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林赛 Lyndsay Chapple

固体废物管理专家，项目报告审稿人

Solid Waste Management Specialist at Self-Employed

BIOS

- Lyndsay Chapple 先生作为工程师、团队负责人和项目主管拥有 40 多年的经验，主要参与环境工程项目，尤其是固体废物管理项目和计划。

He has over forty years' experience as an engineer, team leader and project director, predominantly involved with environmental engineering projects and particularly solid waste management projects and programs.

- Lyndsay 拥有工程学学士和硕士学位，以及管理学研究生文凭。

He has Bachelors and Masters degrees in Engineering, as well as a Graduate Diploma in Management.

- 他在昆士兰州的环境部门工作了 10 年，然后在布里斯班、墨尔本、苏瓦和马尼拉的 SKM 顾问公司工作了 23 年。He spent a decade with the Environment Department in Queensland and then 23 years with SKM Consultants, based in Brisbane, Melbourne, Suva and Manila.

- Lyndsay 领导了许多固体废物管理策略研究，并为小型和大型固体废物设施提出了许多概念和详细设计。

He has lead numerous solid waste management strategy studies and produced many concept and detailed designs for both small and large solid waste facilities.

他的固体废物经验包括回收和再利用研究、废物减量化、收集调查、转运站、社区参与和教育、成本估算和财务计划、受控倾倒和垃圾填埋场设计、操作手册和运行培训计划、准备综合 SWM 计划、垃圾填埋场气体管理、堆肥、废物转化为能源、机械生物处理、垃圾场修复、渗滤液管理以及环境监测和管理计划。

His solid waste experience ranges from recycling and reuse studies, waste minimization, collection investigations, transfer stations, community involvement and education, cost estimating and finance plans, controlled dump and landfill designs, operations manuals and running training programs, preparing Integrated SWM plans, landfill gas management, composting, waste to energy, mechanical biological treatment, dumpsite remediation, leachate management and environmental monitoring and management plans.

ADB TA-9611 PRC

区域垃圾规划和实现政策变化的经验教训——一些国际案例
International Best Practice Cases and Lessons of
Regional Municipal Solid Waste Management Planning
and Achieving Policy Changes

汇报人：Lyndsay Chapple

汇报时间：2022年8月25日 August 25, 2022

- 我的职责是审查报告并提供一些其他国际观点

My role was to review reports and provide some other international perspectives

- Hardy Wong 提供了区域生活垃圾管理选项和机会以及潜在障碍的全面背景和优秀示例

Hardy Wong has provided a comprehensive background and excellent examples of regional MSW management options and opportunities, and potential blockers

- 提供一些其他示例，重点关注区域和政策干预措施

Provide some other examples with a focus on regional and policy interventions

- 有些成功，有些则不那么成功！

Some successes and some less so!

许多国家都苦于垃圾处理.....
MANY COUNTRIES STRUGGLE WITH WASTE.....

印度尼西亚
Indonesia



斐济
Fiji



柬埔寨
Cambodia



越南
Vietnam



许多国家都苦于垃圾处理..... MANY COUNTRIES STRUGGLE WITH WASTE.....

巴基斯坦
Pakistan



斯里兰卡
Sri Lanka



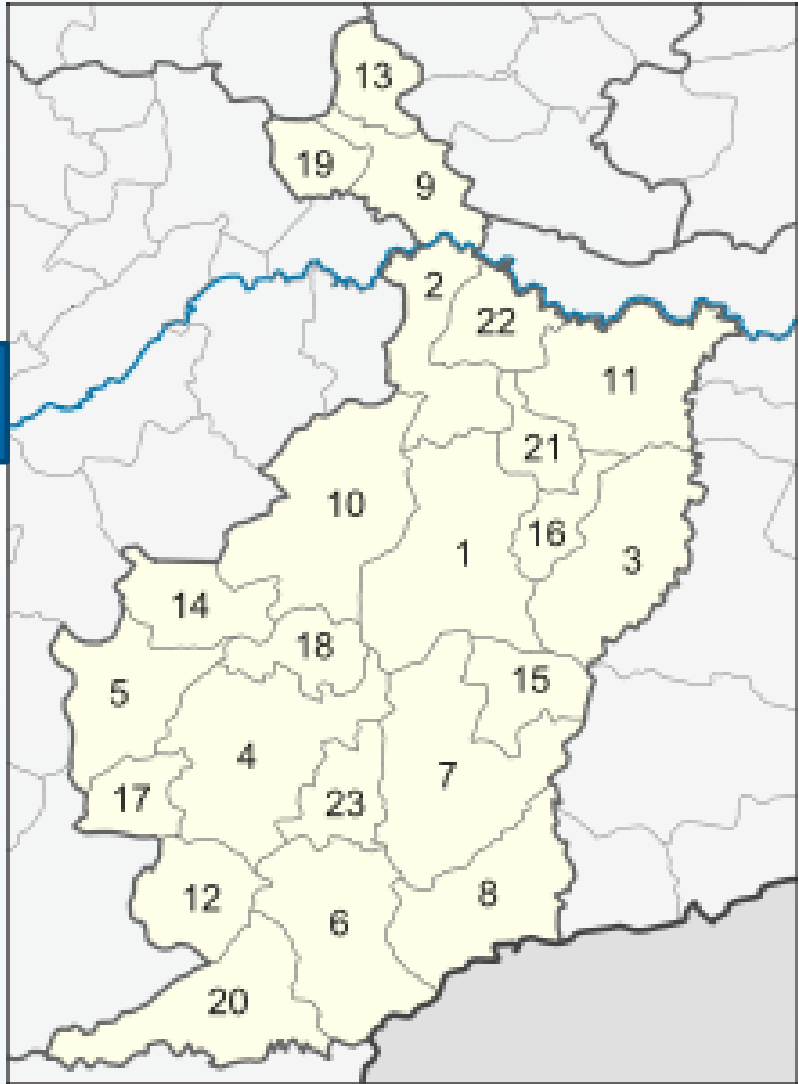
菲律宾
Philippines



泰国
Thailand



泰国北部武里南府
BURIRAM PROVINCE, NORTHERN THAILAND



泰国北部武里南府

BURIRAM PROVINCE, NORTHERN THAILAND

- 超过 150 万居民的人口

Population of over 1.5M residents

- 区域垃圾填埋场接收来自 23 个地区中的 19 个地区的垃圾

Regional landfill accepts waste from 19 of 23 districts

- 基于与主办城市签订的简单的 2 页协议
- Based on simple 2-page agreements with host municipality**

- 其他城市只需支付入场费

Other municipalities just pay a gate fee

- 用户无需承担环境、运营或照付不议的责任

No environmental, operational or take-or-pay liabilities for users

- 保持简单有助于区域方法取得成功!

Keeping it simple helps make a regional approach successful!



PAYATAS 垃圾填埋场 马尼拉奎松市

PAYATAS LANDFILL QUEZON CITY, MANILA

- 2,000 吨混合垃圾与 600 名拾荒者
- 2,000TPD mixed waste with 600 scavengers**
- 区域 IRR 强制要求清除所有清除剂并引入 MRF
- Regional IRR mandated removal of all scavengers and introduce a MRF**
- 第二个目标是提高可回收物的回收率
- Second aim was to increase recyclables recovery**



但是 MRF 失败了，拾荒者又回来了 BUT MRF FAILED AND SCAVENGERS RETURNED

装载机
Loader



滚筒筛
Trommel



碎纸机
Shredder



泥浆泵
Bailer



与社会经济现实相冲突的政策往往失

POLICIES WHICH CONFLICT WITH SOCIO-ECONOMIC REALITIES OFTEN FAIL

- 拾荒者通过拾荒赚取更多的钱，因为没有运输成本，工作时间灵活，不需要特殊的衣服或工具

Scavengers earned more money scavenging, as no transport costs, work flexible hours, no special clothes or tools required

- 成立合作社以最大化拾荒者收入
- Cooperatives were formed to maximise scavenger income**

- 为可回收物提供储存空间

Storage space was provided for recyclables

- 提供更好的工作条件和个人防护装备

Provided better working conditions and PPE



印度尼西亚三宝垄区域垃圾填埋场 SEMARANG REGIONAL LANDFILL, INDONESIA

中爪哇雅加达以东 400 公里，通过简单的入场收费为 18 个城市提供服务
400km east of Jakarta in Central Java . Serves 18 municipalities through a simple gate fee charge.



拾荒者回收可回收物
WASTE PICKERS RECOVER RECYCLABLES



VOLUME SAMPAH MASUK / Kg

TPA BLONDO DLH KABUPATEN SEMARANG TAHUN 2018

NO	BULAN	RUMAH T	PASAR	INDUSTRI	LAIN-LAIN	JUMLAH
1	JANUARI	1.718.750	1.590.410	385.390	120.330	3.814.880
2	FEBRUARI	1.330.410	1.260.320	375.260	117.460	3.043.450
3	MARET	1.720.740	1.583.710	395.480	130.790	3.830.720
4	APRIL	1.707.380	1.270.810	382.270	148.350	3.508.810
5	MEI	1.836.470	1.284.300	393.260	153.440	3.667.470
6	JUNI	1.869.540	1.310.450	357.310	143.320	3.680.620
7	JULI					
8	AGUSTUS					
9	SEPTEMBER					
10	OKTOBER					
11	NOVEMBER					
12	DESEMBER					
	JUMLAH					

- 只有约 6% 的进料废物被回收利用
- Only about 6% of the incoming waste is recycled**

PENGURANGAN VOLUME SAMPAH / Kg

TPA BLONDO DLH KABUPATEN SEMARANG TAHUN 2018

NO	BULAN	ORGANIK	ROSOK	PLASTIK	BODONG	KERTAS	BELING / KACA	KALENG	JUMLAH
1	JANUAR	-	10.450	70.470	4.400	35.960	3.210	1.120	125.610
2	PEBRUARI	-	17.150	70.890	3.230	34.790	3.240	9.750	139.050
3	MARET	-	19.220	72.720	3.150	35.970	2.860	9.150	140.970
4	APRIL	-	18.760	70.980	3.490	34.470	3.100	6.800	137.600
5	MEI	-	18.590	68.010	2.610	40.360	2.780	5.970	138.320
6	JUNI	-	19.230	69.920	2.420	37.150	2.900	5.100	136.720
7	JULI								
8	AGUSTUS								
9	SEPTEMBER								
10	OKTOBER								
11	NOPEMBER								
12	DESEMBER								
	JUMLAH								

- 准确记录垃圾吨位和垃圾类型录入

Accurate recording of waste tonnages and waste type entering

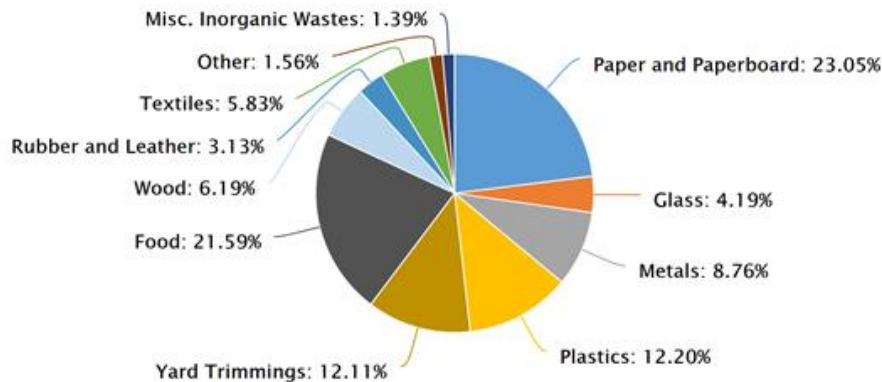
- 准确记录离开垃圾填埋场的可回收物

Accurate recording of recyclables leaving the landfill

- Al Mahmoodyah 区域
MRF, 巴格达
**Al Mahmoodyah regional
MRF, Baghdad**
- 堆肥时 12% 的回收率
**12% recovery when
composting**
- 仅无机物时回收率为 6%
**6% recovery when
inorganics only**
- 每年损失超过 20 万美元
**Losing over USD200k a
year**
- 与拾荒者相同的回收率
**SAME RECOVERY RATE
AS WASTE PICKERS**



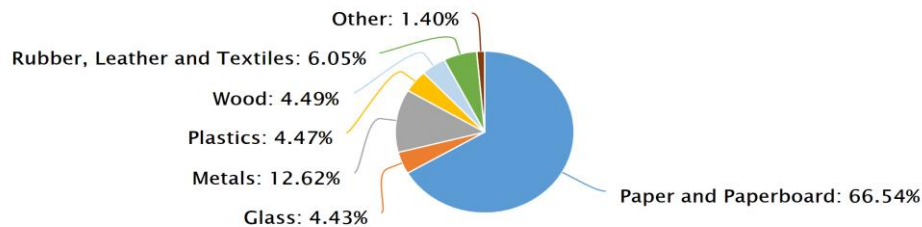
美国垃圾组分变化 USA WASTE COMPOSITION CHANGES



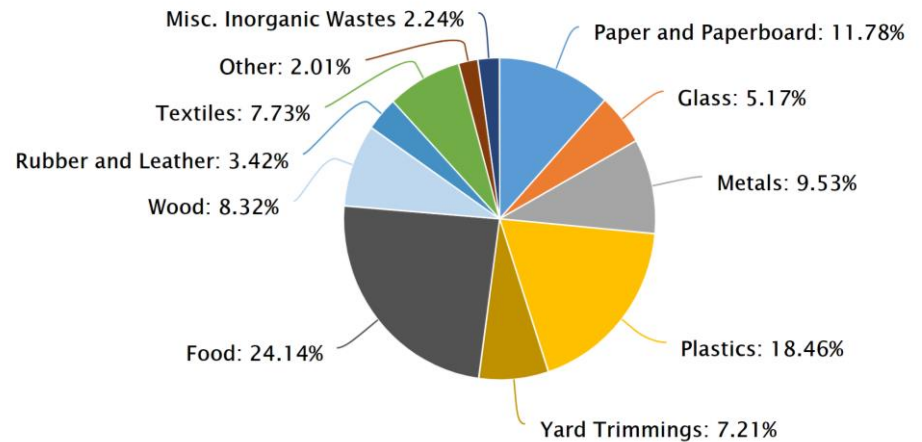
- 原始废物有很多纸、纸板
Raw waste has a lot of paper, cardboard

- 30% 可回收物回收
30% recyclables recovery

- 以纸和纸板为主的可回收物
Recyclables dominated by paper and cardboard



回收后：
AFTER recycling:
 塑料 18%
Plastics 18%
 金属 9%
Metals 9%
 纸/纸板 11%
Paper/board 11%
 有机物 31%
Organics 31%
 玻璃 5%
Glass 5%



有合理的政策预期.....

HAVE REASONABLE POLICY EXPECTATIONS...

- 美国的残留物类似于中国、亚洲等低收入省份的原始废物。

Residuals in USA similar to raw waste in lower income provinces in PRC, Asia, etc.

- 虽然有机物较低

Organics lower though

- 因此，如果不积极解决包括有机物在内的所有成分，就不能期望此类废物流的回收率高达 30%

So cannot expect large recovery percentages like 30% with such waste streams without aggressively addressing all components including organics

- 要求极高回收率的区域政策可能会失败

Regional policies mandating very high recovery rates will likely fail

- 混合废物的机械化与清道夫

Mechanization vs scavengers for mixed waste

- 不能保证更高的可回收物回收率

No guarantee of greater recyclables recovery rates

- 生活垃圾政策必须切合实际才能发挥作用

MSW policies must be realistic to work

- 否则机构将失去兴趣而不会承诺

Otherwise agencies will lose interest and not commit

- 包括16个城市和1个直辖市

Includes 16 cities and 1 municipality

- 私人拥有和经营的设施

No long-term regional waste management facility for the 13M residents

- 每个城市都有自己的垃圾填埋场

Each city accesses their own landfill

- 几乎没有城际合作

Almost no inter-city cooperation

- MMDA成立以促进区域合作

MMDA formed to facilitate regional cooperation

- WtE 设施招标并由 MMDA 授予合同，但没有实际实

WtE facility tendered out and contracts awarded by MMDA, but nothing actually implemented

- 主要问题是解决与权力机构的 FIT 协议

Main problem is resolving FIT agreements with power authority

- 需要国家政府干涉

Requires national govt. intervention

- MMDA 无法解决所以没有进展

MMDA cannot resolve so no progress

□ 区域垃圾填埋场于 2002 年在北吕宋的塔拉克克拉克建立，用于 MM 垃圾
Regional landfill established in 2002 in Clark, Tarlac in Nth Luzon for waste from MM

- 没有为 1300 万居民提供长期区域废物管理设施

Privately owned and operated facility

- MMDA 提供补充资金以支付从马尼拉到打拉的额外运输费用

MMDA provided supplementary funds to cover additional haulage costs from Manila to Tarlac

- 开始接收超过 1000TPD 现在只有 200TPD

Started receiving over 1000TPD now only 200TPD

- MMDA 停止提供补充资金

MMDA stopped providing supplementary funds

- 城市恢复使用当地设施

Cities reverted to using local facilities

□ 区域系统必须是可持续的，不能依赖未承诺的或短期的省级/国家补充支持

Regional systems must be sustainable and not rely on uncommitted or short-term supplementary provincial/national support



- 1991 年菲律宾北部的皮纳图博火山喷发
Mt Pinatubo eruption in 1991 in northern Philippines

- 超过 4000 平方公里的灰烬
Ash over 4000 sq. km

- 菲律宾主要农业区之一被毁
One of the main agricultural areas in the Philippines destroyed

- 灰烬深达 10m
Ash up to 10m deep

- 灰烬上迫切需要有机物来支持种植
Ash urgently needed organics to support cropping



MMDA 建立了集中式 生活垃圾堆肥计划以改善作物

MMDA ESTABLISHED CENTRALIZED MSW COMPOSTING SCHEMES TO IMPROVE CROPS

- MMDA 最初资助堆肥操作和运输并取得成功

MMDA funded compost operations and haulage initially and was successful

- 农民没有成本

No cost to farmers

- 土壤逐渐改良，农作物改良

Soil gradually improved and crops improved



大规模/集中堆肥

LARGE SCALE/CENTRALISED COMPOSTING

- 问题是补充 MMDA 资金停止后的运营预算....

Problem was operating budget after supplementary MMDA funds ceased....

- 无法为产生的堆肥找到可持续的市场。

A sustainable market could not be found for the compost generated.

- 农民不愿意支付可持续的价格

Farmers unwilling to pay a sustainable price

- 有更便宜的营养来源，例如动物粪便或人造肥料

There were cheaper nutrient sources, such as animal manure or artificial fertilisers.

- 由于原始废物流混合在一起，堆肥质量变化很大.....

Compost quality highly variable as raw waste stream was mixed...

- 污染（玻璃、医疗废物等）

Contamination (glass, mediwaste, etc)

- 种子仍然活跃

Seeds still active

现在只是当地的小型垃圾堆肥计划在运作
——没有区域性

NOW JUST SMALL LOCAL WASTE COMPOSTING SCHEMES OPERATING
– NOTHING REGIONALLY



区域计划, 印度尼西亚

REGIONAL SCHEMES, INDONESIA

- 印度尼西亚的许多垃圾管理区域计划没有奏效

Many SWM regional schemes in Indonesia have not worked

- 示例是 SABARGITA 区域垃圾填埋场

Example is SABARGITA regional landfill

- 服务于巴厘岛地区的五个区

Serves five districts in Bali region

- 垃圾填埋场条件极差, 地区战乱

Landfill in very poor condition and districts fighting

- 国家政府对区域设施的持续故障感到沮丧, 并且没有采用 垃圾焚烧等更好的技术

National government frustrated at the ongoing failure of regional facilities, and no uptake of better technologies such as WtE

- 国家政府发布了第 35/2018 号总统令, 以支持特定的区域废物转化为能源设施

National government issued PRESIDENTIAL DECREE NO 35/2018 to support specific regional waste to energy facilities

区域计划, 印度尼西亚

REGIONAL SCHEMES, INDONESIA

- 指定接受支持资金的 12 个地点 (国家政府在特许经营期内每吨 50 美元)

12 locations specified to receive support funding (US\$50 a ton by the national government during the life of the concession)

- 四个区域设施指定在三个相邻省份 (雅加达、勿加泗和丹格朗) , 拥有 1540 万居民

Four regional facilities specified in three adjacent provinces (Jakarta, Bekasi and Tangerang) with 15.4 million residents

- 该法令还要求电力公司 (PLN) 购买所有产生的电力

The decree also obligates the power company (PLN) to purchase all electricity generated

- 经过多年的区域性故障, 现在正在为这些设施准备和授予 WtE 特许权

The decree also obligates the power company (PLN) to purchase all electricity generated

私营部门区域化

PRIVATE SECTOR REGIONALISATION

- 生活垃圾管理干预的大多数方面的全球趋势

Global trend in most aspects of SWM interventions

- 通常的私有化方向是先收集，然后是垃圾填埋场，然后是废物处理

Usual privatisation direction is collection firstly, then landfill operations then waste processing

- 向议会免费发放一些垃圾收集特许权，并且不提供资金保证

Some waste collection concessions issued at no cost to councils, and no funding guarantees offered

- 保证合同期限必须允许摊销

Contract term must allow for amortisation

- 马尼拉有 1 年的收集合同，因此船队效率低下

Manila has 1 year collection contracts so inefficient fleets

- 在支付增加的费用之前，社区必须看到明显的改进

Community must see demonstrated improvements before paying increased fees

- 除非合同构建良好并采用适当的技术，否则不能保证成功

No guarantee of success unless contract is well constructed and appropriate technology is adopted



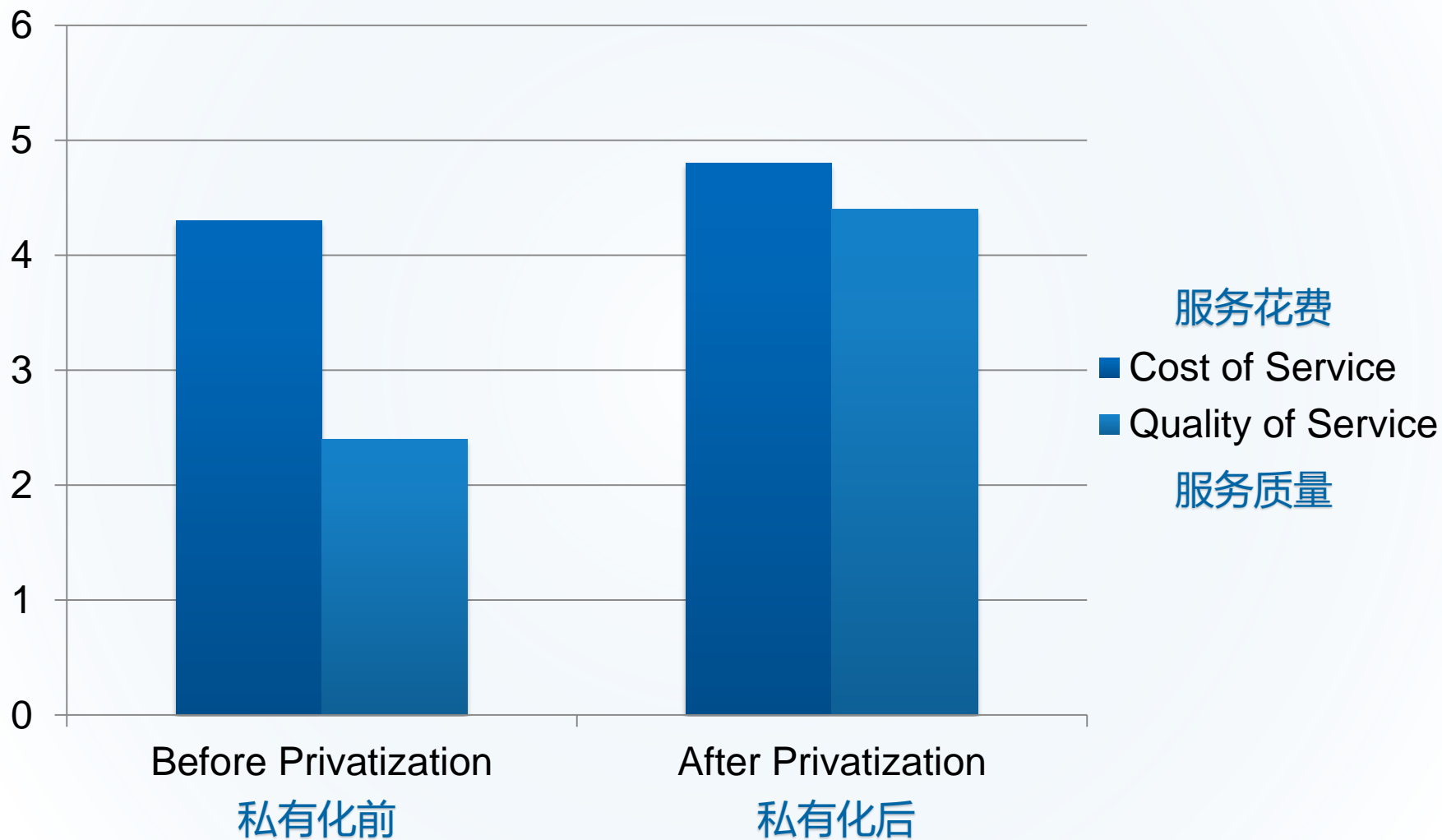
**Understanding
your waste**
理解您的垃圾

**Procuring your
waste service**
采购您的垃圾服务

**Ongoing contract
management**
采购您的垃圾服务

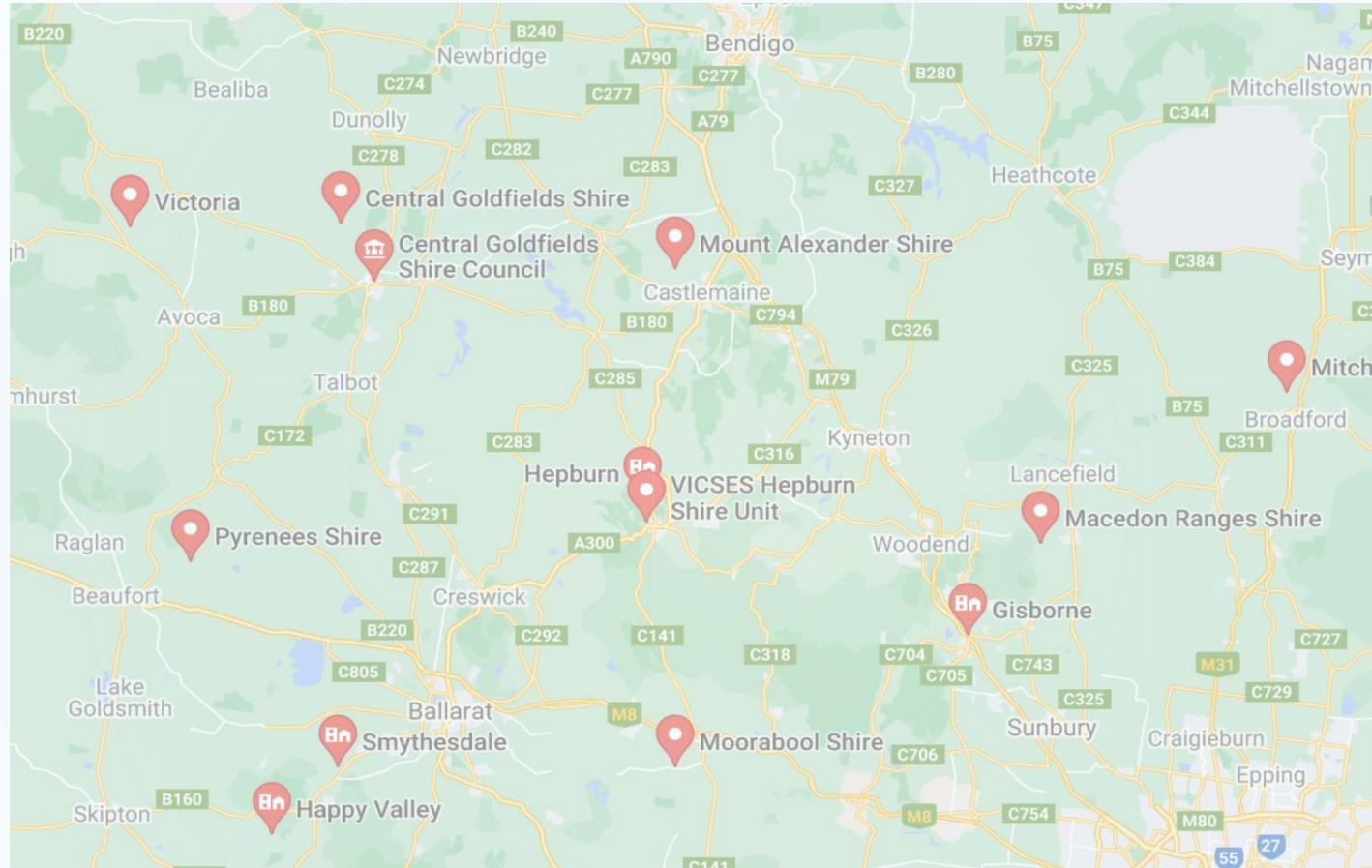
服务质量 = 物有所值

QUALITY OF SERVICE = VALUE FOR MONEY



移动缓冲区和利润....

MOVEABLE BUFFERS AND PROFIT....



- Castlemaine 在 Mt Alexander Shire (Province)中
Castlemaine is in Mt Alexander Shire (Province)

- Castlemaine 垃圾填埋场毗邻与赫本省的边界，强制缓冲区延伸到赫本省。
Castlemaine landfill is adjacent to provincial boundary with Hepburn, and compulsory buffers extend into Hepburn province.

移动缓冲区和利润....

MOVEABLE BUFFERS AND PROFIT....

- 赫本的土地位于缓冲区内，可以与开发区分开

Land in Hepburn could be alienated from development as located within buffer areas.

- 两省都希望避免法律挑战

Both provinces wanted to avoid legal challenges

- 同意共同购买省界沿线缓冲地，初步留空

Agreed to jointly purchase buffer land along the provincial boundary and initially leave vacant

- 垃圾填埋场逐步完成，随着缓冲需求的减少，土地随后被出售并可以开发

Landfill cells progressively completed and as the buffer requirements reduced, land was then sold and able to be developed

- 两省历年分享土地出让利润

The 2 provinces shared the land sale profits over the years

- 一个大学和互利的方法

A collegiate and mutually profitable approach

区域活动可能会导致.....

REGIONAL ACTIVITIES CAN RESULT IN...

- 过于复杂的合同安排

Overly complex contractual arrangements

- 保持简单往往更好

Keeping it simple is often better

- 由于某些方面担心“暴露”（法律、环境、社会等）而导致过度设计的设施

Over engineered facilities as some parties concerned about “exposure” (legal, environmental, social, etc.)

- 使技术与实际风险保持一致

Align technology with real risk

- 合理分配风险

Allocate risk appropriately

- 对某些政党缺乏控制感到紧张

Nervousness about lack of control by some parties

- 能否实施一个多方监督委员会

Can implement a multipartite monitoring committee

- 设置专门的工作人员来收取费用和保存记录

Use fully independent gate staff to collect fees and keep records

区域活动可能会导致.....

REGIONAL ACTIVITIES CAN RESULT IN...

- 预期的结果过于乐观，例如财务或环境收益

Excessively optimistic outcomes expected, such as financial or environmental gains

- 商业案例必须有充分的依据

Business case must be well grounded

- 与社会经济现实的冲突

Conflict with socio-economic realities

- 社区最了解他们的愿望

Community best knows their desires

- 先提供改进的性能，然后再增加费用

Provide the improved performance first and then increase fees

- 私营部门的参与增加

Private sector involvement increasing

- 必须分析为物有所值，而不仅仅是服务成本

Must analyze as value-for-money not just service cost

- 使用适当的合同，允许私营部门提供最适当的设备和服务

Use appropriate contracts to allow private sector to provide the most appropriate equipment and service

- PPP 越来越受欢迎

PPPs becoming more popular

区域活动可能会导致.....

REGIONAL ACTIVITIES CAN RESULT IN...

- 如果外部提供短期资金/支持, 则需要可持续的退出战略

Need for a sustainable exit strategy if short term funding/support provided externally

- 设施/运营必须确定并获得适当的资金来源才能继续

facility/operation must identify and have access to appropriate funding sources to continue

- 需要考虑的创新方法

Innovative approaches needing to be considered

- 缓冲区中的区域土地管理

Regional land management in buffers

- 需要国家政府参与

Need for national government involvement

- 特别是如果涉及 FIT 等非生活垃圾管理部委

Especially if non-SWM ministries involved such as FIT

- 克服跨省障碍

To overcome inter-provincial blockers

THANKS!