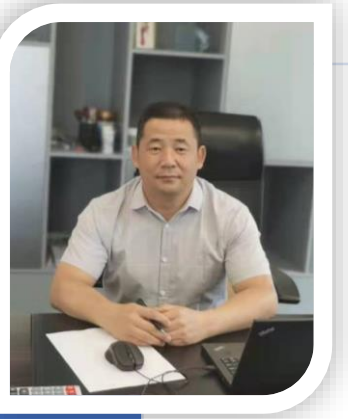

BIOS

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- ✓ 曾任北京兴华会计师事务所有限责任公司合伙人
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ADB TA-9611 PRC

京津冀生活垃圾区域统筹管理成本分析及生态补偿研究

STUDY ON MUNICIPAL SOLID WASTE REGIONAL INTEGRATED MANAGEMENT MODEL FOR BEIJING-TIANJIN-HEBEI COST ANALYSIS AND ECOLOGICAL COMPENSATION RECOMMENDATIONS

王小强 WANG Xiaoqiang

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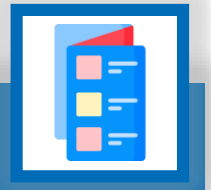
中国城市建设研究院有限公司
CHINA URBAN CONSTRUCTION DESIGN & RESEARCH INSTITUTE CO.,LTD.

汇报内容 CONTENT



成本分析及生态补偿

COST ANALYSIS AND ECOLOGICAL COMPENSATION

- **研究背景**
  Background
- **生活垃圾社会综合成本构成分析及计算方法**
  Analysis and calculation method of social comprehensive cost of MSW
- **京津冀区域统筹典型案例的成本分析**
  Cost analysis of typical cases of MSW regional integrated management in BTH
- **区域统筹模式与属地管理模式的生活垃圾管理成本比较分析**
  Comparison and analysis of MSW management cost between regional integrated management mode and territorial management mode
- **京津冀生活垃圾区域统筹处理生态补偿机制研究**
  The ecological compensation mechanism of BTH MSW regional integrated management

1.项目背景 BACKGROUND

➢ 京津冀垃圾区域统筹模式中成本分析的意义

SIGNIFICANCE OF COST ANALYSIS IN MSW REGIONAL INTEGRATED MANAGEMENT MODE

成本分析的意义

Significance

科学合理地利用资金 Use funds scientifically and rationally

垃圾管理是城市服务中重要的投资运营成本，投资规模相对较大。需要科学合理地开展成本分析以**提高资金利用效率**。 Waste management is an important investment and operation cost in urban services, and the scale of investment is relatively large. It is necessary to carry out cost analysis scientifically and rationally to improve the efficiency of capital utilization.

完成项目论证与评估 Complete project demonstration and evaluation

财务评价是项目管理的关键内容，是**项目论证与评估**的重要依据，即对京津冀垃圾区域统筹模式进行财务评价。 Financial evaluation is the key content of project management and an important basis for project demonstration and evaluation, that is, the financial evaluation of the Beijing-Tianjin-Hebei waste area overall planning model.

- **量化区域统筹模式建立所需的资金**
- Quantify the funds required for the establishment of the regional overall planning model,
- **评价京津冀垃圾区域统筹管理的可行性**
- Evaluate the feasibility of the overall management of the Beijing-Tianjin-Hebei waste area;
- **为政府决策者提供更加决策依据。**
- Provide more decision-making basis for government decision-makers.

1.项目背景 BACKGROUND

➢ 垃圾管理中的财务分析理论——成本效益法

COST THEORIES OF MSW MANAGEMENT INCLUDE COST BENEFIT ANALYSIS (CBA)

成本—效益分析作为一种经济决策方法，通过比较项目的全部成本和效益来评估项目价值。

It is a method to evaluate the value of a project by comparing the total cost and benefit.

起源于1844年法国工程师杜伊特发表的《公共工程效用的评价》中提出的“消费者剩余”思想。
originated from the idea of "consumer surplus" put forward in “The Evaluation of Utility of Public Works” published by French engineer Dupuit

万君宜建立了垃圾焚烧与垃圾填埋的成本-效益核算函数，分析了25个城市的垃圾焚烧成本。
Wan Junyi established the cost-benefit accounting function of MSW incineration and landfill, and analyzed the MSW incineration cost of 25 cities

- **Gao等基于成本效益分析法评估了2013年中国实施的大气污染防治行动计划**
- Gao J evaluated the air pollution prevention and control action plan implemented in China in 2013 based on the CBA method;
- **李红祥等人评估了“十一五”期间CO_2和SO_2 两项主要污染物减排的综合绩效**
- Li Hongxiang et al. quantitatively evaluated the comprehensive performance of CO_2 and SO_2 emission reduction during *The Eleventh Five Year Plan Period* by using the CBA method

1.项目背景 BACKGROUND

➢ 垃圾管理中的财务分析理论——生命周期评价

COST THEORIES OF MSW MANAGEMENT—— LIFE CYCLE ASSESSMENT (LCA)

目标与范围确定
Target and scope determination

确定垃圾管理中财务分析的边界范围

Determine the boundaries of financial analysis in waste management

清单分析
Inventory analysis

确定垃圾管理中涉及财务支出的清单

Determine the list of financial expenditures involved in waste management

影响评估
Impact assessment

评估SWM各部分在总财政中的权重

Assess the weight of each part of SWM in the total finance

周广瑜等人利用生命周期评价方法对深圳市的生活垃圾焚烧社会成本进行了计算与评估。 Zhou Guangyu et al. calculated and evaluated the social cost of MSW incineration in Shenzhen by using the similar LCA method

2018年

2020年

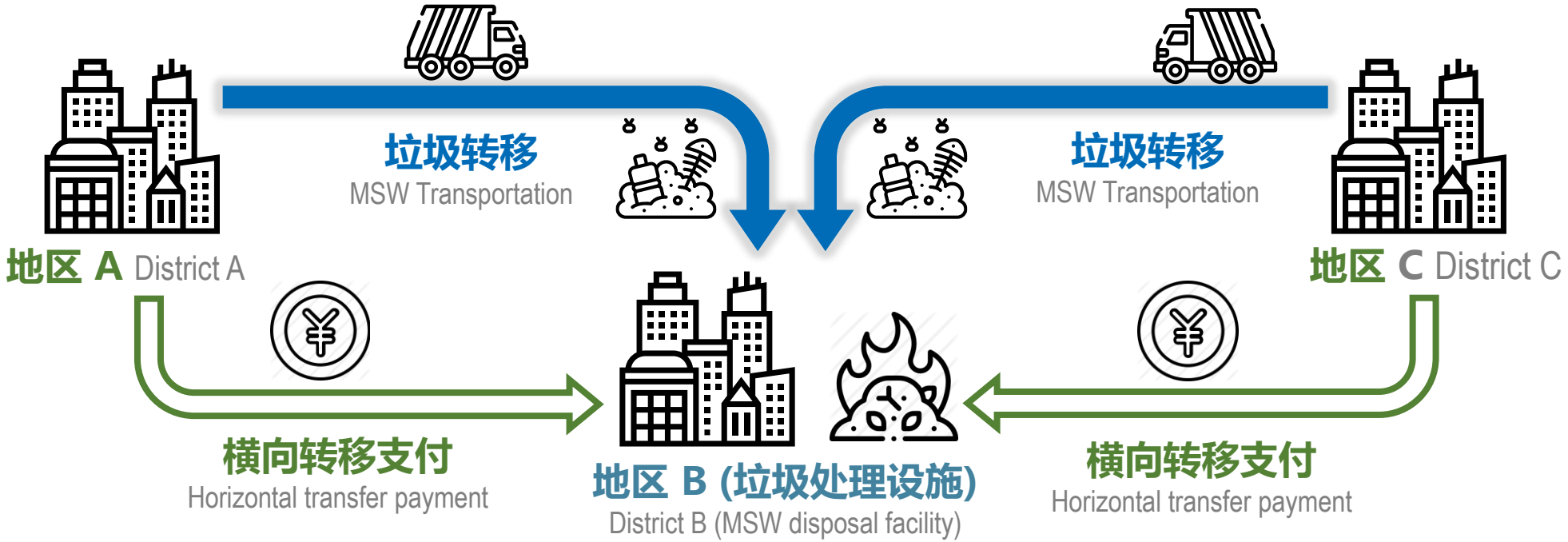
陈思琪等人通过生命周期评价方法对北京市的垃圾管理成本进行了成本分析

Chen Siqi et al. analyzed the cost of MSW management in Beijing by LCA method

1.项目背景 BACKGROUND

➢ 生态补偿理论在京津冀生活垃圾区域统筹管理财务分析中的应用

APPLICATION OF ECO-COMPENSATION IN COST ANALYSIS



京津冀各行政独立地区之间的生态补偿示意图

Schematic diagram of ecological compensation mechanism of MSW regional integrated management

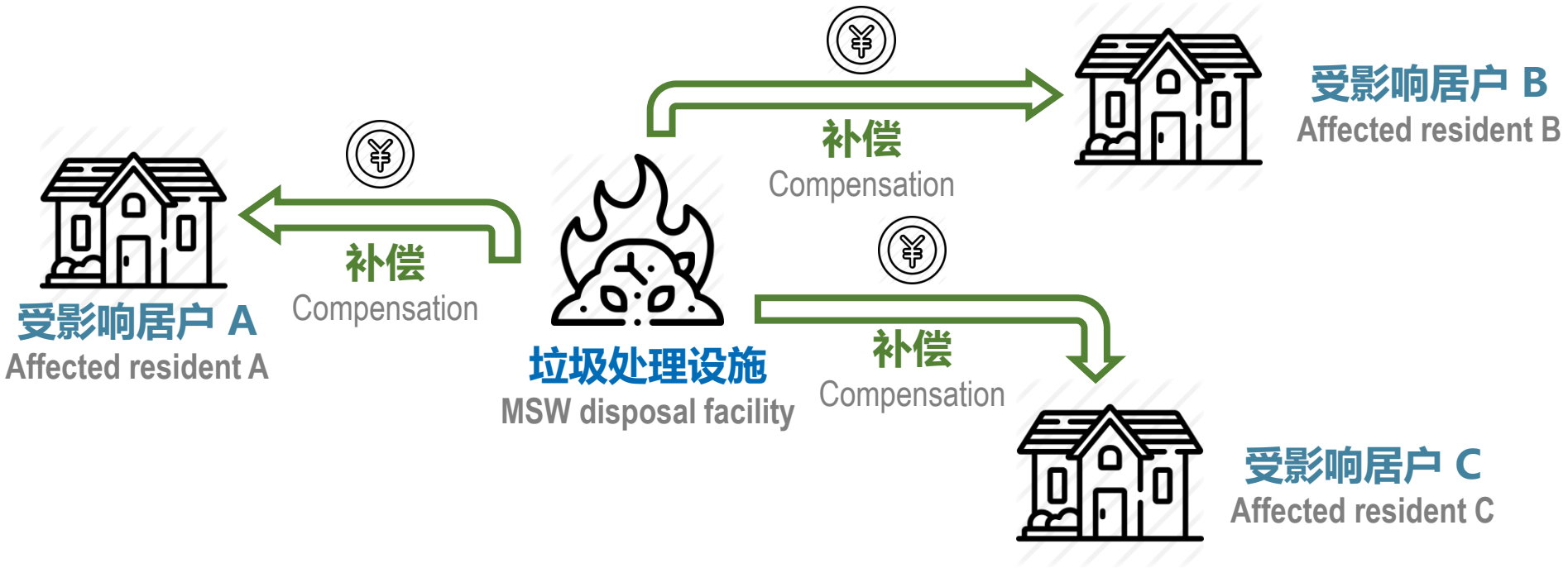
补偿者和受偿者分属于两个行政区，需要建立省际或者市际的补偿机制

Compensators and recipients belong to two administrative regions, and inter-provincial or inter-city compensation mechanisms need to be established

1.项目背景 BACKGROUND

➢ 生态补偿理论在京津冀生活垃圾区域统筹管理财务分析中的应用

APPLICATION OF ECO-COMPENSATION IN COST ANALYSIS



垃圾处理设施对受影响群体的生态补偿示意图

Ecological compensation of MSW treatment facilities to affected groups

垃圾处理的运营主体需要对垃圾处理设施周边可能受影响的利益相关方进行生态补偿

the operation main body of the MSW treatment facilities need to provide ecological compensation to affected residents living around them

1.项目背景 BACKGROUND

➢ 京津冀垃圾区域统筹成本分析的技术路线

TECHNICAL ROUTE OF MSW REGIONAL INTEGRATED MANAGEMENT COST ANALYSIS IN BTH

分析生活垃圾社会综合成本的构成

analyze the composition of social comprehensive cost of MSW

分析垃圾管理项目财务评价的各项指标，阐述了财务计算方法

selects typical indicators of cost evaluation of MSW management project, expounds the cost calculation method of each cost indicator

计算京津冀MSW区域统筹管理的典型案例的显性成本

calculate the explicit cost of typical cases of MSW regional integrated management

完成成本分析报表，分析垃圾收集、转运和处理的成本构成

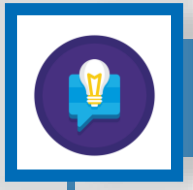
complete the cost analysis statements, analyze the cost level and composition of MSW collection, transfer, treatment and disposal

对比属地管理模式及区域统筹模式的MSW管理成本

Compare the MSW management cost of the territorial management model and the regional overall planning model

识别两种情形下垃圾管理的环境以及社会成本差异

Identify the environmental and social cost differences of waste management in the two situations



基于生态补偿理念，对成本分析提出建议

based on the concept of ecological compensation, we put forward some suggestions on the cost analysis

对补偿的范围进行了划分，分析补偿方案以及可行性

the scope of compensation is divided and suggested, and then the compensation schemes and feasibility of various compensation methods under this mode are analyzed

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾社会综合成本构成分析

ANALYSIS OF MSW SOCIAL COMPREHENSIVE COST

社会综合成本
Social Comprehensive Cost

显性成本
Explicit cost, ExC

显性成本是生活垃圾管理中的**实际入账成本**，例如垃圾设施投资费用、垃圾管理的员工工资费用等。 The **actual recorded cost** in the process of MSW management, such as investment cost of MSW facility, salary of MSW management staffs and so on.

隐性成本
Recessive Cost, ReC

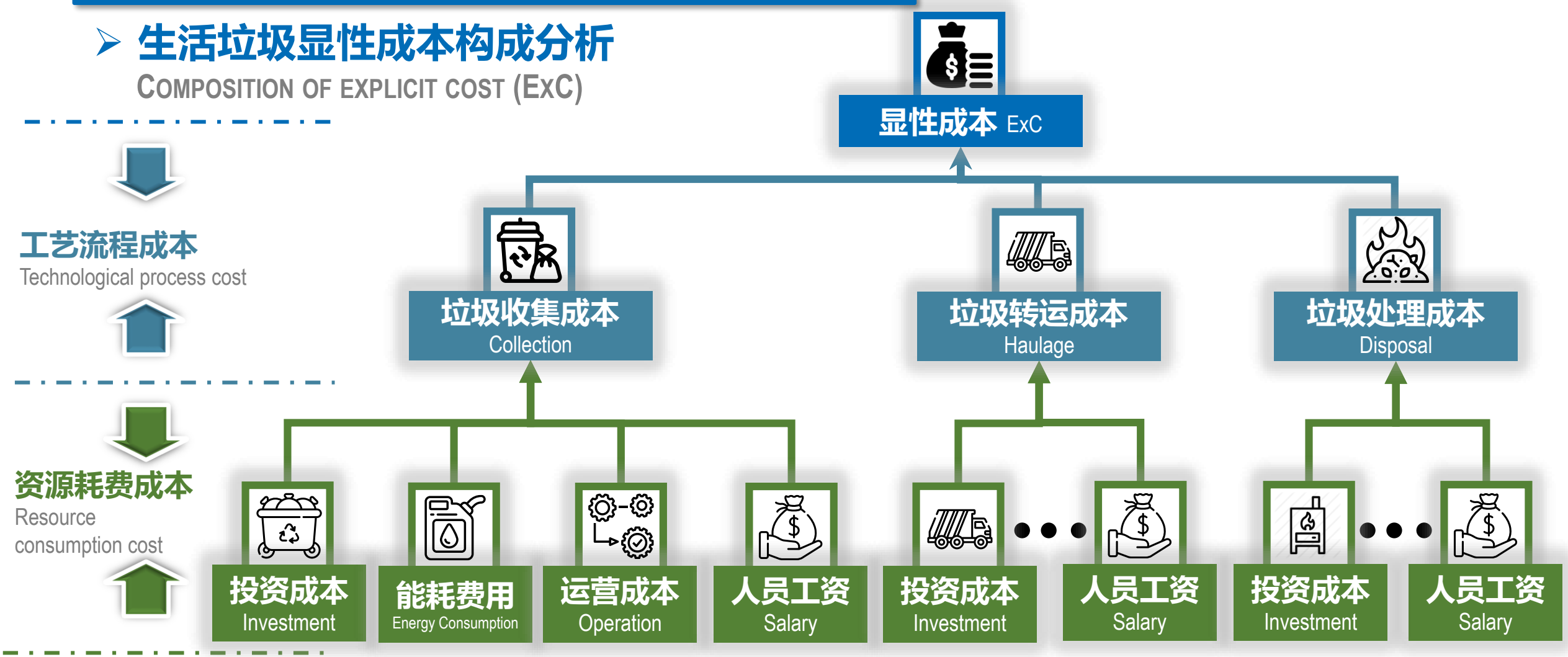
隐性成本指由于生活垃圾转运、处理等管理过程对生态环境、经济发展以及群众身体健康等方面带来的**不利影响而增加的隐性社会成本**。 the social cost increased from the **negative effect** from MSW transfer and treatment on the ecological environment, economic development and the health of the resident around.

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾显性成本构成分析

COMPOSITION OF EXPLICIT COST (ExC)



生活垃圾显性成本分为两个层次进行计算：工艺流程成本及资源耗费成本

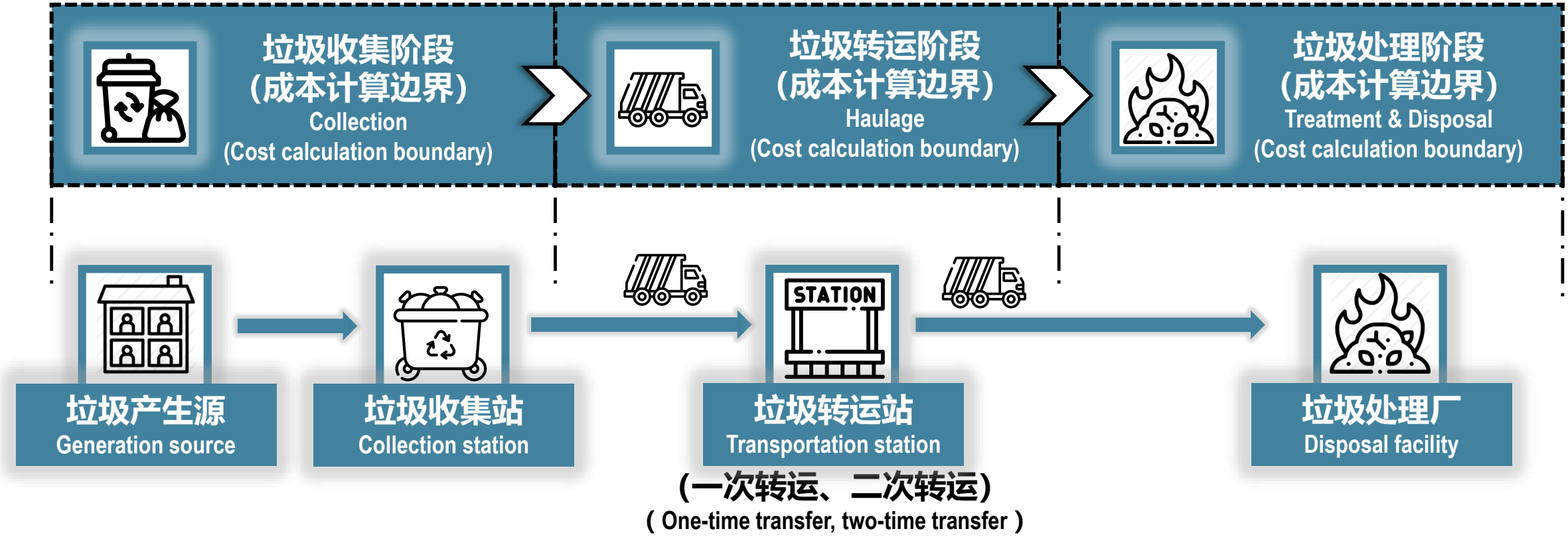
The explicit cost of MSW is calculated in two levels: Technological process Cost + Resource consumption cost

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾显性成本构成分析——工艺流程成本

TECHNOLOGICAL PROCESS COST



后续的MSW垃圾管理显性成本将分别安装收集、运输、处理三阶段计算，各成本边界如上图所示

the explicit cost of BTH MSW regional integrated management is composed of three parts, including MSW collection cost, MSW transfer cost and MSW treatment cost

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾显性成本构成分析——资源耗费成本

RESOURCE CONSUMPTION COST

细类计算将依据计算对象特点进行调整

Details are adjusted according to the features of the objectives

投资成本 investment

投资成本一般按照折旧摊销方法计算:

The investment cost is generally calculated by the Depreciation and Amortization (DA) method:

$$DA_j = [\Sigma_i \frac{IA_{(i,j)} * (1 - y_{(i,j)})}{n_{(i,j)} \times 365}] / Q_j$$

j—第j个工艺流程，包括：收集（CC）、转运（CF）、处理（CD）；

j – One technological process (represented with j) includes: Collection (CC), transfer (CF) and treatment (CD);

DA_j—第j个工艺流程的单吨垃圾投资成本（元/t）；

DA_j – The investment cost of unit MSW in one technological process (represented with j) (yuan/t);

IA_((i,j)) - 第j个工艺流程中，第i项资产的购置成本（元）；

$IA_{(i,j)}$ – The daily amortization (or depreciation) amount of one item (represented with i) intangible assets (or fixed assets) in one technological process (represented with i) (yuan /d);

n_((i,j))—第j个工艺流程中，第i项资产的折旧（摊销）年限（年）；

$n_{(i,j)}$ – The depreciation or amortization period in one item intangible assets (represented with i) of one technological process(represented with j);

y_((i,j))—第j个工艺流程中，第i项资产的净残值率（%）；

$y_{(i,j)}$ – The net salvage rate of the intangible assets (represented with i), of one technological process(represented with j);

Q_j—第j个工艺流程中每日垃圾总量（t/d）。

Q_j – Total daily quantity of waste in one technological process(represented with j) (t/d).

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾显性成本构成分析——资源耗费成本

RESOURCE CONSUMPTION COST

细类计算将依据计算对象特点进行调整

Details are adjusted according to the features of the objectives

人工成本——以运输阶段为例

Labor cost (LA)- take transportation as an example

$$\mathbf{LA_j} = (\boldsymbol{\Sigma_i} \frac{\mathbf{n_{(i,j)}} \times \mathbf{S_{(i,j)}}}{\mathbf{30}})/\mathbf{Q_j}$$

j - 第j个工艺流程，包括：收集（CC）、转运（CF）、处理（CD）；

j – One technological process (represented with j), including Collection (CC), transfer (CF) and treatment (CD);

$\boldsymbol{LA_j}$ - 第j个工艺流程的单吨垃圾人工成本（元/t）；

LA_j – Labor cost of unit waste treatment in one technological process (represented with j) (yuan/t);

$\boldsymbol{n_{(i,j)}}$—第j个工艺流程中，第i类工种所需人数（个）；

$n_{(i,j)}$ – The number of one kind of labor (represented with i) required, in one technological process (represented with j).

$\boldsymbol{S_{(i,j)}}$ - 第j个工艺流程中，第i类工种的每月工资（元/月）；

$S_{(i,j)}$ – The monthly salary one kind of labor (represented with i) required, in one technological process (represented with j).

$\boldsymbol{Q_j}$ - 第j个工艺流程中每日垃圾总量（t/d）。

Q_j – Total daily MSW quantity in one technological process (represented with j).

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾显性成本构成分析——资源耗费成本 RESOURCE CONSUMPTION COST

细类计算将依据计算对象特点进行调整

Details are adjusted according to the features of the objectives

能耗成本——以运输阶段为例

Energy consumption cost take transportation as an example

$$TR_j = \frac{\Sigma_i \left[(FC_f + FC_e) \times Fr \times Di \times Pr\right]}{Q_j}$$

j—第j个工艺流程，包括：收集（CC）、转运（CF）；

j – One technological process (represented with j), including Collection (CC), and transfer (CF);

TR_j—第j个工艺流程的单吨垃圾能耗成本（元/t）；

TR_j – Energy consumption cost of unit MSW quantity in one technological process (represented with j) (yuan/t);

FC_f—该型车辆满载状态下单位里程燃油消耗量（L/km）；

FC_f – Fuel consumption per unit mileage of one type of vehicle under full load (L/km);

FC_e—该型车辆空载状态下单位里程燃油消耗量（L/km）；

FC_e – Fuel consumption per unit mileage of one type of vehicle under no load condition (L/km);

Fr—该型车辆每天运输频次（次/d）； Fr – Daily transfer frequency of one type of vehicle(times/d);

Di—单程运输距离（km）； Di – One way transport distance(km);

Pr—燃油价格（元/L）； Pr – Fuel price(yuan/L);

Q_j—第j个工艺流程中每日垃圾总量（t/d）。 Q_j – Total amount of daily MSW in one technological process (represented with j)(t/d)。

运输距离、频次等参数的获取：

VBA程序联用百度地图API&穷举法实现最优路径、频次

Obtaining parameters such as transportation distance and frequency:

VBA program combined with Baidu map API

&Exhaustive method to achieve optimal path and frequency

2.生活垃圾社会综合成本构成分析及计算方法

ANALYSIS AND CALCULATION METHOD OF SOCIAL COMPREHENSIVE COST OF MSW

➢ 生活垃圾隐性成本构成分析 RECESSIVE COST (REC)

政策需求
Policy requirements

环境影响成本 Environmental effect cost

削减至排放标准以下的环境污染因子仍会对社会环境造成一定负面影响

the environmental pollution factors which have been reduced below the emission standard would still have certain effect on the social environment

居民健康成本 Resident health cost

上述的环境污染因子可能会对居民的健康造成不利影响

the environmental pollution may have adverse effects on the health of residents

发展阻滞成本 Development retardation cost

生活垃圾带来的环境污染还可能会对当地的经济发展造成一定的阻滞

The environmental pollution caused by MSW management may also bring about some obstacles to the local economic development

政策支持成本 Policy support cost

中国目前对于生活垃圾处理行业出台了一系列的扶持政策，包括税收优惠 、电价补贴

China has introduced a series of support policies for the MSW treatment industry, including tax preferences and feed-in tariffs

公众安抚成本 Public comfort cost

垃圾的跨区转运与处理，垃圾输入方民众普遍存在较为强烈的抵制情绪

Because of the trans-regional transfer and treatment of MSW, there is generally a strong resistance among the people at the MSW importing side

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 典型案例的选取 CASES SELECTION

基于前章所述的成本构成分析及计算方法，以通州与北三县垃圾焚烧设施共建共享模式为计算全流程成本计算参考案例，详细计算了不同统筹区域半径范围的垃圾管理显性成本，并分析各统筹半径的垃圾收集成本、转运成本和处理成本占全流程成本比例。

Based on the method of cost analysis, take **Tongzhou District of Beijing and the "Northern Three Counties " of Hebei Province** as cases, for analyzing and comparing the management costs under the MSW regional integrated management modes with differ service radiuses (10 km, 20 km, 30 km, 40 km, and 50 km).

参考《模型研究报告》中的案例设计，包括区域统筹半径10km、20km、30km、40km和50km的案例计算

Refer to the case design in the "Model Study Report", including the case calculation of the regional integrated radius of 10km, 20km, 30km, 40km and 50km

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 成本分析的主要参数 SELECTION OF TYPICAL CASES AND MAIN PARAMETERS OF COST CALCULATION

垃圾排出量预测方法

Prediction method of MSW generation

参数名称 Parameters		城市 City	村镇 Villages & Towns	参数依据 Parameter Basis	取值方法 Value Method
人均垃圾排出量（kg/d） MSW discharge per capita (kg/d)	下限 lower limit	0.8	0.5	《生活垃圾收集运输技术规程》(CJJ205 - 2013) Technical Specification for Collection and Transfer of MSW (CJJ205 – 2013)	依据地区经济发展水平平均计算 According to the average level of economic development
	上限 upper limit	1	0.7		
垃圾日排出量不均匀系数 Non-uniformity coefficient of daily MSW discharge	下限 lower limit	1.1	0.8		
	上限 upper limit	1.3	1.2		
居住人口变动系数 Change coefficient of resident population	下限 lower limit	1	0.9		
	上限 upper limit	1.15	1		

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 成本分析的主要参数 SELECTION OF TYPICAL CASES AND MAIN PARAMETERS OF COST CALCULATION

垃圾收集站配置参数

MSW COLLECTION CONFIGURATION PARAMETERS

类型 Type	规模下限 Minimum Size (t/d)	规模上限 Maximum Size (t/d)	占地下限 Minimum floor area (M^2)	占地上限 Maximum floor area (M^2)	压缩式投资标准下限 Minimum Compressed investment (万元/t)	压缩式标准上限 Maximum Compressed investment (万元/t)	非压缩式投资标准下限 Minimum Non-compressed investment (万元/t)	非压缩式投资标准上限 Maximum Non-compressed investment (万元/t)	定员* Staff (人)	折旧年限 Depreciation Years (年)
I类	20	30	300	400	5	7			6	20
II类	10	20	200	300	4	6	2	4	5	20
III类	0	10	120	200	4	6	2	3	4	20

*：采用经验值 Using empirical values

《生活垃圾收集站工程项目建设标准》

Standard for Construction of Domestic MSW Collection Station Project

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 成本分析的主要参数 SELECTION OF TYPICAL CASES AND MAIN PARAMETERS OF COST CALCULATION

垃圾转运站配置参数

CALCULATION PARAMETERS OF MSW TRANSFER STATION

大类 Large categories	小类 Small categories	最小日转运量 (t/d) Minimum daily transshipment volume	最大日转运量 (t/d) Maximum daily transshipment volume	最小用地指标 (M^2) Minimum floor area	最大用地指标 (M^2) Maximum floor area	投资标准下限 (万元/t) Minimum investment	投资标准上限 (万元/t) Maximum investment	定员下限 (人) Minimum person number	定员上限 (人) Maximum person number	折旧年限 (年) Depreciation Years
大型 Large	I类	1000	3000	15000	30000	4	5	25	60	20
大型 Large	II类	450	1000	10000	15000	4	5	10	30	20
中型 middle	III类	150	450	4000	10000	3	5	5	12	20
小型 small	IV类	50	150	1000	4000	3	4	3	6	20
小型 small	V类	30	50	500	1000	3	4	2	4	20

《生活垃圾转运站工程项目建设标准》*The Construction Standard of MSW Transfer Station Project* (CJ 117-2009)

《生活垃圾转运站技术规范》*The Technical Specification for MSW Transfer Station (Industry Standard No. CJJ/T 47-2016)*

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 成本分析的主要参数 SELECTION OF TYPICAL CASES AND MAIN PARAMETERS OF COST CALCULATION

车辆类型 Parameters	车辆吨位（t） Vehicle tonnage	车辆价格（万元） Vehicle price (10,000 yuan)	满载油耗（L/km） Full load fuel consumption	空驶油耗（L/km） Idle fuel consumption	平均油耗（L/km） Average fuel consumption (L/km)	柴油价格（元/L） Diesel price (yuan/L)	折旧年限（年） Depreciation Years (year)
人力收集车 Manual collection vehicle	0.4	0.15	0	0	-	-	5
小型收集车 Small collection vehicle	1	0.8	0.06	0.06	0.06	5.5	5
压缩垃圾车 Compressed MSW truck	2	9	0.12	0.1	0.11	5.5	5
取值说明 Value description	实际值 Actual value	市场询价 Market inquiry	经验值 Experience value	经验值 Experience value	经验值 Experience value	市场询价 Market inquiry	市场询价 Market inquiry

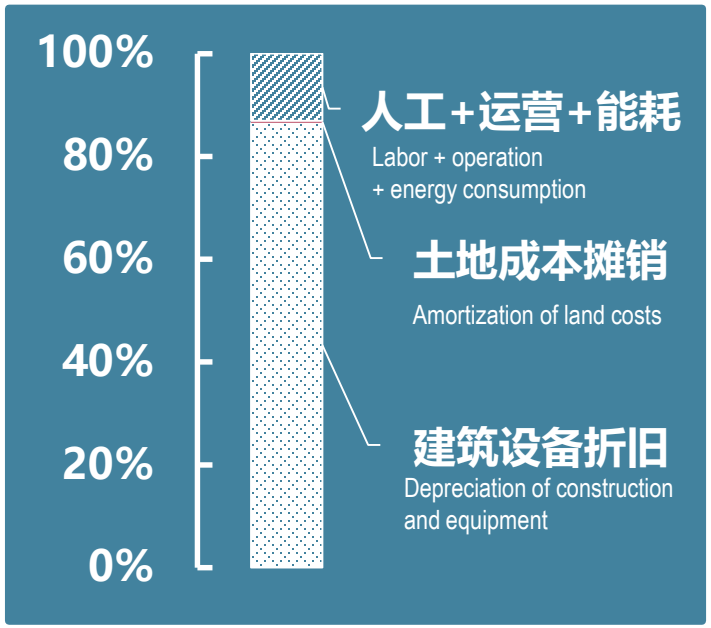
车辆类型 Parameters	车辆吨位（t） Vehicle tonnage	车辆价格（万元） Vehicle price (10,000 yuan)	满载油耗（L/km） Full load fuel consumption	空驶油耗（L/km） Idle fuel consumption	平均油耗（L/km） Average fuel consumption (L/km)	柴油价格（元/L） Diesel price (yuan/L)	折旧年限（年） Depreciation Years (year)
垃圾转运车 MSW transfer truck	5	15.8	0.17	0.15	0.16	5.5	5
	8	18.8	0.18	0.16	0.17	5.5	5
	10	28.6	0.22	0.2	0.21	5.5	5
	25	45	0.28	0.25	0.27	5.5	5
取值说明 Value description	实际值 Actual value	市场询价 Market inquiry	经验值 Experience value	经验值 Experience value	经验值 Experience value	市场询价 Market inquiry	市场询价 Market inquiry

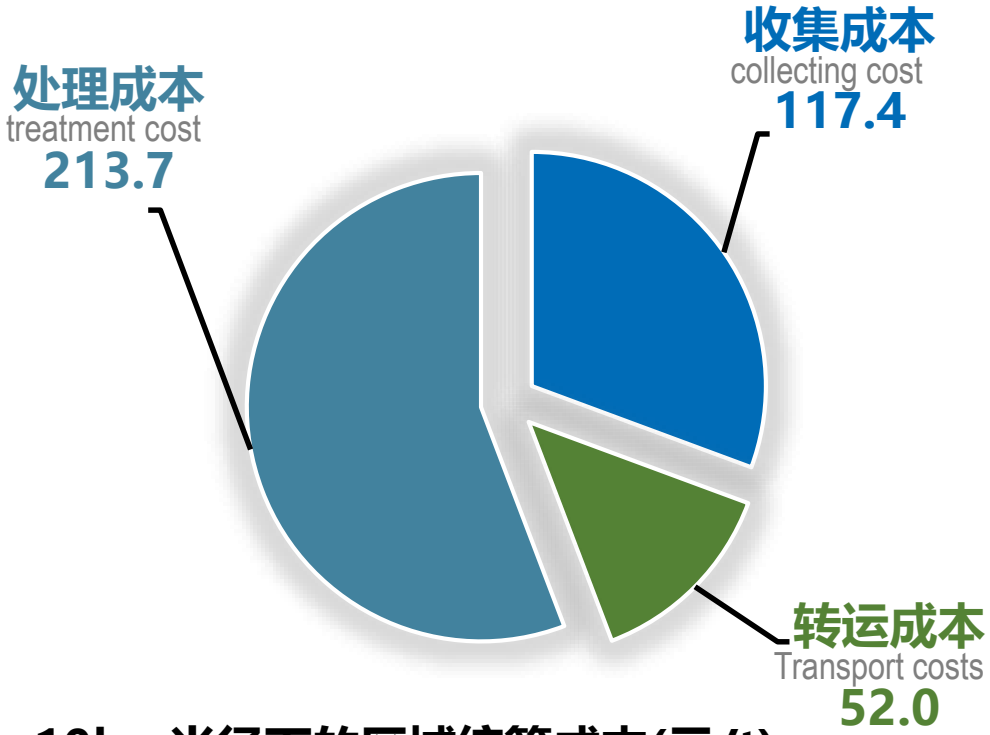
3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——10km

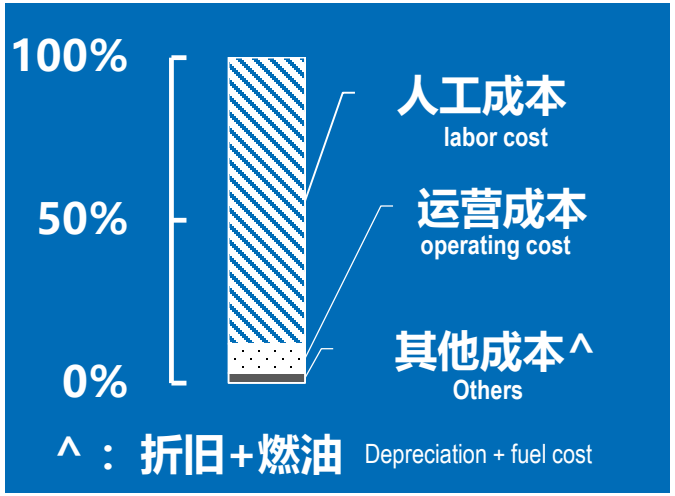
COST ANALYSIS OF 10 KM RADIUS CASE

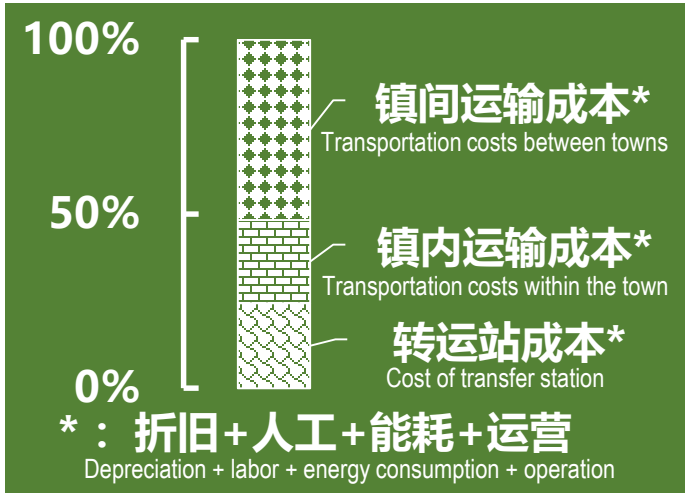




10km半径下的区域统筹成本(元/t)

Cost of MSW regional integrated management of 10 km case





垃圾收运处理的单吨成本约为383.1元/t，收集、转运、处理成本分别占30.6%、13.6%、55.8%。

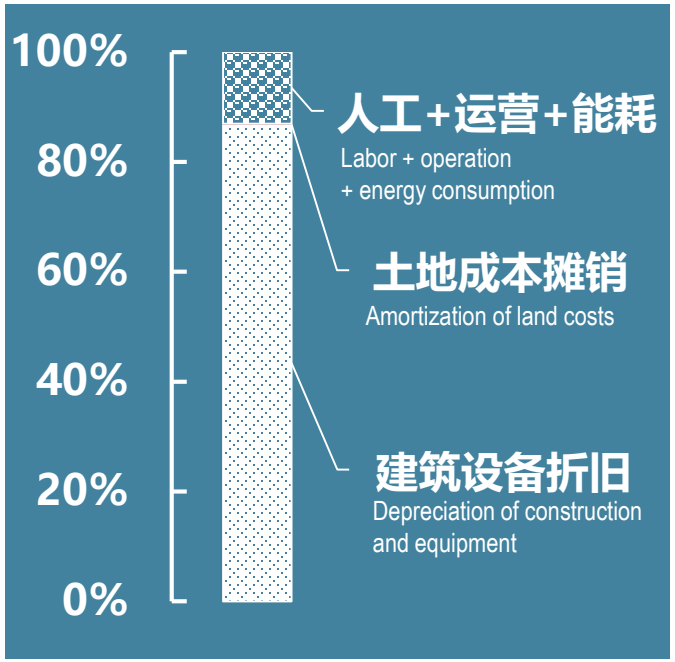
The total cost of per ton of MSW management is about 383.1 yuan/t, and the costs of collection, transfer and treatment account for 30.6%, 13.6% and 55.8% respectively.

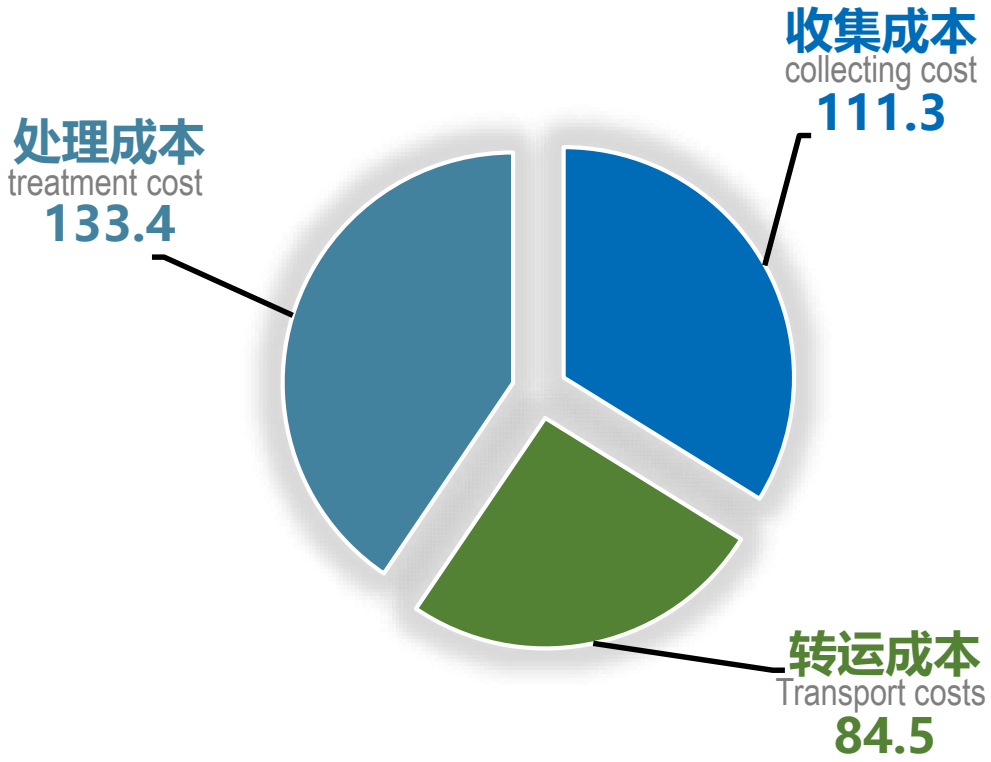
3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——20km

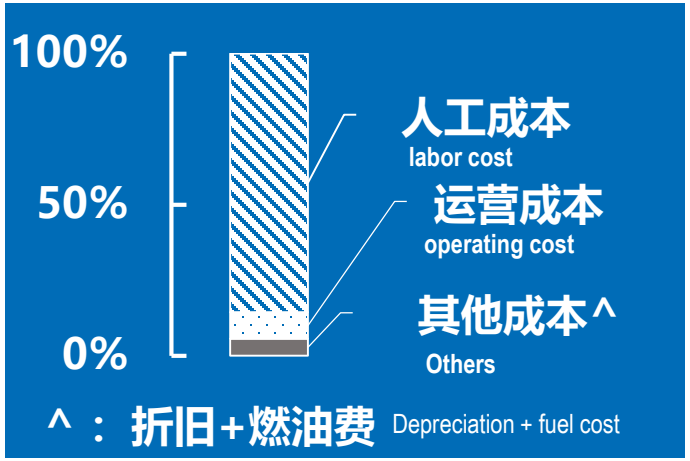
COST ANALYSIS OF 20 KM RADIUS CASE

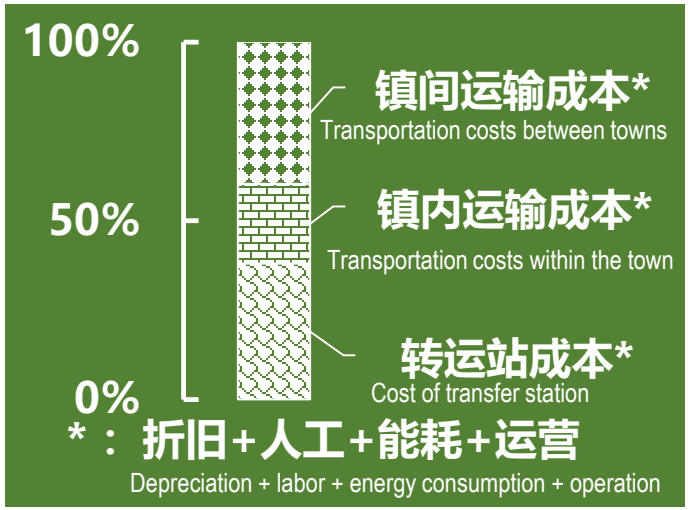




20km半径下的区域统筹成本(元/t)

Cost of MSW regional integrated management of 20 km case





垃圾收运处理的单吨总成本约为329.2元/t，收集、转运、处理成本分别占34%、26%、40%

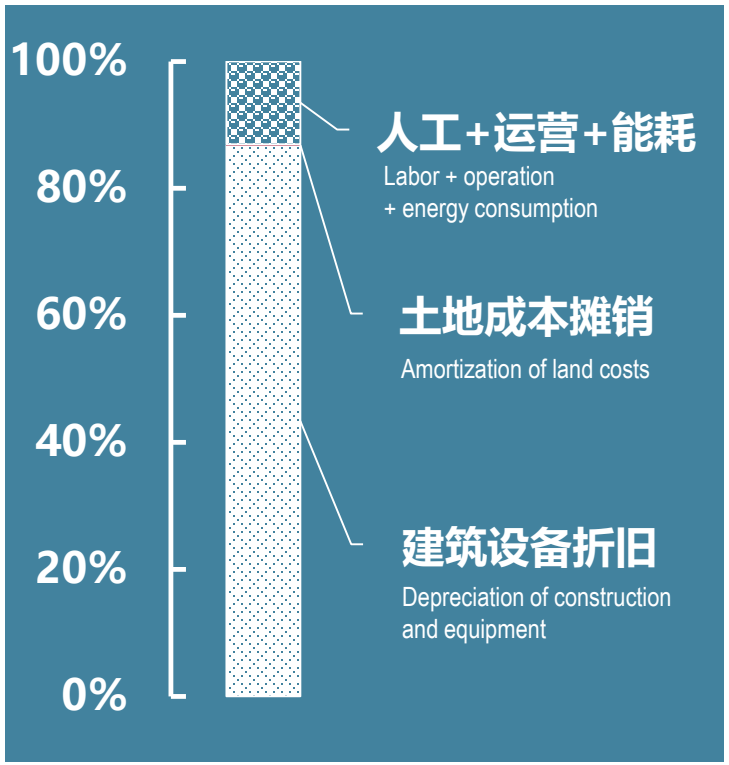
The total cost per ton of waste collection, transportation and treatment is about 329.2 yuan/t, and collection, transshipment, and treatment costs account for 34%, 26%, and 40%, respectively.

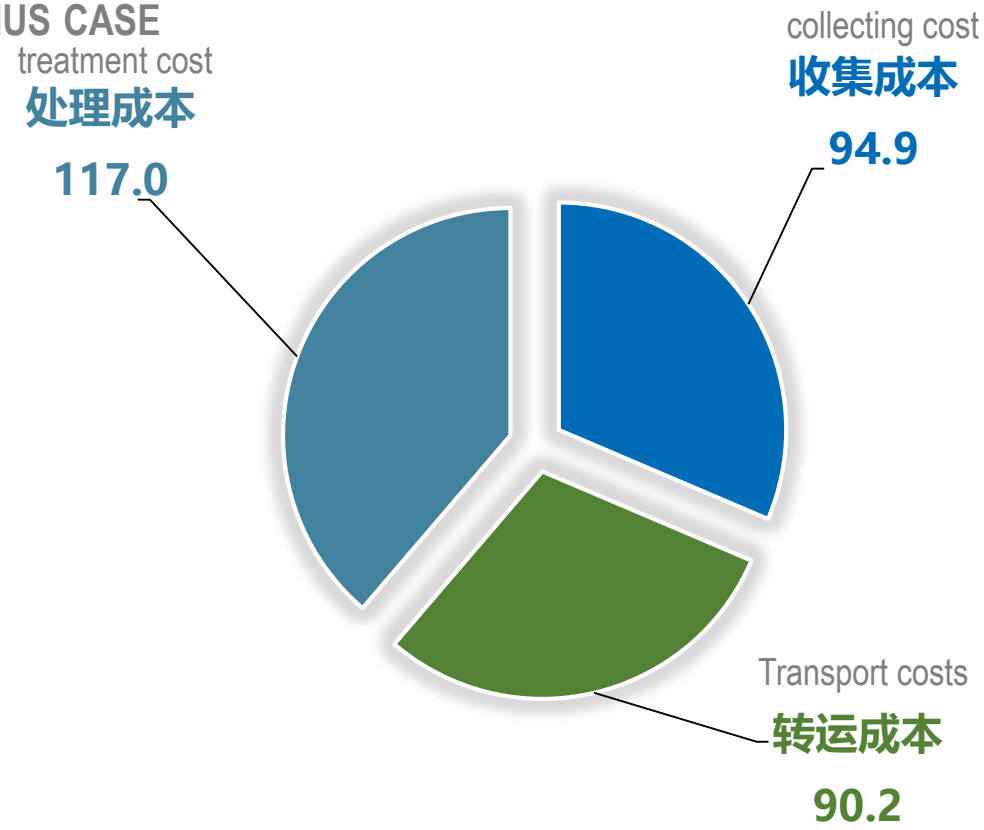
3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——30km

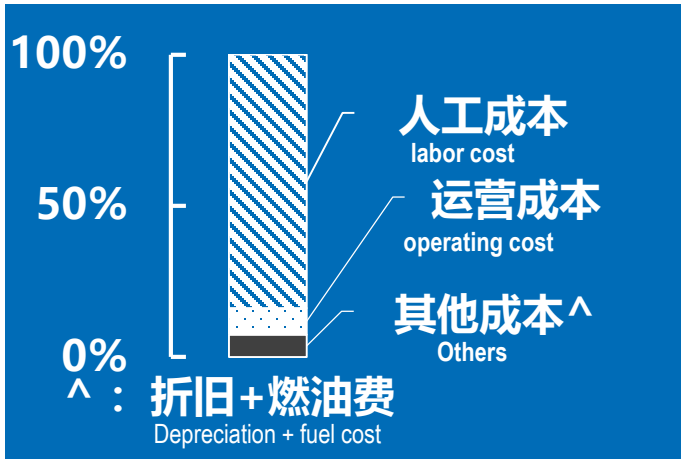
COST ANALYSIS OF 30 KM RADIUS CASE

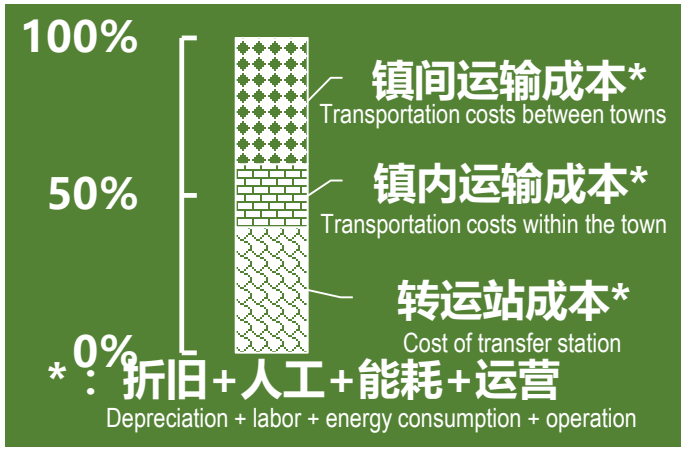




30km半径下的区域统筹成本(元/t)

Cost of MSW regional integrated management of 30 km case





垃圾收运处理的单吨总成本约为302.1元/t，收集、转运、处理成本分别占31.4%、29.9%、38.7%

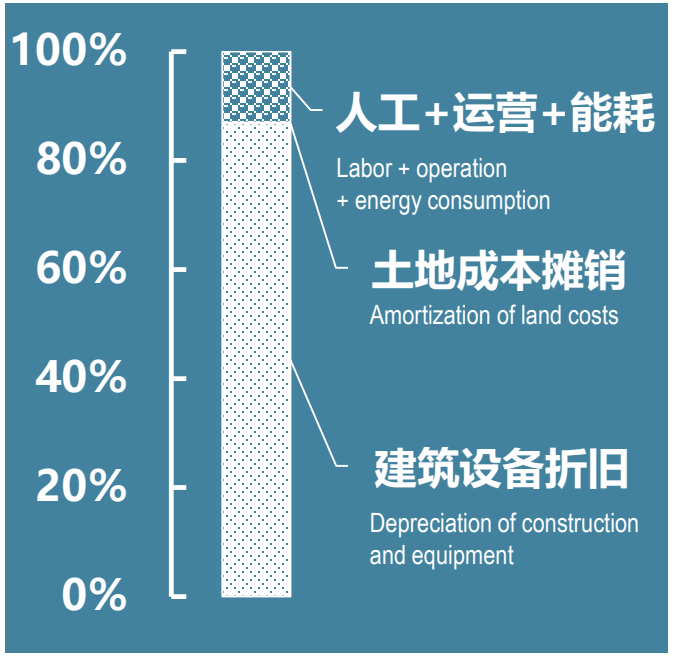
The total cost of MSW management is about 302.1 yuan/t, and the costs of collection, transfer and treatment account for 31.4%、29.9%、38.7% respectively.

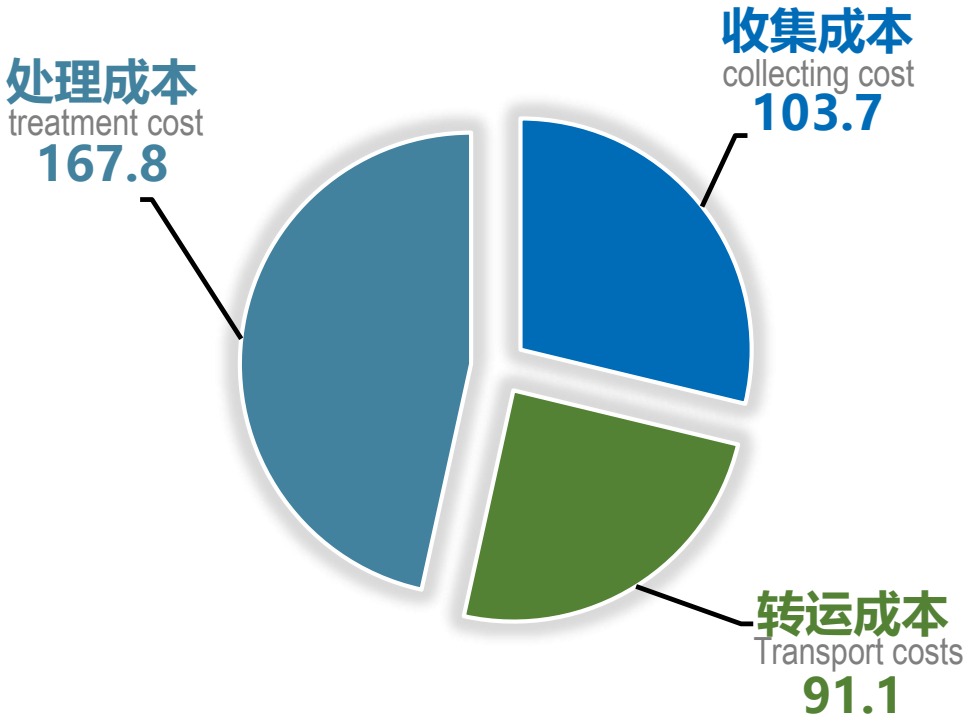
3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——40km

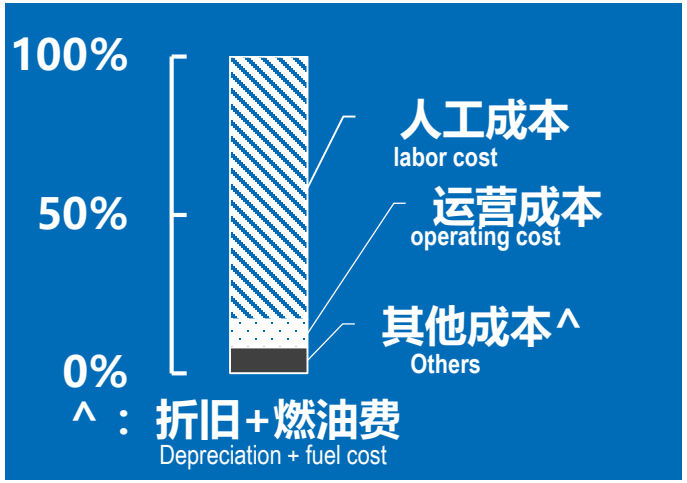
COST ANALYSIS OF 40 KM RADIUS CASE

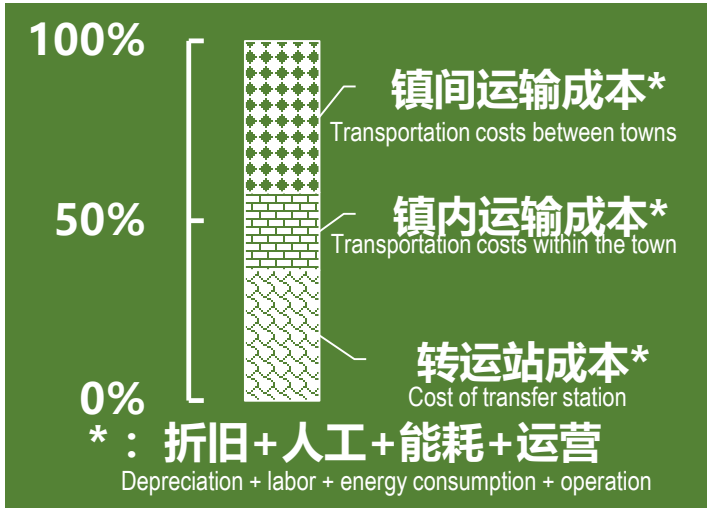




40km半径下的区域统筹成本(元/t)

Cost of MSW regional integrated management of 40 km case





垃圾收运处理的单吨总成本约为362.6元/t，收集、转运、处理成本分别占28.6%、25.1%、46.3%。

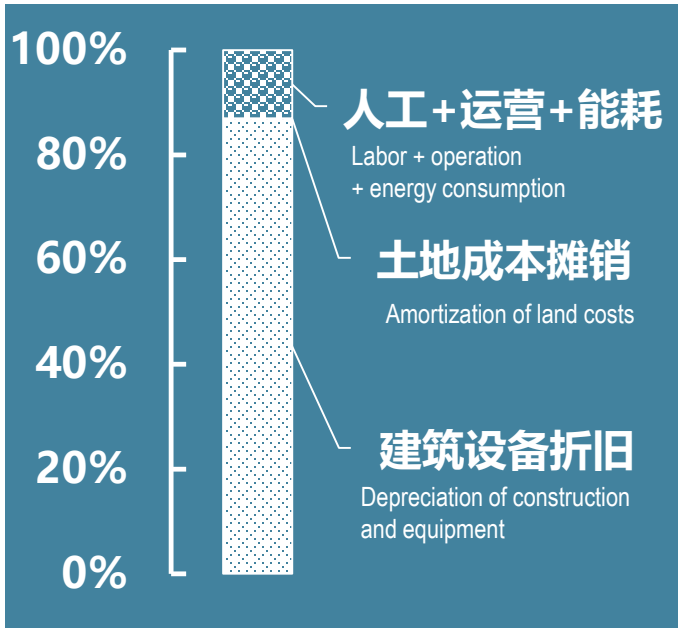
The total cost of MSW management is about 362.6 yuan/t, and the costs of collection, transfer and treatment account for 28.6%、25.1%、46.3%% respectively.

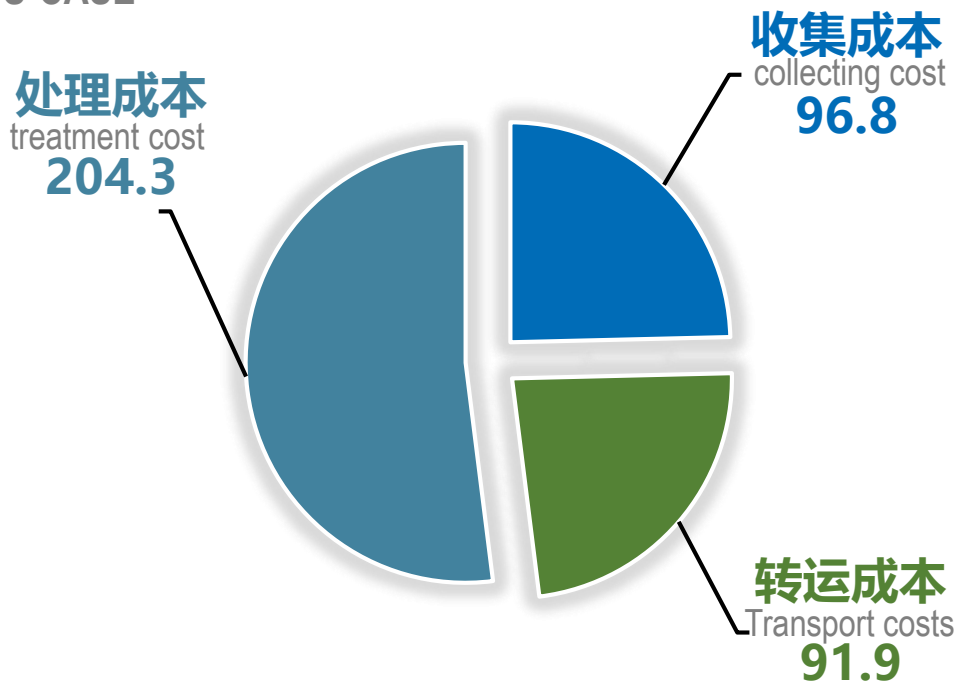
3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——50km

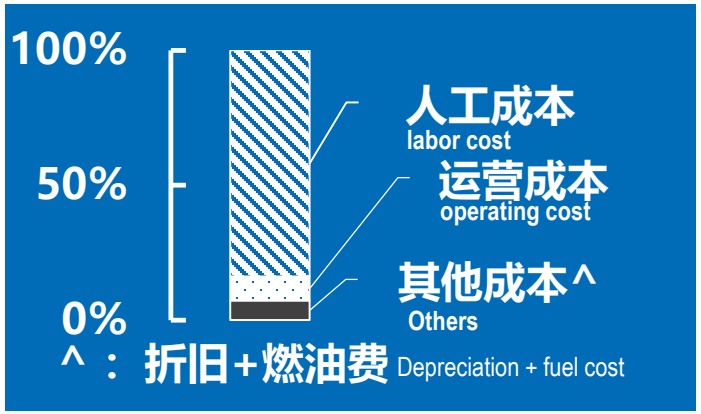
COST ANALYSIS OF 50 KM RADIUS CASE

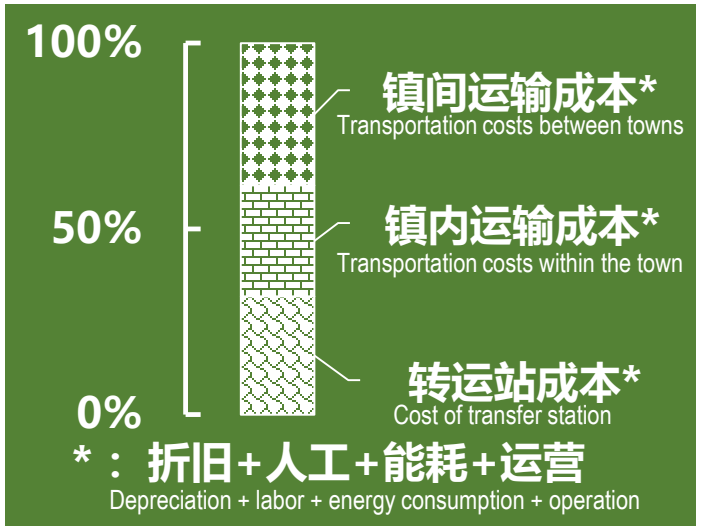




50km半径下的区域统筹成本(元/t)

Cost of MSW regional integrated management of 50 km case





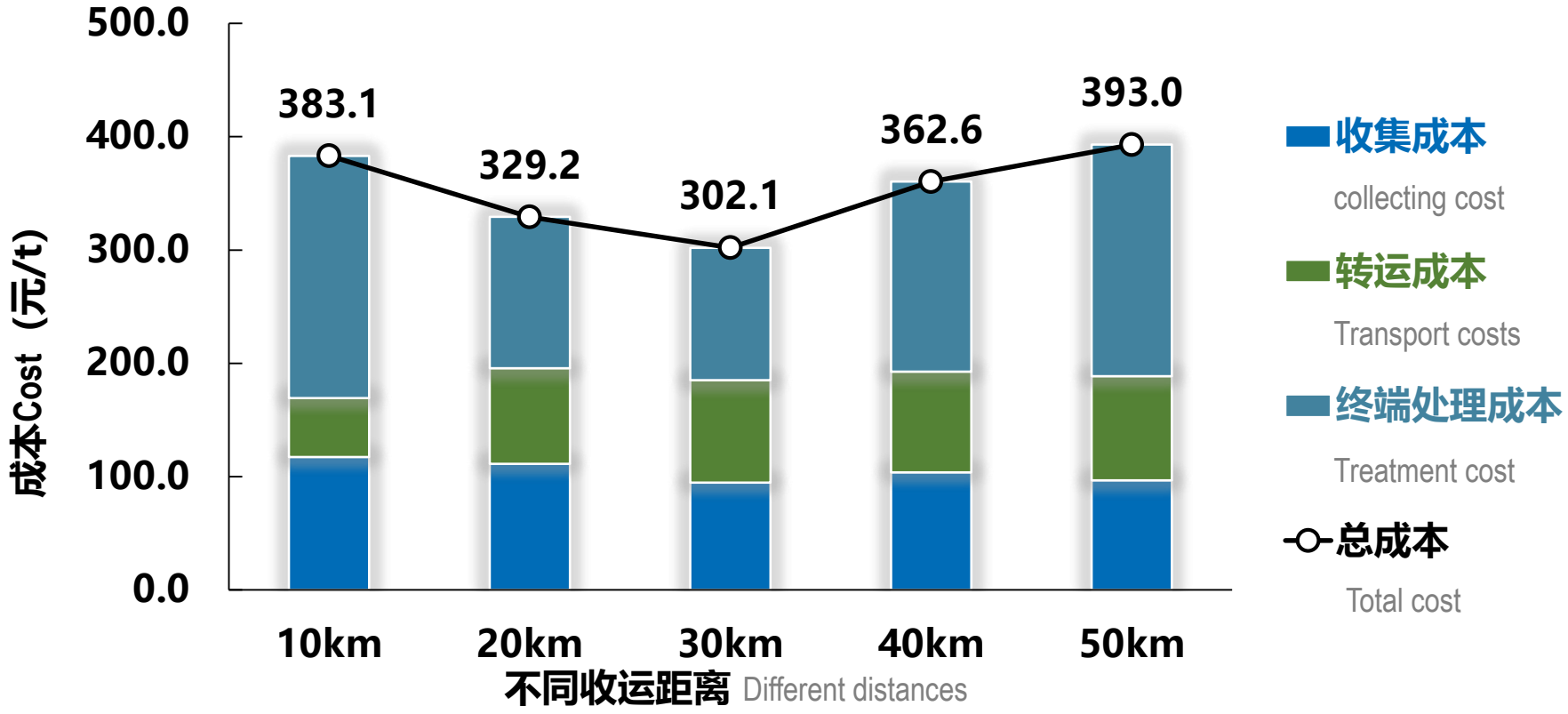
垃圾收运处理的单吨总成本约为393.0元/t，收集、转运、处理成本分别占24.6%、23.4%、52.0%。

The total cost of MSW management is about 393.0 yuan/t, and the costs of collection, transfer and treatment account for 24.6%、23.4%、52.0%

3.京津冀区域统筹典型案例的成本分析

COST ANALYSIS OF TYPICAL CASES OF MSW REGIONAL INTEGRATED MANAGEMENT IN BTH

➢ 垃圾区域统筹成本分析——对比 COST COMPARATION ANALYSIS AMONG DIFFERENT CASES



案例之间生活垃圾管理显性成本对比图

Collection, transfer and treatment costs comparation among cases

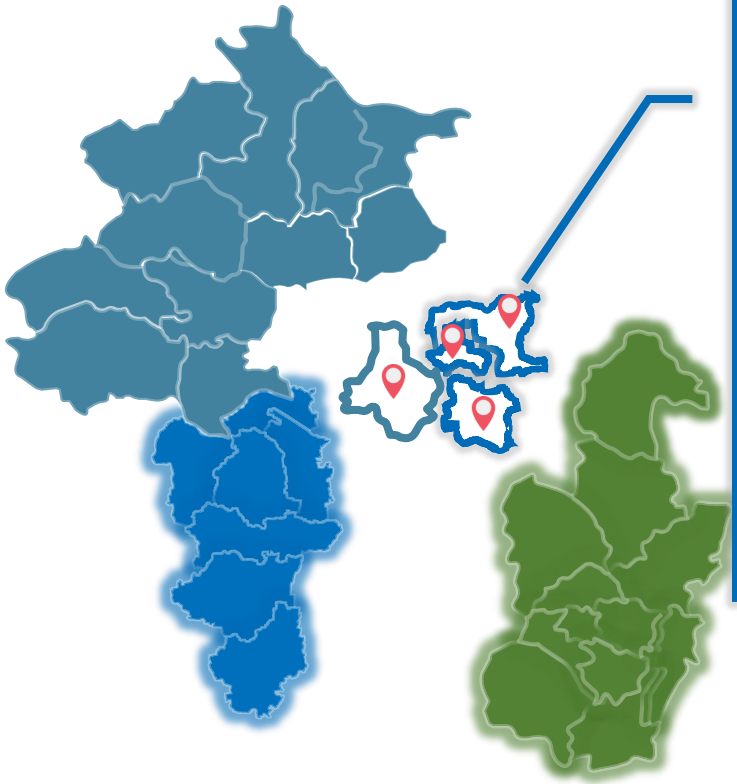
30km收运半径案例的垃圾总成本最低。案例范围包括通州区、香河县、大厂回族自治县、三河市

The total cost of 30 km case is the lowest. The case covers Tongzhou District, Xianghe County, Dachang Hui Autonomous County, and Sanhe City

4.区域统筹模式与属地管理模式的生活垃圾管理成本比较分析

COMPARISON AND ANALYSIS OF MSW MANAGEMENT COST BETWEEN REGIONAL INTEGRATED MANAGEMENT MODE AND TERRITORIAL MANAGEMENT MODE

➢ 案例的选取CASE COMPARATION

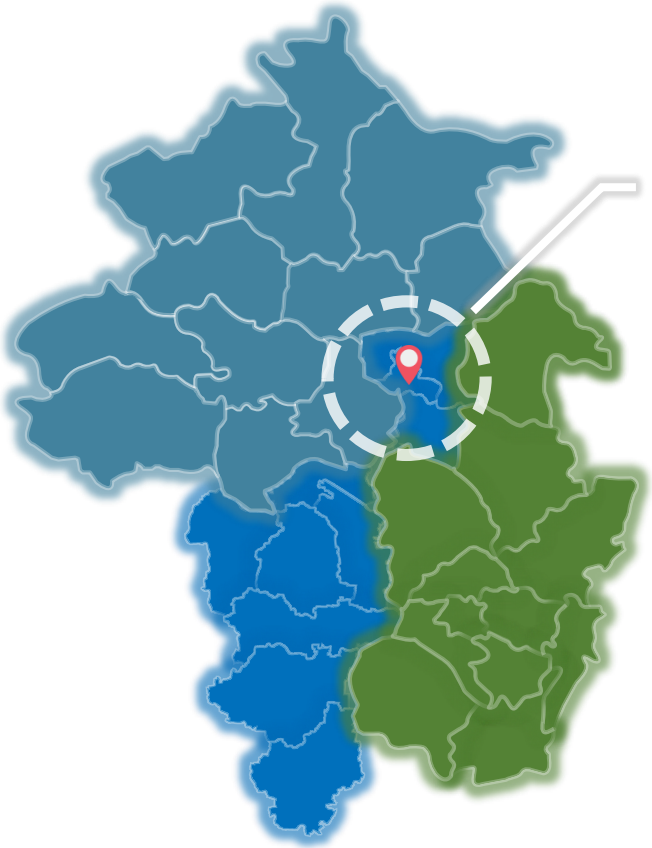


各地区以其行政边界为服务范围完成垃圾收集、转运与处理。即每个地区建设完整的垃圾管理系统。

All regions use their administrative boundaries as the service scope to complete waste collection, transfer and treatment. That is, a complete waste management system will be built in each region.

属地管理模式

territorial management mode



各地区统一建设一个完整的生活垃圾管理系统，为各地区提供MSW管理服务。

Build a complete waste management system in all regions and provide MSW management services for all regions 。

区域统筹模式

regional integrated management mode

本章计算了区域统筹30km案例相对应属地管理模式的生活垃圾管理显性成本。

This chapter calculates the explicit cost of MSW management in the case of regional pooling 30km corresponding to the territorial management mode.

4.区域统筹模式与属地管理模式的生活垃圾管理成本比较分析

COMPARISON AND ANALYSIS OF MSW MANAGEMENT COST BETWEEN REGIONAL INTEGRATED MANAGEMENT MODE AND TERRITORIAL MANAGEMENT MODE

➢ 属地管理模式成本分析 COST ANALYSIS OF TERRITORIAL MANAGEMENT MODE

通州区 Tongzhou

- 单吨收集成本Collection： 83.7元/t;
- 单吨转运成本Transportation： 73.9元/t;
- 单吨处理成本Disposal： 149.9元/t;
- 单吨总成本Total： 307.5元/t。

三河市 Sanhe

- 单吨收集成本Collection： 100.4元/t;
- 单吨转运成本Transportation： 60.8元/t;
- 单吨处理成本Disposal： 143.3元/t;
- 单吨总成本Total： 304.5元/t。

大厂回族自治县 Dachang

- 单吨收集成本Collection： 104.5元/t;
- 单吨转运成本Transportation： 36.9元/t;
- 单吨处理成本Disposal： 253.4元/t;
- 单吨总成本Total： 394.8元/t。

香河县 Xianghe

- 单吨收集成本Collection： 132.4元/t;
- 单吨转运成本Transportation： 40.4元/t;
- 单吨处理成本Disposal： 176.9元/t;
- 单吨总成本Total： 349.7元/t。

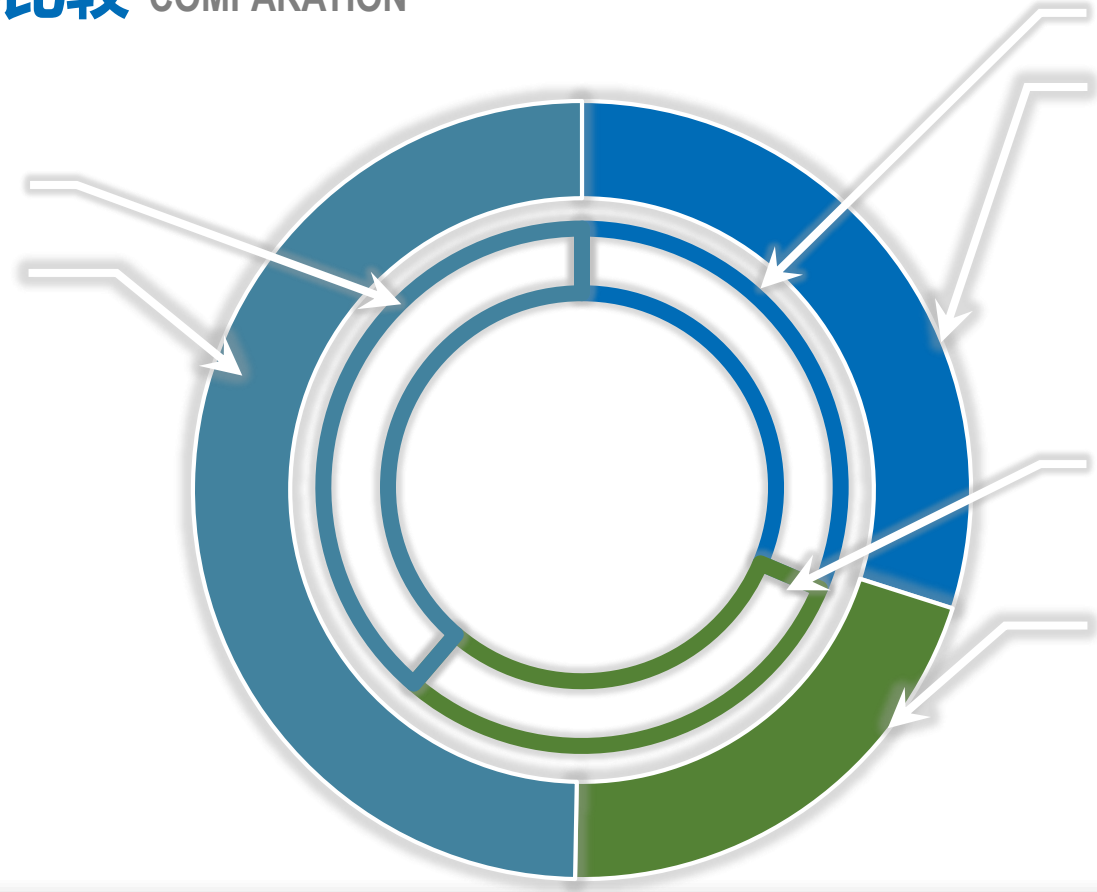
4.区域统筹模式与属地管理模式的生活垃圾管理成本比较分析

COMPARISON AND ANALYSIS OF MSW MANAGEMENT COST BETWEEN REGIONAL INTEGRATED MANAGEMENT MODE AND TERRITORIAL MANAGEMENT MODE

➢ 两种模式的成本比较 COMPARATION

区域统筹模式终端处理成本为117元/t，相比属地管理模式157.7元/t，减少40.7元/t，减少比例约为25.81%。

The terminal processing cost of the regional overall planning model is 117 yuan/t, which is 40.7 yuan/t less than the territorial management model of 157.7 yuan/t, and the reduction ratio is about 25.81%.



两种模式生活垃圾收集成本基本一致，约为92元/t。

The waste collection cost of the two modes is basically the same, about 92 yuan/t.

区域统筹模式转运成本为90.2元/t，相比属地管理模式64.6元/t，增加了40%。

The transshipment cost of the regional integrated model is 90.2 yuan/t, which is an increase of 40% compared with the territorial management model of 64.6 yuan/t.

区域统筹（显性成本约302元/t）

regional integrated management （ExC 302 yuan/t）

属地管理（显性成本约317元/t）

territorial management （ExC 317 yuan/t）

5.京津冀生活垃圾区域统筹处理生态补偿机制研究

THE ECOLOGICAL COMPENSATION MECHANISM OF BTH MSW REGIONAL INTEGRATED MANAGEMENT

➢ 国内外垃圾生态补偿现状分析 CURRENT SITUATION OF MSW ECOLOGICAL COMPENSATION DEVELOPMENT

国内现状 National

- **垃圾处理行业起步较晚，生态补偿机制未建立**
- The waste treatment industry started late, and the ecological compensation mechanism has not been established
- **生态补偿理论和模型研究不足，生态补偿金额和范围难以确定**
- It is difficult to determine the amount and scope of ecological compensation
- **垃圾处理行业逐渐重视生态补偿，企业自发展开尝试**
- The waste treatment industry gradually attaches importance to ecological compensation, and the enterprises spontaneously start to try
- **部分发达城市先行，大部分城市仍未开展生态补偿**
- Some developed cities take the lead, and most of them have not yet carried out ecological compensation
- **生态补偿的核心意义偏离**
- The core meaning of ecological compensation is not accurate
- **生态补偿的第三方参与不足**
- Third party participation in ecological compensation is insufficient

国外实践 International

- **起步早，积累丰厚**
- Start early, accumulate abundantly
- **机制较为完善**
- The mechanism is relatively complete
- **补偿形式多样**
- Various forms of compensation

5.京津冀生活垃圾区域统筹处理生态补偿机制研究

THE ECOLOGICAL COMPENSATION MECHANISM OF BTH MSW REGIONAL INTEGRATED MANAGEMENT

➢ 区域统筹下的生态补偿框架研究 ECOLOGICAL COMPENSATION FRAMEWORK UNDER REGIONAL COORDINATION

生态补偿基本原则 Basic principles

受益方补偿、受损方受偿
compensation for the beneficiary and compensation for the injured

生态补偿调整的是利益相关方的关系，实现利益均衡的前提是受益方补偿、受损方受偿，这是生态补偿遵从的第一原则。
The premise of realizing the balance of interests is the compensation of the beneficiary and the compensation of the injured, which is the first principle of ecological compensation.

生态优先、发展优先
ecological priority and development priority

坚持生态优先，即是修复、重建因垃圾处理受到影响的生态环境；坚持发展优先；即是改善、协调垃圾产生区域与垃圾处理区域之间的统筹发展。
To adhere to ecological priority means to repair and rebuild the ecological environment affected by waste disposal; to adhere to development priority means to improve and coordinate the overall development between waste producing areas and waste disposal areas.

充分补偿、现实可行
full compensation and practical feasibility

在确定补偿标准等指标时，应结合所在地区的经济社会发展实际情况，在具备可操作性的基础上充分补偿，使生态补偿机制体现公平与效率。
When determining the compensation standard and other indicators, the actual situation of economic and social development in the region should be considered, and made full compensation on the basis of operability, so as to make the ecological compensation mechanism reflect fairness and efficiency

生态补偿主体与客体 compensation subject and object

补偿主体：依据“受益者补偿原则”，生态补偿主体应该是生活垃圾的产生者或是生态服务的受益者。
subject：the producer of MSW or the beneficiary of ecological services

补偿客体：是指生态补偿所给予的对象。在京津冀垃圾区域统筹模式中，补偿客体为生活垃圾输入区政府和垃圾处理设施周边的居民，如大厂回族自治县。**object**：who obtain the ecological compensation. In the BTH MSW regional integrated management mode, the object of compensation is government where MSW input and residents surrounding MSW disposal facilities, such as Dachang Hui Autonomous county.

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➢ 区域统筹下的生态补偿框架研究 ECOLOGICAL COMPENSATION FRAMEWORK UNDER REGIONAL COORDINATION

生态补偿资金来源 Fund Source

政府和市场主导下的生态补偿的优势劣势比较

Comparison of the advantages and disadvantages of ecological compensation led by the government and the market

	政府主导 led by the government	市场主导 led by the market
优势 PROS	➢ 交易费用少 ➢ Low transaction fees ➢ 强制性 ➢ Mandatory	➢ 直接性 ➢ Direct ➢ 激励性 ➢ Incentive
劣势 CORS	➢ 补偿客体的评估价值偏低 ➢ The evaluation value of the compensation object is low ➢ 资金来源不够充分 ➢ Insufficient funding sources ➢ 补偿主体责任不清晰 ➢ The liability of the compensation subject is not clear ➢ 制度维护和监管成本高 ➢ System maintenance and supervision costs are high	➢ 开展困难 ➢ Development difficulties ➢ 不稳定 ➢ Unstable ➢ 交易费用高 ➢ High transaction costs

建议以统筹区域政府间财政转移支付作为生态补偿资金来源，市场补偿作为辅助手段

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生态补偿标准
Ecological compensation standard

对标准制定的建议
Recommendations for standard setting

生态补偿的补偿标准确定既不是完全市场条件下供需平衡的结果，也不是仅靠政府调控的结果，而是两者相互结合的妥协产物。从实践来看，很少有横向生态补偿能够按照严格的理论测算生态补偿标准并付诸实施，更多的则是采取利益相关方协商的办法，通过协商确定补偿方和受偿方都能够接受的生态补偿标准31。建议在政府间合作机构框架下研究制定生态补偿的标准，并由政府、社区、居民等利益相关方通过谈判达成协议，通过听证会或引入第三方参与等形式进行监督。

In practice, there are few horizontal ecological compensation standards that can be calculated and implemented according to strict theory. More importantly, the method of stakeholder consultation is adopted to determine the ecological compensation standards acceptable to both the compensators and the compensates . It is suggested that the standards of ecological compensation should be studied and formulated under the framework of intergovernmental cooperation agencies, and the government, communities, enterprises and other stakeholders should reach an agreement through negotiation, and supervise through hearings or the introduction of third-party participation.

现行可参照的标准
Current standards that can be referred to

生态补偿应当主要针对生活垃圾处理隐性成本对应的损失，如环境影响成本、居民健康成本、发展阻滞成本、公众安抚成本等。由于这些成本的确认标准不明确、难以准确计量，目前比较可行的操作方式是由垃圾输出方政府与垃圾输入方政府通过协调或者由输出、输入方共同的上级政府出台规范文件直接确定补偿标准。如，北京市生活垃圾异地处理的生态补偿标准为150 元/吨，天津市、河北省为50 元/吨。

The main cost is recessive cost of waste treatment, such as environmental pollution cost, resident health cost, development retardation cost, public appeasement cost, etc. Because the confirmation standard of these costs is not clear and it is difficult to accurately measure, the relatively feasible operation mode is to directly determine the compensation standard by the government of the waste exporter and the government of the waste importer through coordination or by the higher-level government of the exporter and the importer. For example, the ecological compensation standard of MSW treatment in Beijing is 173 yuan/ton, and that in Tianjin and Hebei Province is 50 yuan/ton.

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生态补偿方式
Ecological compensation mode

有关资金筹集的建议
Recommendations on fundraising

- **补偿主体筹集**：在典型案例区域内，由大厂回族自治县设立生态补偿专项资金账户，通州区、三河市和香河县按补偿成本标准，即50 元/吨，每月以实际垃圾输入量计算，向该账户汇入生态补偿费用。
- Compensation subject raising: In the typical case area, Dachang Hui Autonomous County will set up a special fund account for ecological compensation. Tongzhou District, Sanhe City and Xianghe County will use the compensation cost standard, namely 50 yuan/ton, calculated on the basis of actual waste input per month. Remit ecological compensation fees to this account.
- **补偿客体筹资：**在典型案例区域内，统筹模式下垃圾处理成本节约额度，由大厂回族自治县设立垃圾处理生态补偿专项基金账户，每月以实际垃圾处理量计算，按节约额向该账户汇入生态补偿费用。
- Compensation object financing: In the typical case area, under the overall planning mode, the waste treatment cost savings amount will be set up by Dachang Hui Autonomous County to establish a waste treatment ecological compensation special fund account, which is calculated on the basis of the actual waste treatment volume every month, and the savings are transferred to the account Ecological compensation costs.

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生态补偿方式
Ecological compensation mode

对地方居民的补偿方式
Compensation methods for local residents

- **确定补偿范围：**建议补偿范围主要根据环境防护距离和影响距离来定，影响距离参考最大落地浓度距离确定。初步的环境补偿范围划定后，再根据该范围内自然村的行政区划进行适当调整。
- **Compensation range:** based on the environmental protection distance and the impact distance. The impact distance is determined with reference to the maximum landing concentration distance. After the initial environmental compensation scope is delineated, appropriate adjustments will be made according to the administrative divisions of the natural villages within the scope.
- **直接补偿：**按人口补偿：在环卫设施的运营期间内进行人均补偿，由生态补偿资金专用账户支付。
- **Direct compensation**: Compensation according to population: per capita compensation will be made during the operation of sanitation facilities, which will be paid from the special account of ecological compensation fund.

  按土地补偿：对红线内征用的土地，或用地红线范围外使用价值受影响的土地进行补偿。
  Compensation according to land: Compensation is made for the land expropriated within the red line, or the land outside the red line whose use value is affected.
  按垃圾处理量补偿：划定环境补偿范围，结合项目规模等确定每吨补偿标准。
  Compensation according to waste disposal volume: delineate the scope of environmental compensation, and determine the compensation standard per ton in combination with the project scale.
- **间接补偿：**入股补偿：补偿范围内居民以土地使用权入股相关项目，以取得的收益补偿其损失。
- **Indirect compensation:** Share compensation: Residents within the scope of compensation use land use rights to invest in related projects to compensate their losses with the gains obtained.

  择业补偿：通过对垃圾处理设施周边居民提供就业岗位以完成补偿。
  Compensation for job selection: completed by providing jobs to residents around garbage treatment facilities.
  社会保障补偿：将受垃圾处理设施影响的周边居民纳入社会保障体系。
  Social security compensation: surrounding residents affected by garbage treatment facilities into the social security system.
  建设完善基础设施：在垃圾处理设施影响区域建设道路、桥梁等基础设施。
  Construct and improve infrastructure: construct roads, bridges and other infrastructures in areas affected by garbage treatment facilities.

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➢ 生态补偿制度下的生活垃圾区域统筹成本效益分析

COST ANALYSIS IN THE WHOLE PROCESS OF MSW REGIONAL INTEGRATED MANAGEMENT MODE AND MSW TERRITORIAL MANAGEMENT MODE UNDER ECOLOGICAL COMPENSATION SYSTEM

生态补偿制度下垃圾统筹处理模式与属地管理模式全流程成本分析

The whole process cost analysis of waste management mode and territorial management mode under ecological compensation system

区域名称 District/County	垃圾产生量（吨/天） Waste generation	属地管理模式垃圾处理全流程显性成本C_l（元/吨） Explicit cost of the whole process of waste treatment under territorial management mode Cl	区域统筹模式垃圾处理全流程显性成本C_g（元/吨） Explicit cost of the whole process of waste treatment under regional integrated management mode Cg	生态补偿制度下的垃圾统筹处理全流程显性成本C_e（元/吨） Explicit cost of the whole process of waste regional integrated treatment under the ecological compensation system Ce	两种模式下垃圾管理全流程显性成本差 C_l-C_g（元/吨） The explicit cost difference of the whole process of waste management under the two modes Cl-Cg	生态补偿制度下两种模式垃圾管理全流程显性成本差 C_l-Ce（元/吨） The explicit cost difference of the whole process of waste management under the two modes under the ecological compensation system Cl-Ce
通州区Tongzhou	1390.51	307.5	302.1	352.1	5.4	-44.6
三河市Sanhe	532.62	304.5	302.1	352.1	2.4	-47.6
香河县Xianghe	298.87	349.7	302.1	352.1	47.6	-2.4
大厂县Dachang	134.31	394.8	302.1	302.1	92.7	92.7

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区域统筹模式下各利益相关政府的经济效益分析

Analysis of the economic benefits of each stakeholder government under the regional integrated management mode

区域名称 District/County	区域统筹模式垃圾处理获益（元/吨） Benefits of waste treatment in regional integrated management mode(yuan/t) (1)	生态补偿获益（元/吨） Ecological compensation benefit (yuan/ton) (2)	垃圾处理设施建设用地使用权获益（元/吨） Benefits of land use right for construction of waste treatment facilities (yuan/ton) (3)	获益合计（元/吨） Total benefit (yuan/ton) (1) + (2) + (3)
通州区 Tongzhou	5.4	-50.00	77.40	32.8
三河市 Sanhe	2.4	-50.00	23	-24.6
香河县 Xianghe	47.6	-50.00	30.6	28.2
大厂县 Dachang	92.7	50.00	-32.6	110.1

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THE ECOLOGICAL COMPENSATION MECHANISM OF BTH MSW REGIONAL INTEGRATED MANAGEMENT

➢ 生态补偿费用管理和保障 MANAGEMENT AND SAFEGUARD MEASURES OF ECOLOGICAL COMPENSATION FEE

保障措施 Safeguard Measures

成立生活垃圾管理生态补偿协调组织机构

Establishment of ecological compensation coordination institution for MSW treatment

SWM生态补偿机制要有强有力的组织机构领导作保障，对事项进行部署、决策。

It must be guaranteed by strong organizational leadership, make unified deployment and comprehensive decision on major issues, and timely coordinate and solve the possible contradictions between different stakeholders.

建立健全生活垃圾补偿相关政策法规

Establish and improve policies and regulations related to MSW compensation

通过建立健全相关政策法规，将生活垃圾处理生态补偿纳入统筹区域合作规划。

the ecological compensation for MSW treatment should be included in the overall regional cooperation planning

加大生活垃圾处理生态补偿投入，逐步形成多元补偿方式

Increase the investment in ecological compensation for MSW treatment, and gradually form a multiple compensation mode

探索多样性生态补偿方式，如政府搭建协商平台，引导建立横向补偿关系。

explore diversified ecological compensation methods in combination with the actual situation of waste generation and treatment areas

强化生活垃圾处理生态补偿的监管与评价

Strengthen the supervision and evaluation of ecological compensation for MSW treatment

将区域统筹生态补偿标准、用途、使用金额、效果等进行公示，接受公众监督。

Standardize the management of ecological compensation, formulate information disclosure system, publicize the standard, use, amount and effect of regional ecological compensation, and accept public supervision

倡导公众参与，提升全民生态补偿意识

Promote public participation and enhance the resident awareness

利用生态补偿资金开展宣传教育工作，提升公众环保素质，降低突发事件发生风险。

Make full use of ecological compensation funds to carry out publicity and education work, correct the misunderstanding of the public about waste disposal, improve the public environmental protection quality, and reduce the risk of emergencies

THANKS!