3. Secure demand for treated products

Ensuring demand for treated products such as biodiesel and biogas allows for predictable revenue streams. This can be negotiated through long term contracts with consumers of these products.



## Partnerships

1. **City government:** Initiate the land planning for treatment plants and launch the call for tender for the construction and operation of the plants. The government also plays an important role in shaping the market demand for biodiesel through policy and regulation.
2. **Engineering, Procurement and Construction (EPC) company:** Foodie City fund partners with EPC companies to fund attractive projects.
3. **Waste transportation company:** Collect food waste from cooperating restaurants and transport to the treatment plants.
4. **Commercial customers:** Potential customers include Sinopec and Petro China which purchase biodiesel to mix with the diesel at their gas stations for commercial and passenger vehicles; Reach agreements with agricultural customers to sell fertilizer.
5. **Financial Institutions:** Initial funding to come from development finance institutions (e.g. IFC, AIIB). Given interest of institutional investors, follow on funding to come from broad range of investors including pension funds and asset management firms. Potential banks issuing green bonds include Industrial Bank and Shanghai Pudong Development Bank, both of which are pioneers in the issuance of green bonds in China.

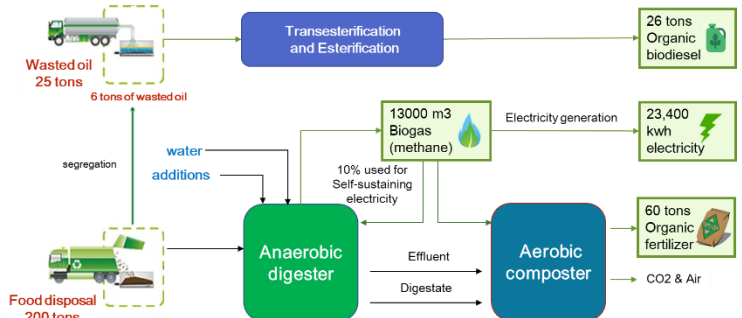
## Capital Structure of Public-Private Partnership

**Debt tranche (60% of total, USD 9.5M per plant): Total ~ USD 75M**

**Green bond:** with environmental evaluation report and other certificates from government authorities, the project will apply to be included in the issuance of financial green bonds issued by commercial banks. Compared to normal interest rates of about 8% p.a. to private-owned plants, Foodie City's plants will be financed with interest rate of a 5%-6% p.a. by banks' proceeds from green bonds which are subsidized by the government.

**Equity tranche (40% of total, USD 6.3M per plant): Total ~ USD 50M --supported by Foodie City Investment Fund I**

The equity portion of the plant is supplied through the Foodie City Investment Fund I private equity vehicle in to an SPV containing the plant. The SPV will partner with the EPC company which operates the plant, and the SPV is also responsible for debt service and the payment of a management fee to Foodie City Investment Fund I.



## Fund Portfolio:

**Eight waste disposal plants with capacity of 200 tons/day** with integrated digestion (for energy production) and composting technology to maximize the product output. Financial incentives provided to partner restaurants and institutions to secure the quantity and quality of food waste.

**Technology applied:** Aerobic composting + Anaerobic digestion to increase the useful product and reduce the excess waste.

The integrated system has the following advantages:

- Reduction or elimination of digester effluent treatment. Due to the combined processing technique, end-waste products are minimized.

- Electricity cost saving by direct onsite use of biogas energy
- Conservation of effluent nutrients to increase the value of fertilizer
- Increase in overall plant capacity by producing a portfolio of products and reduction in total footprint by reducing the intermediary process

USD	Tons / Day				Annualized 200 tons
	50	60	100	200	
Subsidy from government	\$1,190	\$1,440	\$2,381	\$4,762	\$1,738,095
Sales of biodiesel from food disposal	\$1,429	\$1,728	\$2,857	\$5,714	\$2,085,714
Sales of biodiesel from wasted oil	\$4,762	\$5,759	\$9,524	\$19,048	\$6,952,381
Sales of organic fertilizer	\$1,905	\$2,304	\$3,810	\$7,619	\$2,780,952
Revenue of electricity	\$578	\$698	\$1,155	\$2,310	\$843,254
Total revenue	\$9,863	\$11,928	\$19,727	\$39,453	\$14,400,397
<b>Total contribution margin</b>	<b>\$3,296</b>	<b>\$3,986</b>	<b>\$6,592</b>	<b>\$13,183</b>	<b>\$4,811,905</b>
<b>% of revenue</b>	<b>33%</b>	<b>33%</b>	<b>33%</b>	<b>33%</b>	<b>33%</b>
<b>Total operating profit</b>	<b>(\$842)</b>	<b>(\$152)</b>	<b>\$2,454</b>	<b>\$9,045</b>	<b>\$3,301,588</b>
<b>% of revenue</b>	<b>--</b>	<b>--</b>	<b>12%</b>	<b>23%</b>	<b>23%</b>

Under the assumptions illustrated, the break-even capacity is found at ~60 tons/day, which is 30% of full capacity. That is approximately the food waste generated by ~350 restaurants assuming waste of 170kg/day.

### Social Impact

- **Recycle 584,000 tons of restaurant waste** (with potential to scale subsequently), which may otherwise have gone into landfill.
- The products from recycling include:
  - 1) 76,000 tons of biodiesel which, given that its carbon emissions which are 60% lower than for standard diesel, results in 225,000 tons lower carbon emissions.
  - 2) 38M m<sup>3</sup> biogas – reducing CO<sub>2</sub> emission by 228,000 tons by replacing electricity generated by 28,500 tons of standard coal.
  - 3) 175,200 tons of organic fertilizer – helping to alleviate problems of poor soil quality, desertification and food security which are prevalent in China.
- The energy generated could also provide electricity to the plant and the neighborhood. The estimated economic value of the products is about USD 6M/ year.
- 73,000 tons of oil will be safely recycled which helps to suppress illegal gutter oil that could threaten the health of millions of people.

### Foodie City Fund term sheet:

Fund Name	Foodie City Investment Fund I
Fund Type	Double Bottom Line PE fund
Fund Size	USD50m
Target Portfolio	8 plants (USD 6.3m investment per plant)
Tenor	10 years
Target Investors	Impact investors, Foundations, Institutions
Projected IRR	15.3% (net of management fees and carry)
Fee structure	2.0% management fee + 20% carried interest (hurdle rate 8%)

Figure: Fund I Cash Flows to LPs (net of fees)



**Assumptions:** Projections are based on having 8 plant investments financed 60% through green bond and 40% through Foodie City PE Fund. Two plants will become operational each year from years 1-4 and will be sold 5 years after investment at a 5x EBITDA multiple.

### Investment Criteria

- **Economic Return Focus:** 1) provinces where government provides sufficient subsidy and tax refund policies to treatment plants 2) the capacity is significantly short compared to demand 3) districts where food disposal contains higher percentage of oil
- **Social Impact focus** 1) districts where the new plant could significantly reduce the landfill method 2) districts where restaurants lack proper channels to dispose of wasted oil legally

### Gross IRR Sensitivity Analysis

Factor	USD M	Gross IRR
Initial Total Plant Investment	\$14.9	21.90%
	\$15.4	20.40%
	\$15.9	18.92%
	\$16.4	17.46%
\$16.9	16.02%	
Factor	%	Gross IRR
Green Bond Funding	40%	14.41%
	50%	16.30%
	60%	18.92%
	70%	22.83%
80%	29.42%	
Factor	USD	Gross IRR
Biodiesel Selling Price	\$852	5.29%
	\$902	12.86%
	\$952	18.92%
	\$1,002	23.95%
\$1,052	28.27%	

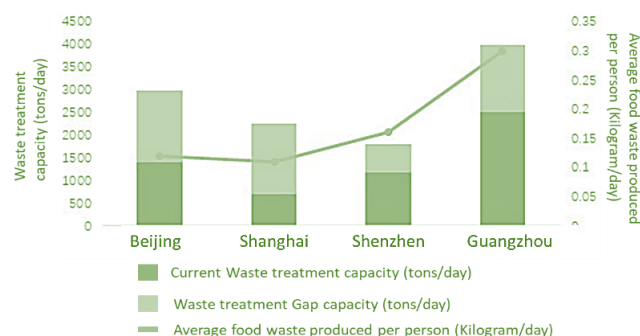
### Risks and mitigates

Type	Risk	Mitigation
Operational Risk	Plant operational issues	Ensure high caliber management team are hired and have appropriate incentive structures
	Environment pollution risk	The project will comply with strict environmental requirements and third-party environmental evaluation reports will be issued and renewed annually
	Quality and quantity of waste below expectations	Provide incentives to restaurants according to the quantity and quality of the waste provided and provide education for waste categorization and management
Financial Risk	Price volatility of the final product	Price volatility can be mitigated through long term contracts (e.g. biodiesel sales contracts with Petro China) and fertilizer contracts linked to long term government soil improvement projects e.g. in Gansu and Shanxi province
	Delay in bond issuance	Apply for bridge loan from the bank using fixed assets and land rights as collateral
	Plant cost overruns	Rigorous use of KPIs and constant monitoring of key metrics
	Sale difficulties	Ensure high quality functioning assets and interact with potential buyers from early stage
Policy Risk	Cancellation of agreements	Active cooperation with the government and updated processes in accordance with new policies
	Difficulty obtaining permits	Sustainable practices which benefit the country must be demonstrated by the project

### Future Addressable Market

According to a 2017 report<sup>3</sup> on food waste treatment capacity, there is a clear capacity gap in first tier cities (Beijing, Shanghai, Shenzhen and Guangzhou). With economic development, the second tier cities (e.g. Hangzhou, Suzhou, Nanjing) are seeing similar issues. We propose initially leveraging the opportunities in Tier 1 and 2 cities, before using our expertise to expand into the rest of China.

Graph: Food Waste treatment capacity and gap in 2017



Source:

1 <http://www.ocn.com.cn/chanjing/201702/jlexd20093503.shtml>  
 2 [https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual\\_Beijing\\_China%20-%20Peoples%20Republic%20of\\_1-18-2017.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Beijing_China%20-%20Peoples%20Republic%20of_1-18-2017.pdf)  
 3 <https://baijiaohao.baidu.com/s?id=1592310906501137672&wfr=spider&for=pc>