ADB TA 9611 Dissemination Workshop
Solid Waste Management Coordination
in the Beijing-Tianjin-Hebei City Cluster
亚行技术援助传播研讨会
京津冀城市群固体废弃物管理协调

25-26 AUGUST 2022
2022年8月25-26日

International Circular Economy Initiatives and ADB's Roadmap for Circular Economy Zero Waste Cities in the People's Republic of China

國際循環經濟倡議和关于中华人民共和国循环经济零废弃物城市亚行的发展路线图

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Why Circular Economy?为什么是循环经济？

Effectively address increasing waste generation, environmental and ocean pollution

- Global consumption of materials such as biomass, fossil fuels, metals and minerals is expected to double in the next forty years, while annual waste generation is projected to increase by 70% by 2050.
- 2016 – 2050: 2.01 – 3.4 billion tons of Municipal Solid Waste globally
- East Asia and Pacific highest contribution among world's regions generating 468 million tons or 23% (2016) (World Bank Group)

有效解决日益增多的废弃物产生、环境和海洋污染问题

- 未来四十年，全球对生物质、化石燃料、金属和矿物等材料的消费量预计将翻一番，而到 2050 年，每年的废物产生量预计将增加 70%
- 2016 – 2050: 全球20.1-34亿吨城市固体废弃物
- 东亚和太平洋地区是世界上贡献最大的地区，产生4.68亿吨或23%（2016年）（世界银行集团）。

Why Circular Economy?为什么是循环经济？

Effectively address scarcity of resources, water, and land

- Accelerated by climate change
- Rare earth, metals, minerals, sand, fossil fuels, food, animal feed, clean water, agricultural land - all scarce

有效解决资源、水和土地的稀缺问题

- 被气候变化加速
- 稀土、金属、矿物、沙子、化石燃料、食物、动物饲料、清洁水、农业用地——都很稀缺

https://blogs.worldbank.org/eastasiapacific/tracking-urbanization-how-big-data-can-drive-policies-make-cities-work-poor

ADB

Why Circular Economy?为什么是循环经济？

Capture wasted economic resource

Take-Make-Waste linear economic model wastes 80% of $ 3.2 trillion of global consumer goods each year.

“The circular economy…offers an alternative that can yield up to $4.5 trillion in economic benefits to 2030”.(World Economic Forum, 2014)

获取浪费的经济资源

取--用---弃的线性经济模式每年浪费了全球3.2万亿美元消费品中的80%。

“循環經濟……提供了一種替代方案，到 2030 年可產生高達 4.5 萬億美元的經濟效益。” (世界经济论坛，2014）

https://www.goodairgeeks.com/uses-for-recycled-paper/

Why Circular Economy?为什么是循环经济？

Decoupling natural resource use from urban and economic growth

Core challenge to sustainable development is current link between increasing natural resources consumption along urbanization (bigger cities = more waste) and increased well-being.

UNEP concept of resource- and impact decoupling

将自然资源使用与城市和经济增长脱钩

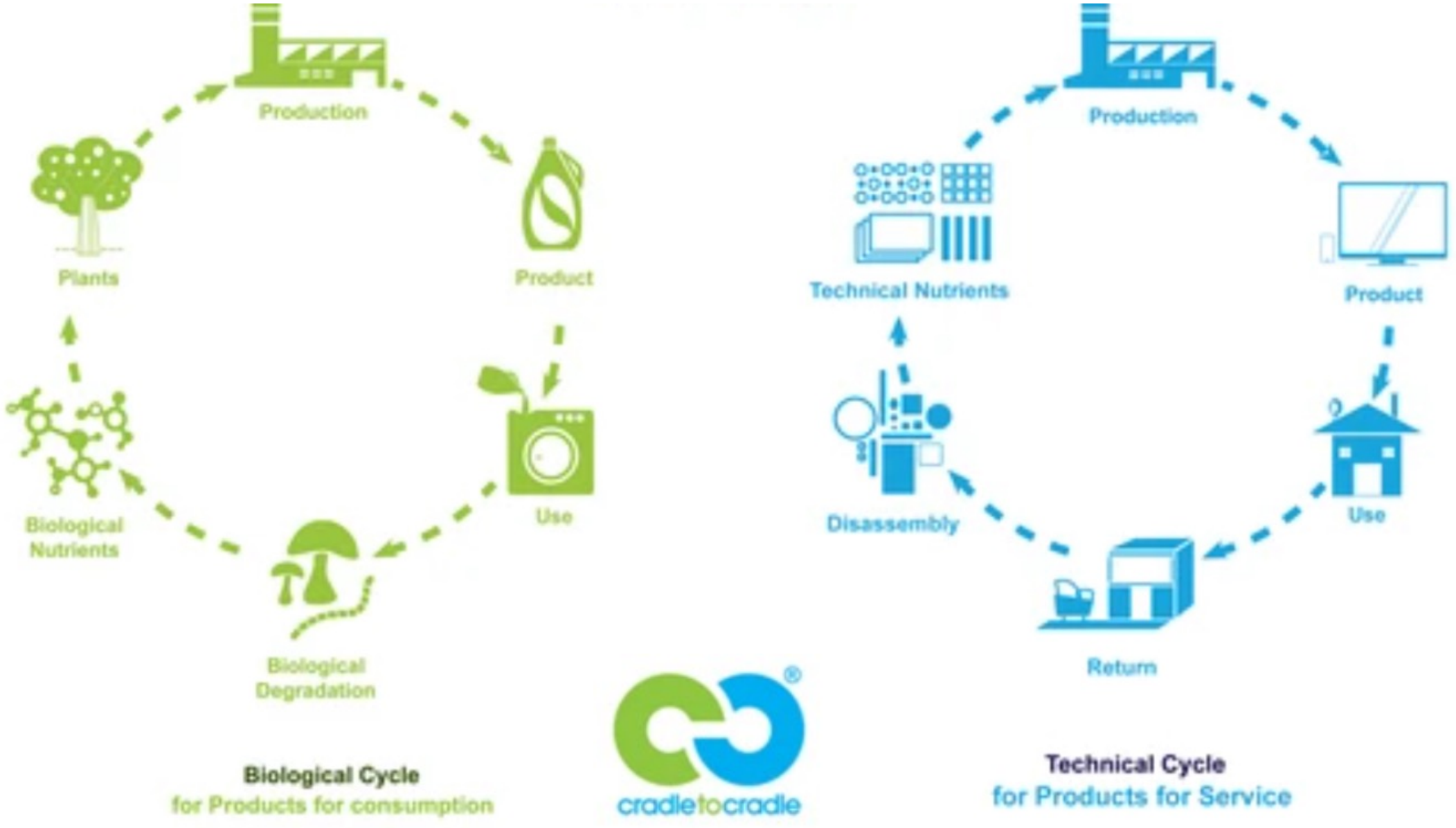
可持续发展的核心挑战是目前城市化过程中不断增加的自然资源消耗（更大的城市=更多的废弃物）和增加的福祉之间的联系。

联合国环境署，资源与影响脱钩的概念

World Economic Forum, 2014

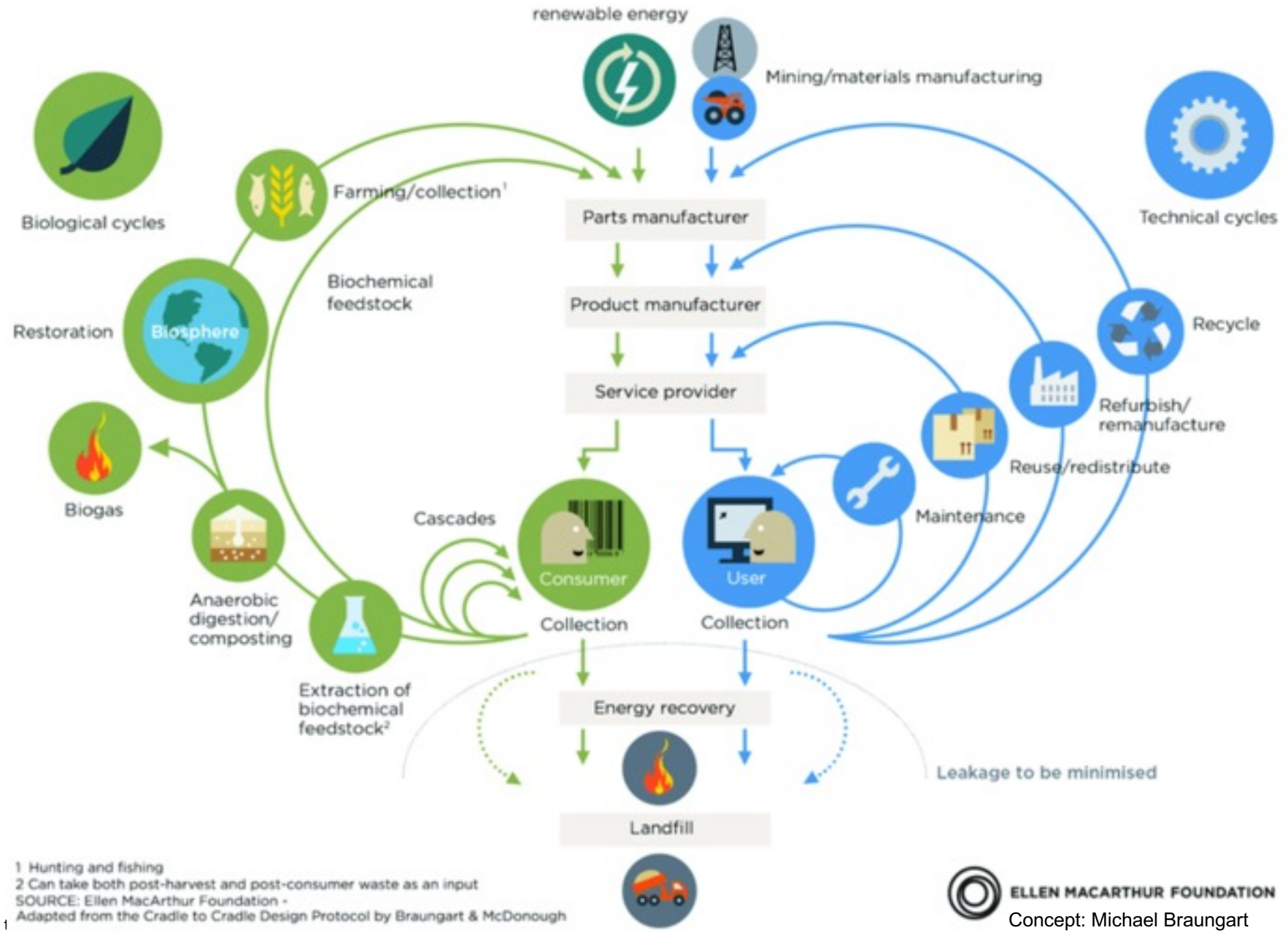
ADB

What is Circular Economy? 如何做循环经济？

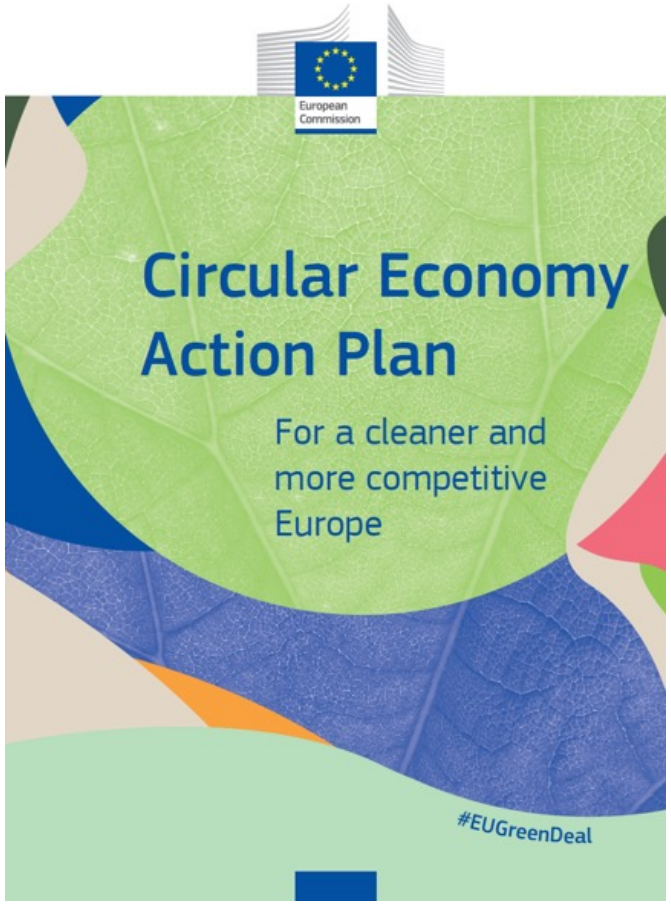


Source: Michael Braungart. https://epea.com/en/about-us/cradle-to-cradle

How to Conceptualize Circular Economy Actions? 如何做循环经济？



Example for Action: European Union 行动示例：欧盟



The European Union accelerates transition towards regenerative growth model that gives back to the planet more than it takes, advance towards keeping resource consumption within planetary boundaries, and reduce consumption footprint and double circular material use rate by 2030.
欧盟加快向可再生增长模式的过渡，该模式对地球的回馈大于其需要，推进将资源消耗保持在地球边界内，并在 2030 年之前减少消耗足迹和双循环材料使用率。

- A Sustainable Product Policy Framework
- Key Product Value Chains
- Less Waste, More Value
- Making Circular Economy Work for People, Regions and Cities
- Crosscutting Actions
- Leading Efforts at Global Level
- Monitoring Progress

- 可持续产品政策框架
- 关键产品价值链
- 更少的浪费，更多的价值
- 让循环经济为人们、地区和城市服务
- 横切行动
- 全球领先的努力
- 监控进度

Source: European Commission. 2020. *Circular Economy Action Plan: For A Cleaner and More Competitive Europe*. Luxembourg: Publications Office of the European Union.

Circular Economy Policies in the PRC中国的循环经济政策

Circular Economy Promotion Law of the People's Republic of China, enacted 1.1.2009
(a comprehensive law, first focus on industrial synergies in circular economy industrial parks to address challenge of industrial waste)

《中华人民共和国循环经济促进法》，2009年1月1日颁布
(一部综合性法律，首先关注循环经济工业园区的产业协同效应，以应对工业废弃物的挑战)

12th, 13th FYPs included objectives of CE and pilot program for CE projects and pilot cities (from the 2013 CE action plan by State Council)

“十二五”、“十三五”规划包括了循环经济的目标和循环经济项目及试点城市的试点计划（来自国务院2013年发布的循环经济行动计划）。

Ministry of Ecology and Environment: Pilot Zero Waste Cities Program (2019)

生态和环境部: 无废城市试点计划(2019年)

14th FYP: “Fully implement concept of circular economy and build a multi-level resource efficient recycling system.”

- Circular industrial parks and circular production chains
- standardize remanufacturing
- circular agriculture and organic agriculture
- "reverse recycling" model of production enterprises
- extended producer responsibility system
- reduction, standardization and recycling of express packaging
- waste materials recycling and sorting system of urban waste
- resource recycling system that integrates online and offline and has a controllable flow

(PRC's 14FYP, CHAPTER 11: Promote green development and promote harmonious coexistence between man and nature; Chapter 39: Accelerating the Green Transformation of Development Mode; Section 2: Build a resource recycling system)

十四五”规划“全面推行循环经济理念，构建多层次资源高效循环利用体系。”

- 深入推进园区循环化改造，补齐和延伸产业链
- 规范发展再制造产业
- 加快发展种养有机结合的循环农业。
- 推行生产企业“逆向回收”等模式
- 拓展生产者责任延伸制度覆盖范围。
- 推进快递包装减量化、标准化、循环化。
- 完善城市废旧物品回收分拣体系
- 建立健全线上线下融合、流向可控的资源回收体系

(中华人民共和国国民经济和社会发展第十四个五年规划，第十一篇推动绿色发展　促进人与自然和谐共生；第三十九章　加快发展方式绿色转型；第二节: 构建资源循环利用体系)

Solid Waste Management Improvement in the PRC中华人民共和国固体废物管理改进

Previous and Current ADB Operations in Circular Economy
亚行之前和现在在循环经济方面的业务

Clean and Sustainable Ocean Initiative and Plastic Pollution Reduction
清洁和可持续海洋倡议和减少塑料污染

Circular economy industrial parks supporting industrial symbiosis
支持工业共生的循环经济产业园

Circular agriculture and bio-economy
循环农业与生物经济

Solid Waste Management: improvements **with 3R/5R principles and increased segregation, and recycling rates and decreased landfilling, and optimized waste-to-energy** inclusive of collection, management and treatment with characterization and segregation, mining of old dumpsites, kitchen-waste management pilot, construction and demolition waste management. Also waste-to-energy investment support to private sector.
固体废弃物管理:采用**3R/5R原则进行改进，改善分类，提高回收利用率，减少填埋，优化废弃物转化为能源**，包括收集、管理和处理，并进行分类和分离，挖掘旧垃圾场，厨余垃圾管理试点，建筑和拆除垃圾管理。同时向私营部门提供废弃物转化为能源的投资支持。

Water supply and Wastewater management: water efficiency improvements inclusive of non-revenue-water reduction, treated wastewater reuse, sludge treatment and use in many urban and rural projects
供水和废水管理:提高用水效率，包括减少非收入用水、处理过的废水再利用、污泥处理以及在许多城市和农村项目中的使用

River pollution reduction, river rehabilitation and flood risk management: water quality improvement increases higher level of water usability and retaining value of otherwise damaged areas, infrastructure and assets, and river greenways increases land value and enables local recreation and reduces the urge for travel
减少河流污染、河流修复和洪水风险管理:水质的改善提高了水的可用性，保留了原本被破坏的地区、基础设施和资产的价值，河流绿道增加了土地价值，使当地的娱乐活动得以进行，减少了旅行的冲动。

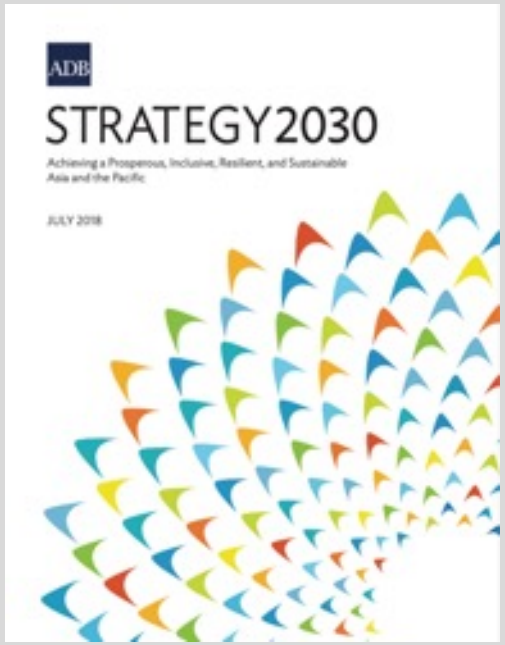
Sponge city projects: local rainwater recovery and reuse (in addition to river works above)
海绵城市项目:当地雨水回收再利用(除以上河流工程外)

Mining and land remediation and wetland rehabilitation: follows principle of bringing back land to higher value uses as brownfield redevelopment
采矿、土地修复和湿地恢复:遵循将土地作为棕地再开发重新用于更高价值用途的原则

Sustainable urban mobility, public transport, non-motorized transport, road safety and road maintenance
可持续城市交通、公共交通、非机动交通、道路安全和道路养护

Energy efficiency, local energy cycles and renewable energy generation
能源效率、当地能源循环和可再生能源发电

Selected CE Related ADB Strategies and Papers
与循环经济相关的亚行战略和文件选编



https://www.adb.org/documents/strategy-2030-prosperous-inclusive-resilient-sustainable-asia-pacific
循环经济符合亚行的2030战略，所有业务重点，特别是业务重点3，4，5，6
循环经济也支持亚行的清洁和可持续海洋倡议

https://www.adb.org/sites/default/files/institutional-document/684081/prc-cps-2021-2025.pdf

https://www.adb.org/publications/urban-mining-green-circular-economy-prc

https://www.adb.org/projects/documents/prc-54065-001-tar

https://www.adb.org/publications/waste-to-energy-age-circular-economy-handbook

https://www.adb.org/sites/default/files/institutional-document/659991/waste-energy-age-circular-economy-compendium.pdf

Concept: Circularize Four Linear Activity Areas
基础：循环四个线性活动区域

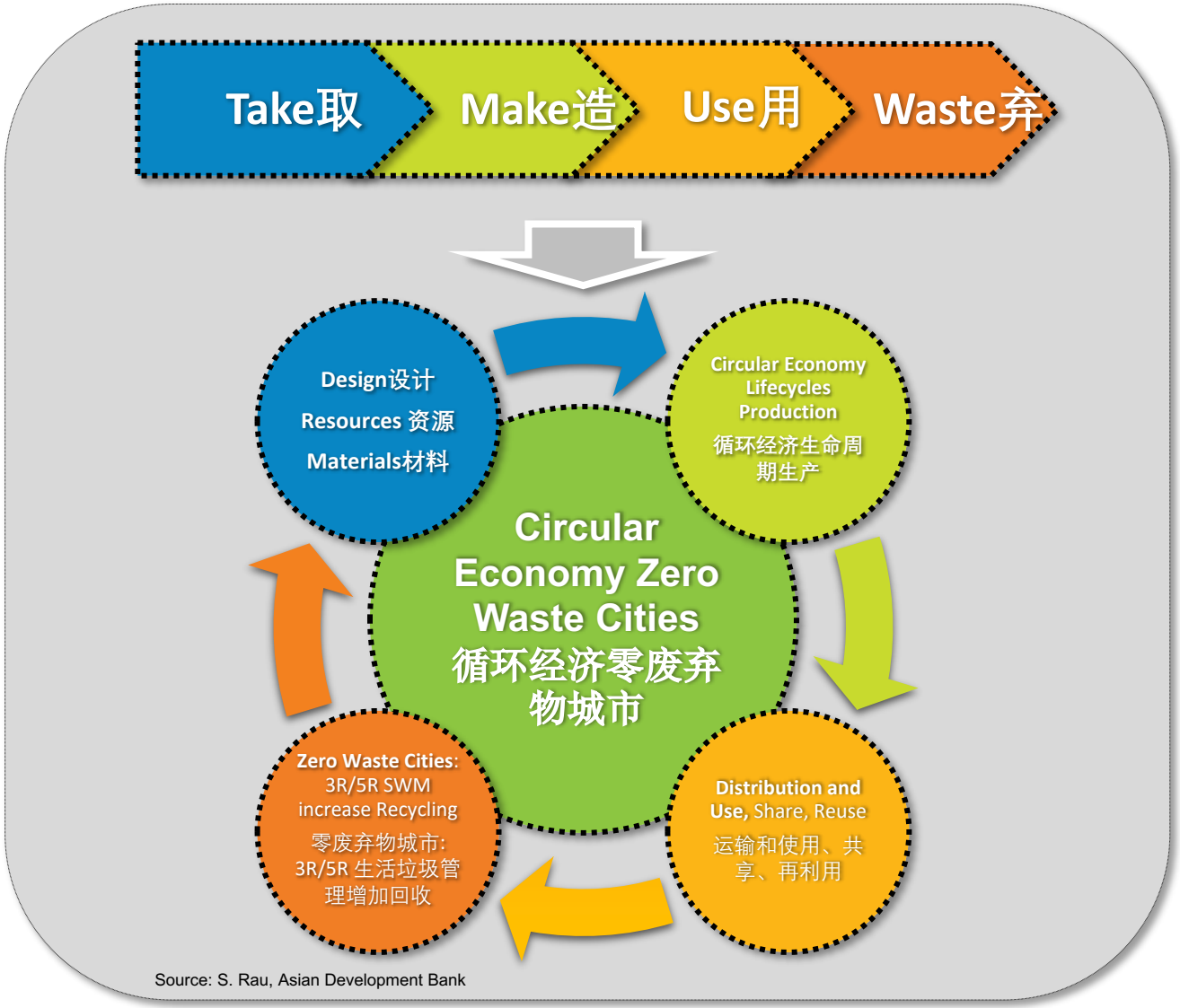
For the PRC we have prepared a roadmap for circular economy as one of five frameworks to guide implementation of the country partnership strategy 2020-2025 and we have a related TA under implementation.
在中国，我们正在制定循环经济路线图，作为指导最近批准的国家伙伴关系战略实施的五个框架之一，我们正在实施一个技术援助。

We conceptualize this through four areas of activity we support as transformation from the linear take-make-use-waste model into a circular system.
我们通过我们支持的四个活动领域将这一点概念化，即从线性取-用-弃的模式转变为循环系统。

Arrows in this simplified diagram should go both ways.
这个简化图中的箭头应该是双向的。

We are building on the original work by, among others, Michael Braungart with biological and technical cycles and the cradle-to-cradle concept and on international best practice cases from Asia, Europe, Oceania and US.
我们以迈克尔·布劳恩加特等人的原创作品为基础，采用生物和技术循环以及从摇篮到摇篮的理念，并借鉴亚洲、欧洲、大洋洲和美国的国际最佳实践案例

And we build on the fundamental work by UNEP, UNIDO, OECD, European Union (i.e. CE Action Plan) Ellen MacArthur Foundation, and the PRC government, and others.
我们以联合国环境署、工发组织、经合组织、欧盟(即循环经济行动计划)埃伦·麦克阿瑟基金会、中国政府和其他机构的基本工作为基础。



Source: S. Rau, Asian Development Bank

Integrate Top-Down and Grass-Roots Approaches
整合自上而下和自下而上的方法

Circular Economy Zero Waste Cities (CEZWC)
循环经济零废弃物城市(CEZWC)

Institutions, Policies, Standards, Governance, Taxes, Incentives, Disincentives, Education and Capacity Development, R&D, IT Platform, Engage Private Sector, Develop business models, Promote Behavior Change in Community

机构、政策、标准、治理、税收、激励、抑制、教育和能力发展，研发，信息技术平台，私营部门参与，发展商业模式，促进社区行为改变

Design, Resources and Materials Input
设计，资源和材料投入

Lifecycle design of products and processes
产品和过程的生命周期设计
Component reuse from disassembly
从拆卸中重用组件
Materials from renewable sources and from urban mining and recycling
来自可再生资源以及城市采矿和回收的材料
Input from sustainable extraction as still needed
仍然需要来自可持续开采的投入

Source: S. Rau, Asian Development Bank

Circular Economy Lifecycles Production
循环经济生命周期生产

Bio-economy agriculture
生物经济农业
Circular urban planning, infrastructure, buildings
循环城市规划、基础设施、建筑
Circular industrial parks with industrial synergies and lifecycles production
具有产业协同效应和生命周期生产的循环工业园区
Circular economy in energy
能源方面的循环经济
Circular economy in transport, vehicles
交通、车辆中的循环经济

Distribution and Use, Share, Reuse
运输和使用、共享、再利用

Reusable packaging and circular logistics
可重复使用的包装和循环物流
EPR (extended producer responsibility), repair, reuse, replacement
生产者延伸责任，修理，再利用，更换
Sharing economy pilots and mainstreaming
共享经济试点和主流化
Products as service pilots
产品即服务试点
Viable Business Models
商业模式

Zero Waste Cities
零废弃物城市

Improved household waste management 3R/5R
改善家庭生活垃圾管理3R/5R
Increased recycling rates and local materials reuse
提高再循环率和当地材料再利用
Construction and demolition waste management
建筑和拆除垃圾管理
Kitchen/organic waste management
厨余/有机垃圾管理
Medical waste management
医疗废弃物管理

ADB

Circular Economy Zero Waste Cities (CEZWC)
循环经济零废弃物城市(CEZWC)

Avenue 1: ADB Roadmap and TA promote Circular Economy Zero Waste Cities – initiate policies and pilots
途径1: 亚行路线图和技术援助促进循环经济零废弃物城市——初始政策和试点

Avenue 2: Institutions, Policies, Standards, Governance, Taxes, Incentives, Disincentives
途径2: 机构、政策、标准、治理、税收、激励，抑制

Avenue 3: Education and Capacity Development, R&D, IT Platform
途径3: 教育和能力发展、研发、信息技术平台

Avenue 4: Engage Private Sector, Develop business model
途径4: 私营部门参与，发展商业模式

Avenue 5: Promote Behavior Change in Community
途径5: 促进社区行为改变

Source: S. Rau, Asian Development Bank

Circular Economy Zero Waste Cities (CEZWC)
循环经济零废弃物城市(CEZWC)

Avenue 1: ADB Roadmap and TA promote Circular Economy Zero Waste Cities – initiate policies and pilots
路线1：亚行路线图和技援项目促进循环经济无废城市建设——提出政策、启动试点

Avenue 1, Step 1: Develop ADB CE Roadmap with NDRC and MOF and define objectives, knowledge activities and lending pipeline
路线1-第1步：与国家发改委和财政部共同制定亚行循环经济路线图，并明确目标、知识活动和贷款渠道

Avenue 1, Step 2: Implement TA on Circular Economy Zero Waste Cities in the PRC and initiate policies and pilots
路线1-第2步：实施“促进中国循环经济无废城市建设”技援项目，并提出政策、启动试点

Circular Economy Zero Waste Cities (CEZWC)
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Avenue 1, Step 2: Implement TA on Circular Economy Zero Waste Cities in the PRC and initiate policies and pilots
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ADB Technical Assistance Circular Economy Zero Waste Cities in the PRC, approved in 2020

The TA will conceptually and programmatically link into biological and technical cycles current linear upstream, midstream, and downstream processes.

(i) **Green circular industrial production plan of Qinghai Province advanced -** targeting upstream heavy industrial production with raw material processing.

(ii) **Zero municipal waste action plan for Guangdong Province developed -** targeting downstream waste management, increase recycling and resource recovery in highly developed urban centers with state-of-the-art light industry manufacturing and services, and less-developed rural towns displaying differentiated levels and patterns of consumption and waste generation.

(iii) **Green circular e-commerce packaging and logistics pilot program for the People's Republic of China developed.** pilot cities of different sizes and development levels will be working together with industry partners to circularize midstream e-commerce packaging and logistics

(iv) **Capacity and institutions to implement green circular economy in the People's Republic of China enhanced -** above three outputs will be linked and lessons drawn for policies, technical guidance, and business models aiming at green circular economy zero waste cities.

亚行“促进中国循环经济无废城市建设”技援项目，2020年获批

该技援项目将从概念上和程序上将生物循环和技术循环链入当前线性的上中下游过程。

(i) **推进青海省绿色循环工业生产计划**——针对上游进行原材料加工的重工业生产。

(ii) **制定广东省无废城市建设行动计划**——针对下游废弃物管理，在拥有先进轻工制造业和服务业的高度发达城市中心以及消费和废弃物产生水平及模式存在差异的欠发达农村城镇，加强循环利用和资源回收。

(iii) **制定中国绿色循环电商包装和物流试点方案**——不同规模和发展水平的试点城市将与行业伙伴合作，推动中游电商包装和物流的循环化。

(iv) **增强中国实施绿色循环经济的能力和制度**——上述三项成果相互关联，为旨在打造绿色循环经济无废城市的政策、技术指导和商业模式提供借鉴。

Circular Economy Zero Waste Cities (CEZWC)
循环经济零废弃物城市(CEZWC)

Avenue 2: Institutions, Policies, Standards, Governance, Taxes, Incentives, Disincentives
路线2：制度、政策、标准、治理、税收、激励措施、抑制措施

Avenue 2, Step 1: Engage national, provincial and local governments
路线2-第1步：与国家、省级和地方政府合作

Avenue 2, Step 2: Support development of policies, standards, and market-based instruments like incentives and disincentives
路线2-第2步：为制定政策、标准和市场手段（如激励和抑制措施）提供支持

Avenue 3: Education and Capacity Development, R&D, IT Platform
路线3：教育和能力建设、研发、IT平台

Avenue 3, Step 1: Engage national, provincial and local governments
路线3-第1步：与国家、省级和地方政府合作

Circular Economy Zero Waste Cities (CEZWC)
循环经济零废弃物城市(CEZWC)

Avenue 4: Engage Private Sector, Develop business model
路线4：与私营部门合作，制定商业模式

Avenue 4, Step 1: Engage national, provincial and local governments
路线4-第1步：与国家、省级和地方政府合作

Avenue 5: Promote Behavior Change in Community
路线5：促进社区行为改变

Avenue 5, Step 1: Engage communities and people and raise awareness and showcase and promote positive behavior
路线5-第1步：推动社区和民众参与，提高公众意识，展示并促进积极行为

Top-Stream: Design, Resources, Materials Input
顶流: 设计，资源，材料投入

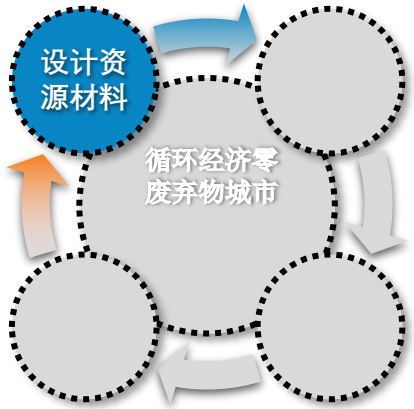
Avenue 1: Promote Lifecycle design of products and processes product longevity, "disassemblability", repairability
途径1: 促进产品和过程的生命周期设计产品寿命、"可拆卸性"、可维修性

Avenue 2: Component reuse from disassembly
途径2: 从拆卸中重用组件

Avenue 3: Materials input from renewable sources and from urban mining and recycling
途径3: 来自可再生资源以及城市采矿和回收的材料投入

Avenue 4: Material input from sustainable extraction as still needed
途径4: 仍然需要来自可持续开采的投入

Source: S. Rau, Asian Development Bank



Ave. 3, Past: TA Policy on Circular Economy Qinghai
路线3-过去：“青海省循环经济发展政策”技援项目

ADB Technical Assistance approved in 2011

The provincial economy is heavily dependent on mineral and natural resource exploitation to produce iron and steel, oil and natural gas, and nonferrous and rare earth metals. These damaged natural environment, causing soil and vegetation degradation, desertification, increased salinization, and decline in available underground and surface water. Qinghai promotes circular economic as strategy to mitigate environment degradation and fundamentally transform economic development.

Three outputs:

(i) comprehensive review of Chaidamu Circular Economy Pilot Zone conducted and strategy and action plan developed;
(ii) monitoring and evaluation system for circular economy development in Qinghai Province established; and
(iii) policy recommendations on promoting circular economic development in Qinghai Province proposed.

Policy recommendations included:

(i) optimizing industrial policies and organization, promoting synergetic development of industrial parks, prioritizing SMEs, and accelerating development of a new industrial system;
(ii) optimizing economic policies, including finance, investment policies, pricing policies, government procurement policies, and waste reuse policies;
(iii) optimizing talent policies, empowering human capital and allocation, talent development and promotion, institutionalizing talent clustering;
(iv) optimizing science and technology policies and innovation capacity especially in priority fields, reinforcing commercialization of science and technology outcomes, innovation platforms, and opening and exchange; and
(v) optimizing social policies, including developing multiple incentives, promoting sharing economy, encouraging green consumption, promoting green buildings, advocating green travelling, developing a recycling system, and establishing circular economy communities.

Ave. 3, Past: TA Policy on Circular Economy Qinghai
路线3-过去：“青海省循环经济发展政策”技援项目

亚行技援项目于2011年获批

青海省经济严重依赖矿产和自然资源开采，主要生产钢铁、石油天然气以及有色金属和稀土金属。这种模式破坏了自然环境，导致土壤和植被退化、荒漠化、盐渍化加剧、可用的地下水和地表水减少。青海省决心推进循环经济战略，以减缓环境退化，并从根本上转变经济发展模式。

该技援项目的三大成果：

(i) 对柴达木循环经济试验区进行了综合检查，并制定了战略和行动计划；
(ii) 构建了青海省循环经济发展监测评价体系；
(iii) 提出了一系列有助于促进青海省循环经济发展的政策建议。

相关政策建议包括：

(i) 优化产业政策和结构，促进产业园区协同发展，优先发展中小企业，加快构建产业新体系；
(ii) 优化经济政策，包括金融和投资政策、价格政策、政府采购政策、废物再利用政策；
(iii) 优化人才政策，赋能人力资本和配置、人才发展和提升，使人才集群制度化；
(iv) 优化科技政策，提升科技创新能力，特别是重点领域的创新能力；促进科技成果转化、创新平台商业化；加强科技开放交流；
(v) 优化社会政策，包括建立多元化的激励机制、促进共享经济发展、鼓励绿色消费、推广绿色建筑、倡导绿色出行、构建循环利用体系、建设循环经济社区等。

Upstream: Circular Economy Lifecycles Production
上游：循环经济生命周期生产

Avenue 1: Bio-economy agriculture
途径1: 生物经济农业

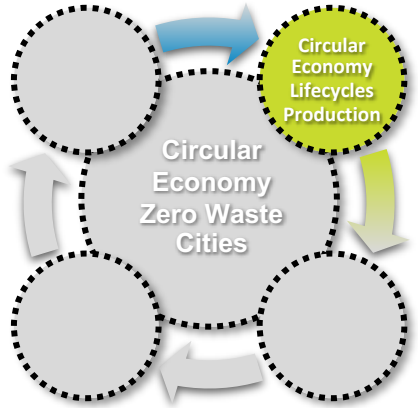
Avenue 2: Circular urban planning (brownfield redevelopment), infrastructure, buildings (adaptive reuse, disassembly)
途径2: 循环城市规划(棕地再开发)，基础设施、建筑(适应性重用、拆卸)

Avenue 3: Circular industrial parks with industrial synergies and lifecycles production
途径3: 具有产业协同效应和生命周期生产的循环工业园区

Avenue 4: Circular economy in energy
途径4: 循环经济在能源行业

Avenue 5: Circular economy in transport, vehicles
途径5: 交通、车辆中的循环经济

Source: S. Rau, Asian Development Bank



Ave. 1, Step 1: Circular Bio-Economy for Rural Vitalization
路线1-第1步：发展循环生物经济，推进乡村振兴

Circular bioeconomy in primary industry
agriculture, forestry and fisheries as key rural vitalization initiative aiming at: food security, climate resilience, environmental sustainability and rural prosperity.

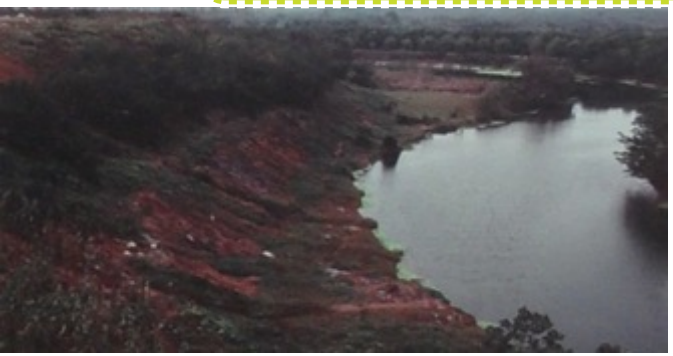
Production of renewable biological resources and use as value-added products and conversion of waste stream back into the value chain, such as food, feed, bio-based products, and bioenergy; organic waste composting registration and licensing of firms, brands, and products.

TA: Agriculture Green Production and Waste Management is scaling up comprehensive use of rural biological resources.

循环生物经济在第一产业中的应用
农业、林业和渔业举措是乡村振兴的关键，旨在实现粮食安全、气候韧性、环境可持续性和乡村繁荣。
生产可再生生物资源并用作增值产品，让废物流重新进入价值链，如食物、饲料、生物基产品和生物能源；有机废物堆肥实行公司、品牌和产品登记及许可制度。
“农业绿色生产和废物管理”技援项目正逐步扩大农村生物资源的综合利用。**吉林市松花湖**项目用有机废物和人畜粪便制造堆肥，并推进秸秆综合利用。

Source: EU (2018) Updated Bioeconomy Strategy
资料来源：欧盟（2018）新版生物经济战略

Ave. 2, Step 1: Anhui Hefei Rehabilitation of Former Landfill Site
路线2-第1步：安徽合肥市垃圾填埋场生态修复项目



Anhui Hefei Urban Environment Improvement Project (ADB loan completed)
Landfill remediation and closure along a river: before and after…

安徽合肥城市环境改善项目（亚行贷款，已完工）
河畔垃圾填埋场关停和生态修复工程：之前和之后……

Ave. 2, Step 2: Heilongjiang Green Urban Economic Revitalization
路线2-第2步：黑龙江省绿色城市和经济振兴项目

- ADB loan catalyzes **economic transformation to a non-coal economic future** of four coal-based cities in East Heilongjiang and urban transformation from dirty coal-mining cities to livable, green and clean cities.
- **Mining remediation** strategies and pilot projects cleaning up and make available for reuse
- of environment that is polluted from more than 60 years of coal-mining and industries.
- 亚行贷款项目促进黑龙江省东部四大煤城向**非煤经济转型**，同时推动城市从污染严重的煤城向宜居、绿色、
- 清洁、有吸引力的新城转型。
- **矿山修复**策略和试点项目对因60余年煤矿开采而备受污染的环境进行清理，使之恢复使用功能。

Ave. 2, Step 3: Treated Wastewater Reuse: ADB TA and Loan
路线2-第3步：污水处理回用：亚行技援和贷款

Urban Wastewater Reuse and Sludge Utilization Policy Study (TA 7083-PRC)

The TA focused on the development of:

- policy recommendations related to planning procedures and regulations, technology applications, and institutional capacity for promoting wastewater reuse; and
- a national policy framework for the promotion of beneficial sludge utilization.

The policy study has played a catalytic role in promoting policy innovation to regulate and promote beneficial sludge utilization and wastewater reuse. Consistent with the recommendations of the policy study, MOHURD and the National Development and Reform Commission have published the National Technical Guideline for Urban Sewage Sludge Treatment and Disposal (Trial) in March 2011.

This TA also enabled private sector engagement.

Beijing Enterprises Water Group Limited and BEWG Environmental Group Company Limited Wastewater Treatment and Reuse Project

ADB Private Sector Operations loan. A-loan $120 million and B-loan $288 million.

Loans supported acquisition and operation of wastewater treatment plants, which treated 760 million tons of wastewater to grade 1A standard annually and reused 40 million tons, helping to reduce water pollution and increase water use efficiency. Project also helped improve energy efficiency in wastewater treatment and reuse. In 2015, BEWG conducted 96 technological transformation projects, which saved in total 12.69 million kilowatt-hours of electricity and about 6% in chemicals used for treatment.

ADB enabled BEWG secure a large credit facility on its own and become more independent from its parent, enhancing market confidence in BEWG's capacity.

Ave. 2, Step 3: Treated Wastewater Reuse: ADB TA and Loan
路线2-第3步：污水处理回用：亚行技援和贷款

“城市污水回用和污泥利用政策研究”技援项目（TA 7083-PRC）

该技援项目的重点是：

- 编制有关促进污水回用的规划程序和法规、技术应用及机构能力方面的政策建议；
- 制定有关促进污泥资源化利用的国家政策框架。

该项政策研究有效推动了政策创新，规范并促进了有益的污泥利用和污水回用。根据该政策研究的建议，住建部和国家发改委于2011年3月联合发布了《城镇污水处理厂污泥处理处置技术指南（试行）》。

该技援项目还促成了私营部门参与。

北控水务集团有限公司和北控中科成环保集团有限公司污水处理回用项目

亚行私营部门业务局提供贷款，其中 A类贷款1.2亿美元，B类贷款2.88亿美元。

贷款被用于支持污水处理厂的收购和运营，这些污水处理厂每年处理7.6亿吨污水，使之达到一级A标准，回用污水达4,000万吨，帮助减少水污染并提高用水效率。该项目还帮助提高了污水处理和回用的能源效率。2015年，北控水务集团共实施技术改造项目96个，累计节约电力1,269万千瓦时，减少使用水处理化学品6%。

亚行贷款使北控水务集团能够独立获得大额信贷融资，更加独立于其母公司，增强了市场对其能力的信心。

Ave. 2, Step 1: Nanjing Qinhuai River Environment Improvement
路线2-第1步：南京秦淮河环境改善项目

ADB loan project improves urban environment, public health, quality of life of residents and businesses and management of surface water resources in Nanjing.
亚行贷款项目改善了南京的城市环境、公共卫生、居民和企业的生活质量以及地表水资源的管理。

Mid-Stream Distribution and Use, Share, Reuse
中游--运输和使用、共享、再利用

Avenue 1: Reusable packaging and circular logistics
途径1: 可重复使用的包装和循环物流

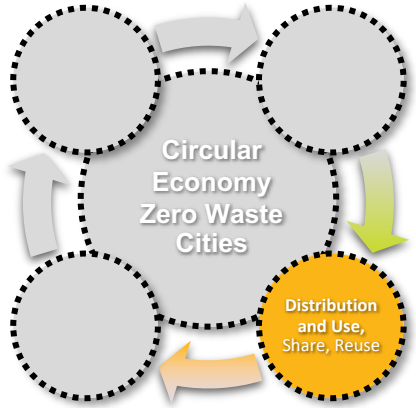
Avenue 2: EPR (extended producer responsibility), repair, reuse, replacement
途径2: 生产者延伸责任，修理，再利用，更换

Avenue 3: Sharing economy pilots and mainstreaming
途径3: 共享经济试点和主流化

Avenue 4: Products as service pilots
途径4: 产品即服务试点

Avenue 5: Business Models to ensure private investments in CE
途径5: 确保私人投资于循环经济的商业模式

Source: S. Rau, Asian Development Bank



Ave 2, Step 1: midstream (upstream – downstream): Plastics
路线2-第1步：中游（上游—下游）：塑

RETA: Promoting Action on Plastic Pollution from Source to Sea in Asia and the Pacific
区域性技术援助：推动亚太地区从源头到海洋的塑料污染防治行动

Activities:

- Government led national and city action plans
- National Financing Roadmaps and task forces
- Policy and regulatory reforms to stimulate circular economy and promote 3R
- Plastic pollution reduction investments and pilot demonstrations (e.g. Integrated SWM, behavior change, support for local circular business models and women's economic empowerment)
- Studies on investment needs; technology solutions; circular economy and green jobs potential; sustainable and innovative financing solutions
- Circular business hub and test facility in Indonesia
- Knowledge-sharing workshops, regional cooperation, cross-country site visits, city twinning.

Status: TA Cluster and Subproject 1 approved, Subproject 2 proposed for 2021
Amount: $13 million total ($8 million Indonesia project)
Duration: December 2019 – June 2023
Participating countries: Indonesia, Myanmar, Philippines, Thailand, Viet Nam, with regional knowledge sharing
Key partners: Governments of Japan and Korea; Global Environment Facility; Global Plastics Action Partnership; WWF, ADB sub-regional cooperation programs

Ave 2, Step 1: midstream (upstream – downstream): Plastics
路线2-第1步：中游（上游—下游）：塑

RETA: Promoting Action on Plastic Pollution from Source to Sea in Asia and the Pacific
区域性技术援助：推动亚太地区从源头到海洋的塑料污染防治行动

活动：

- 政府主导的国家和城市行动计划
- 国家融资路线图和特别工作组
- 实施政策改革和监管改革，刺激循环经济发展，倡导循环经济的“3R”原则
- 推动减少塑料污染的投资和试点示范（如固体废弃物综合管理、行为改变、支持当地循环商业模式和女性经济赋权）
- 投资需求研究；技术解决方案；循环经济和绿色就业潜力；可持续的创新融资解决方案
- 在印度尼西亚建设循环商业中心和检测设施
- 知识共享研讨会、区域合作、跨国实地考察、城市结对共建。

状态：技援群组项目和子项目1已获批准；子项目2拟于2021年实施

金额：合计1,300万美元（其中，印尼项目800万美元）

期限：2019年12月—2023年6月

参与国：印度尼西亚、缅甸、菲律宾、泰国、越南，通过区域知识共享的方式

主要合作伙伴：日本和韩国政府、全球环境基金、全球塑料行动合作伙伴、世界自然基金会、亚行多个次区域合作计划

Down-Stream Zero Waste Cities: 3R/5R SWM increase
下游零废弃物城市: 3R/5R 生活垃圾管理改善

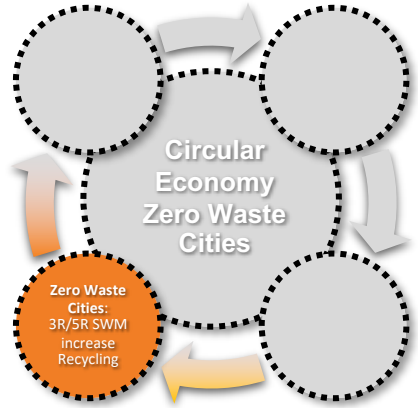
Avenue 1: Improved household waste management 3R/5R
途径1: 改善家庭生活垃圾管理3R/5R

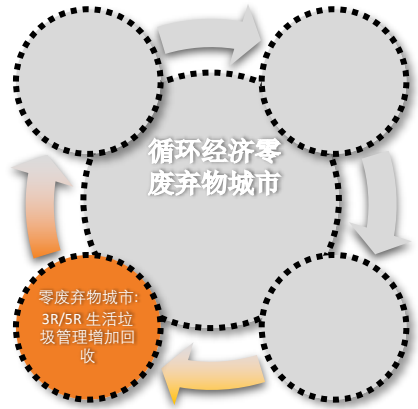
Avenue 2: Increased recycling rates and local materials reuse
途径2: 提高再循环率和当地材料再利用

Avenue 3: Construction and demolition waste management
途径3: 建筑和拆除垃圾管理

Avenue 4: Kitchen/organic waste management
途径4: 厨余/有机垃圾管理

Avenue 5: Medical waste management
途径5: 医疗废弃物管理





Source: S. Rau, Asian Development Bank

Ave. 1, Steps 1/2: Manage Solid Waste, Land, Urban Mining: Hunan
路线1-第1/2步：固体废物、土地、城市采矿管理：湖南

Hunan Xiangjiang River Watershed Existing Solid Waste Comprehensive Treatment ADB Loan Project

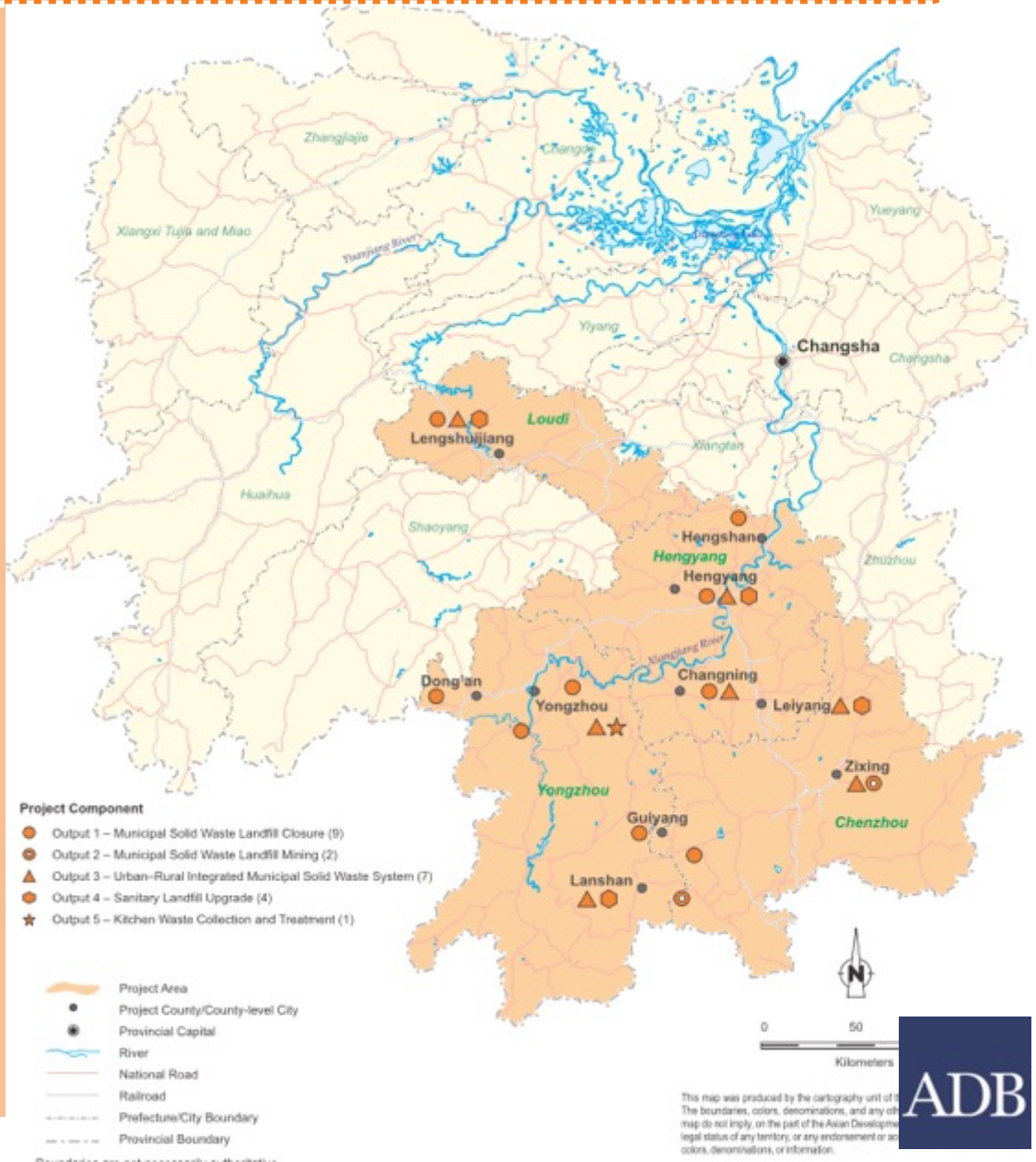
ADB loan project improves environment in Xiangjiang River watershed in Hunan and reduces pollutants discharge to Xiangjiang River and directly benefit 6.9 million people and more indirectly.

- **Substandard municipal solid waste landfills closed, and/or mined and remediated.**
- **New urban–rural integrated municipal solid waste management systems established.**
- **Sanitary landfill facilities upgraded.**
- **New kitchen waste treatment and management system established.**

湖南省湘江流域存量垃圾综合治理及固废处理项目

亚行贷款项目改善了湖南湘江流域的环境，减少了排放至湘江的污染物，直接受益人口690万，间接受益人口无数。

- **对不符合标准的城市固体废物填埋场进行关停和/或开采和修复。**
- **建立城乡一体化的新型城市固体废弃物管理体系。**
- **对清洁卫生型垃圾填埋设施进行升级改造。**
- **建立新型厨余垃圾处理和管理体系。**



Ave. 1, Step 3: Scaled Waste to Energy
路线1-第3步：大规模推进垃圾焚烧发电项目建设

1. ADB Private Sector Operations loan to China Everbright Environmental Energy Limited
Loan of $200 million for PRC with six investments in Waste to Energy plants plus $100 million for Viet Nam.
2. ADB Private Sector Operations loan to SUS Environment to invest in Waste to Energy plants in eco-industrial parks in 2nd and 3rd tier cities.

Use of advanced technologies including advanced flue gas emission control systems meeting EU emissions standards. This project supports the construction and operation of a portfolio of SUS Environment's WtE plants. The proceeds of ADB loan of $100million will be channeled into portfolio of subprojects as project equity which is not available from the local commercial banks.

1.亚行私营部门业务局向中国光大环保能源有限公司提供贷款。其中，2亿美元用于在中国投资六个垃圾焚烧发电厂，1亿美元用于推进越南的垃圾焚烧发电项目。
2.亚行私营部门业务局向上海康恒环境股份有限公司提供贷款，用于在二三线城市的生态工业园区投资垃圾焚烧发电厂。

贷款还促进了先进技术的使用，包括符合欧盟排放标准的先进烟气排放控制系统。该项目为康恒环境的垃圾焚烧发电厂项目的建设和运营提供支持。亚行1亿美元贷款的收益将作为项目股本投入子项目，这是当地商业银行无法做到的。

Support Institutional Strengthening
支持机构强化

Institutionalization of cross-sector coordination and cooperation

(i.e. working group established among concerned national ministries and related local agencies, think tanks and academia)

跨部门协调与合作的制度化

(即在相关国家部委和相关地方机构、智库和学术界之间建立的工作组)

Simultaneous multilevel engagement

(national, provincial and municipal pilots)

同时多级参与

(国家级、省级和市级试点)

Policies, standards, governance

(taxes, market-based instruments with incentives, disincentives, education, technical training, capacity development, R&D, IT Platform, monitoring, and enforcement)

政策、标准、治理

(税收、基于市场的激励、抑制手段、教育、技术培训、能力发展、研发、信息技术平台、监测和执法)

Private sector engagement, business models and pilots, capacity development and education, support R&D

私营部门参与、商业模式和试点、能力发展和教育，支持研发

Community engagement and consumer behavior change

proactively promoted by government and private sector

社区参与和消费者行为改变

政府和私营部门积极推动

Monitoring of Results and Achievements
结果和成就的监测

Institutions strengthened, policies and governance improved as result of lessons learned from the pilot program and policy dialogue, digital platform installed
由于从试点项目和政策对话中吸取的经验教训，机构得到加强，政策和治理得到改善，数字平台得到安装

Circular Economy Zero Waste Cities Program and Pilots implemented and lessons for a number of key challenges captured from successes and failures
实施了循环经济零废弃物城市计划和试点项目，并从成功和失败中吸取了许多关键挑战的经验教训

Waste management improved with 3R/5R principles and increased segregation, and recycling rates and decreased landfilling and optimized waste-to-energy in a number of cities
在一些城市，废弃物管理通过3R/5R原则得到改善，分类增加，回收利用率提高，填埋减少，废弃物转化为能源得到优化

Private sector engaged resulting in a number of improved product designs with increased durability, reusability, upgradability, reparability, with increased recycled content, more products from remanufacturing eliminated hazardous chemicals, and increased energy and resource and land efficiency, reduced single-use introduced ban on the destruction of unsold durable goods
私营部门的参与带来了一系列改进的产品设计，提高了耐用性、可重复使用性、可升级性和可修复性，增加了回收量，更多的再制造产品消除了危险化学品，提高了能源、资源和土地效率，减少了一次性使用，禁止销毁未售出的耐用品

Improved digitalization, EPR, product-as-a-service, sharing economy in a number of pilots tested
在多个试点中，数字化、生产者责任延伸、产品即服务、共享经济得到了改善

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International Circular Economy Initiatives and ADB's Roadmap for Circular Economy Zero Waste Cities in the People's Republic of China

國際循環經濟倡議和关于中华人民共和国循环经济零废弃物城市亚行的发展路线图

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- Mr. Rau is leading ADB's urban development support to the People's Republic of China (PRC) and significantly contributes to ADB wide urban policy and related publications. He supports city cluster coordination, urban-rural integration, climate change adaptation and sponge cities with nature-based solutions, circular economy zero waste cities.
- He conceptualizes and implements pilot projects for low-carbon climate-resilient healthy and age-friendly city action and management planning to bring out tangible benefits for the globally emerging four-generation urban communities.
- his publications, policy dialogue and project work focus on strategic urbanization policy and integrated economic and urban development project design and implementation, promoting socially inclusive and environmentally livable cities.

- 他是亚行在中国执行“城市发展规划”战略的领导者，为制定城市政策作出了重要贡献。
- 他支持国家城镇化战略、城市群协调、城乡一体化、适应气候变化和海绵城市、循环经济零废物城市、开放空间规划和生态系统保护的政策和制度能力发展。
- 他的著作、出版物、政策对话和项目工作侧重于战略性城市化政策以及综合经济和城市发展项目的设计和实施，促进社会包容和无害环境的宜居城市。

在加入亚洲开发银行之前， 饶士凡领导国际咨询公司团队完成了多个欧洲、北美和亚洲的可持续城市规划、城市设计和大型建筑项目。他曾在德国、美国和中国的大学任教，参与并组织国际规划会议。Stefan获得数学学士学位和建筑、城市规划硕士学位，他也获得德国的注册城市规划师和建筑师资格。

Prior to ADB Stefan led teams in international consultant firms on sustainable urban planning, urban design and large building projects in Europe, North America and Asia. He taught and lectured at universities in Germany, the United States, and the PRC. He published papers, contributed to and organized international planning conferences. Stefan studied in Stuttgart, Bonn and Chicago with an undergraduate in Mathematics and a Masters in Architecture, Urban Planning. He is licensed urban planner and architect in Germany.