A global initiative to prevent plastic waste from entering the seas

05 August 2015

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Plastic is the ultimate single use material and the ocean is the ultimate planetary sink – the status quo will result in 250m m.t of ocean plastic

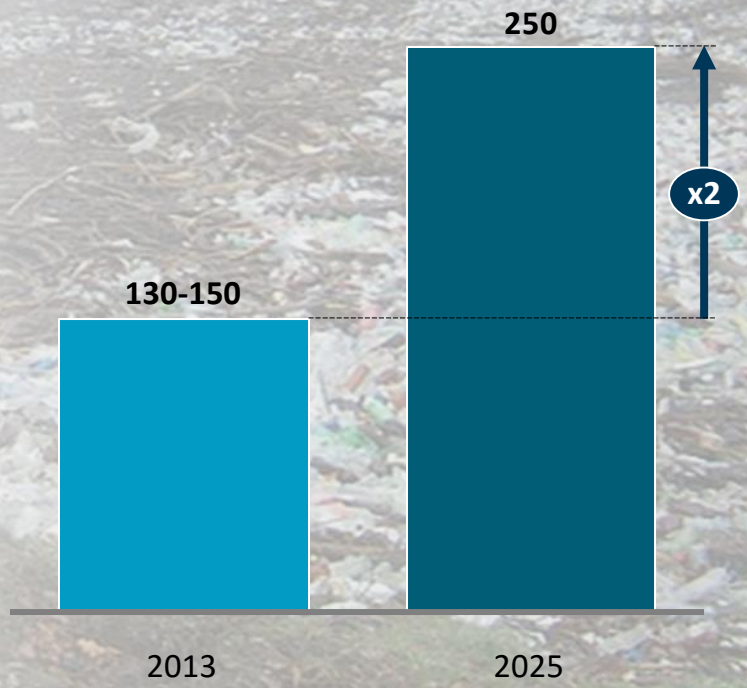
Leading polymer scientists believe plastics never fully degrade in marine environments

Ocean decay into unrecognizable fragments (in years)

Plastic consumption is growing fast with ocean plastic leakage set to reach unsustainable levels if action is not taken

Ocean plastic debris

Million tonnes[1]



1 Model conservatively assumes 2% of plastic produced is leaked into ocean, although some scientists estimate higher levels

SOURCE: Jang et al., 2014; Plastics Europe; Ocean Conservancy; Koelmans et al., 2014; Pham et al., 2014; German Umweltbundesamt (2013). Independent Chemical Information Services (ICIS, 2014)

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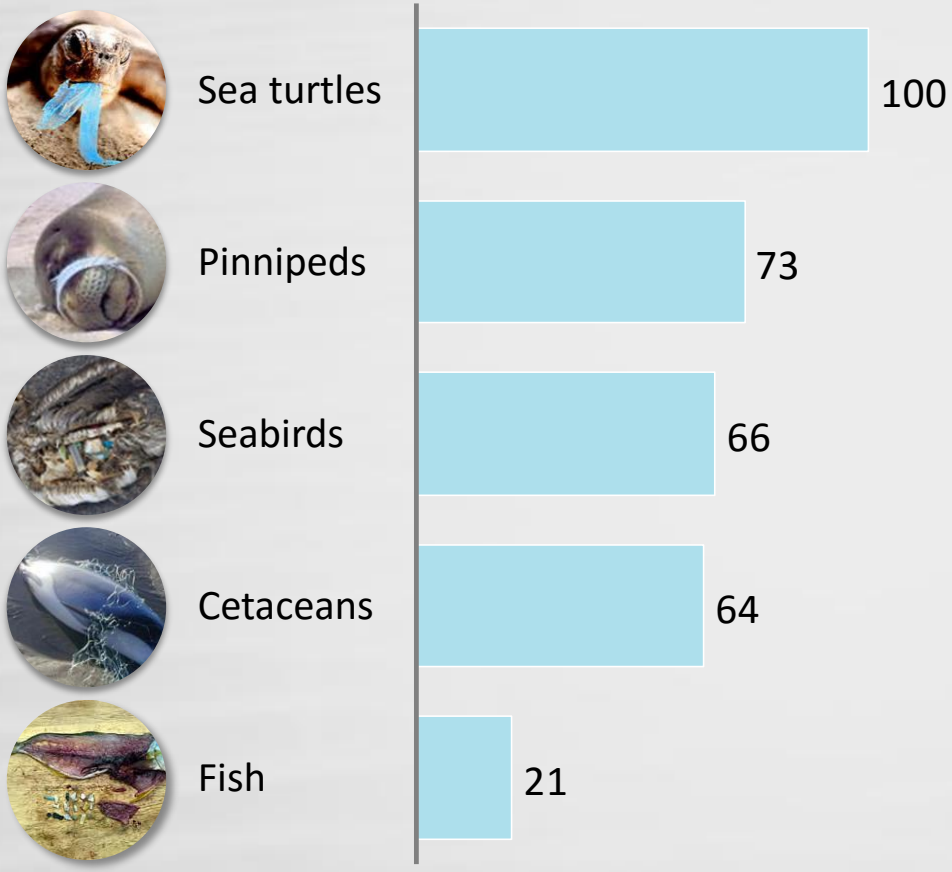
…with far-reaching economic and ecological consequences

Percent of taxa impacted by marine debris[1] %



Beyond, impact on marine life, ocean plastic has **numerous economic implications**

- Fishery challenges
  - Missed fishing opportunities
  - Toxic contamination of fish and subsequent flows to humans
  - Clogged vessel propellers and equipment
- Loss in tourism revenue
- Costs for beach and waterway clean-ups
- Increasing negative plastic stigma potentially leading to negative brand pressure and even de-selection as a packaging material

1 Percent of fish in the pacific central gyre region with ingested plastic

SOURCE: 2012 Convention on Biological Diversity report; press search; Plastic ingestion by planktivorous fishes in the North Pacific Central Gyre; Choy and Drazen 2013, Marine Ecology Progress Series; Beorger et al. 2010, Marine Pollution Bulletin; Davison and Asch 2011, Marine Ecology Progress Series

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Ocean Conservancy is leading the largest effort in history to solve this problem, with a broad coalition of industry, governments and NGOs…

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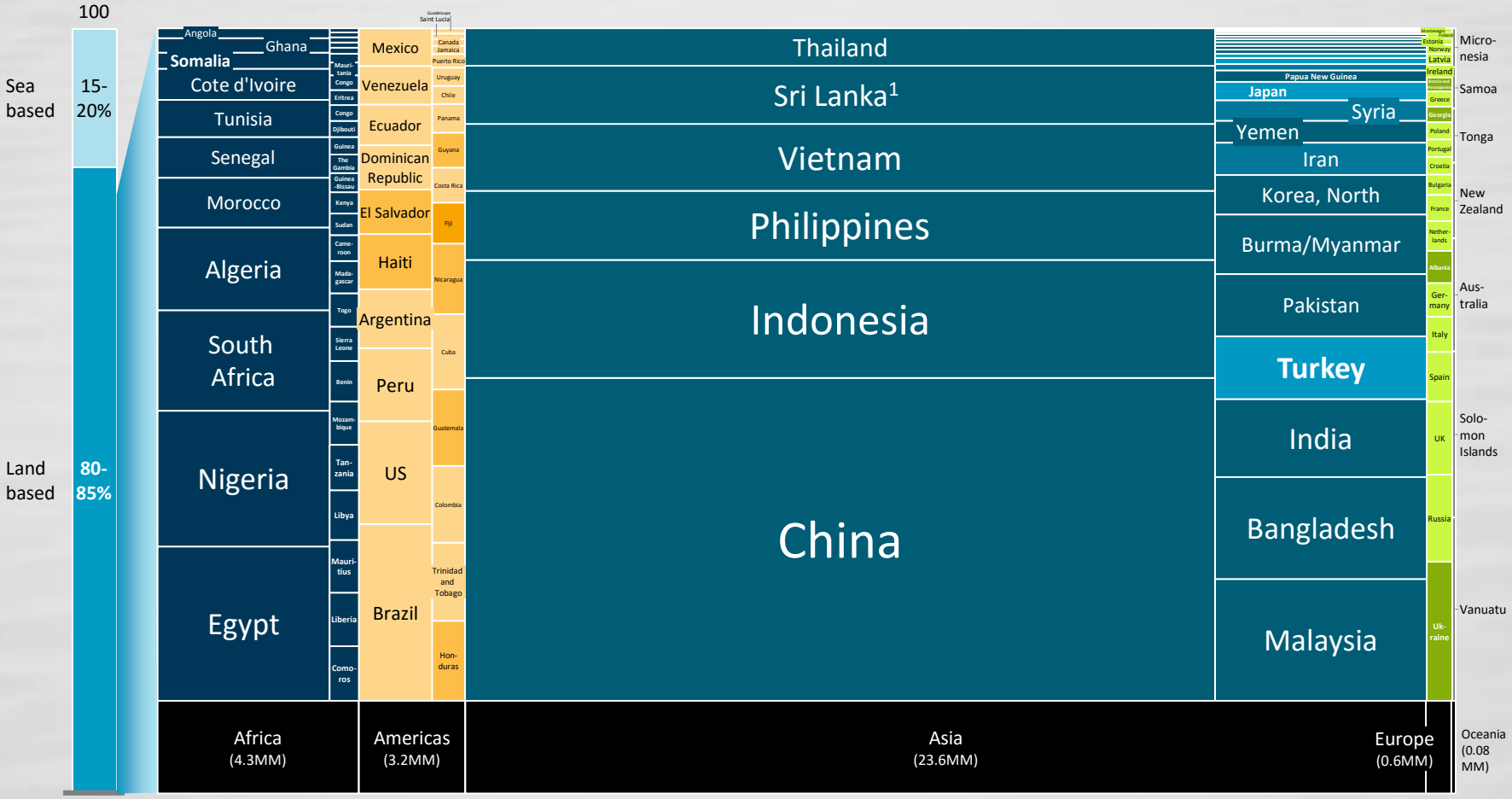
We leveraged research published in *Science,* which quantified leakage sources for the first time…

Size of box indicates contribution to global ocean leakage

SWM effectiveness
Most effective
Less effective



1 Our analysis suggests that the leakage contribution of Sri Lanka is smaller than what was originally estimated

SOURCE: "Plastic waste inputs from land into the ocean" - Jambeck, Geyer, Wilcox, Siegler, Perryman, Andrady, Narayan, Law (as published in Science Magazine, February 2015)

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…and conducted a holistic study of the drivers and solutions of the problem, pooling the input of 100+ experts

Since the project kickoff in February 2015 …

… 100+ interviews with (plastics) waste management experts and field visits in the Philippines, China and Hong Kong have been made

USA / EU

spi · agilyx · DSM · WM Waste Management · National Waste & Recycling Association · Kingsbury Ramos · Edmonton · CYNAR · University of Plymouth · American Chemistry Council · DOW · COVANTA · MBA Polymers · McKinsey&Company · Columbia University · SEA · The City College of New York · Moore Recycling Associates Inc · The University of Texas at Austin · Imperial College London · Plastics Recycling Conference · Ocean Breeze Recovery

Philippines

NSWMC National Solid Waste Management Commission · Mother Earth Foundation · Earth Day Network Philippines · Reinheart Marketing · SWAPP Solid Waste Management Association of the Philippines · Greenpeace · PBE Philippine Business for the Environment · ADB · change.org · PPIA · OPAEP · World Economic Forum · The World Bank · Department of Environment and Natural Resources Environmental Management Bureau

China / Hong Kong

CSPA 中国废塑料协会 · 中国环境科学研究院 Chinese Research Academy Of Environmental Scien · 環境保護署 Environmental Protection Department · 中华人民共和国 环境保护部 Ministry of Environmental Protection The People's Republic of China · ZEROWASTE · CMI · SOW Asia Investing in Humanity · Good Fuel Group · ECOZINE · OceanRecovery Personalistic holistic treatment programme relating to stress and dependency disorders · ACC Green Utilities · 清潔香港 Hong Kong Cleanup · JUCCCE 聚思 · China Water Risk · China International Recycling Conference & Exhibition 2014 · Green Island (Holdings) Ltd · ADM Capital Foundation · 環境局 Environment Bureau · Waste Ventures "One Person's Trash Is Another Person's Treasure"

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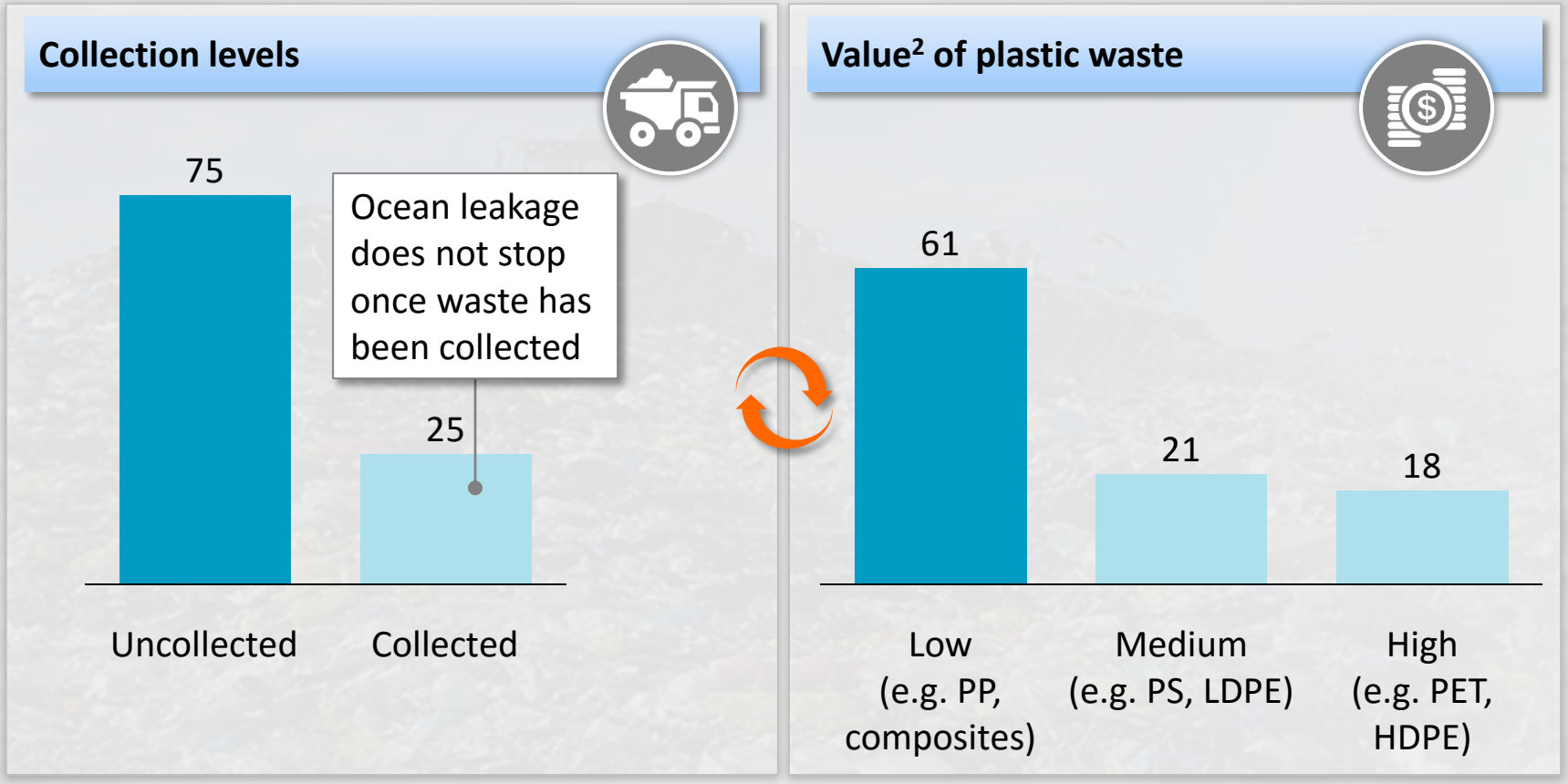
To solve ocean leakage we must tackle 2 key interdependent problems – uncollected waste and low value waste

AVERAGE TOP 5 LEAKAGE COUNTRIES[1]

% of top 5 leakage countries'[1] total plastic waste leakage

Largest source of ocean leakage



1 China, Indonesia, Philippines, Vietnam, Thailand

2 'Value' is a quantitative function of price at secondary dealers and time taken to collect, combined with a qualitative function of homogeneity and likelihood of rejection by secondary dealers

SOURCE: Team analysis

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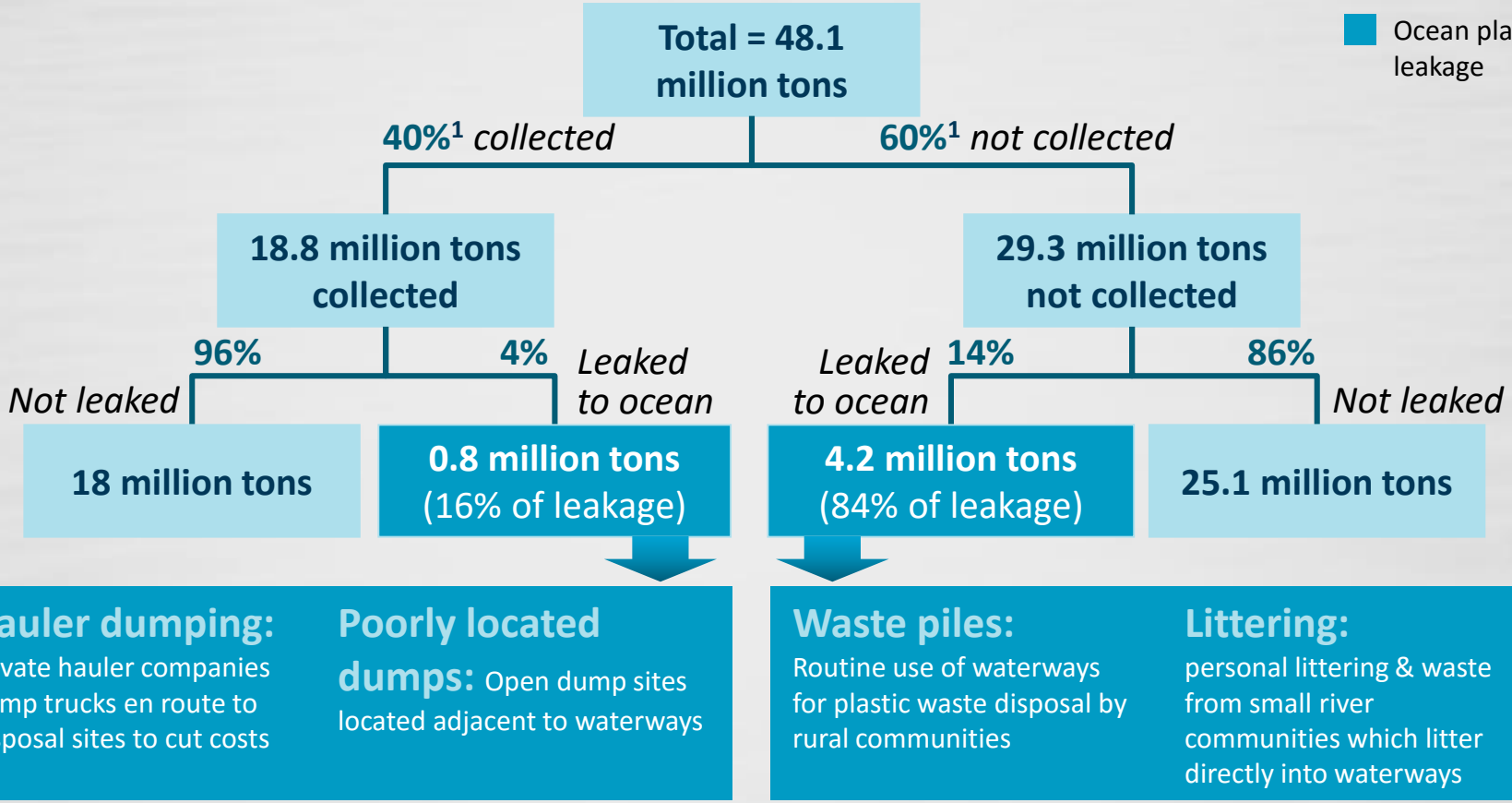
Our analysis quantified leakage and identified its drivers at a country level, based on field work in China and the Philippines (1/2)

Flows of plastic waste



1 Not including residual waste from imported plastic, estimated at between 1 – 1.5 million metric tonnes per annum
2 Based on aggregate of urban and rural waste

SOURCE: "Plastic waste inputs from land into the ocean" - Jambeck, Geyer, Wilcox, Siegler, Perryman, Andrady, Narayan, Law (as published in Science Magazine, February 2015), World Bank, China Environment Statistics Yearbook, team analysis, expert interviews

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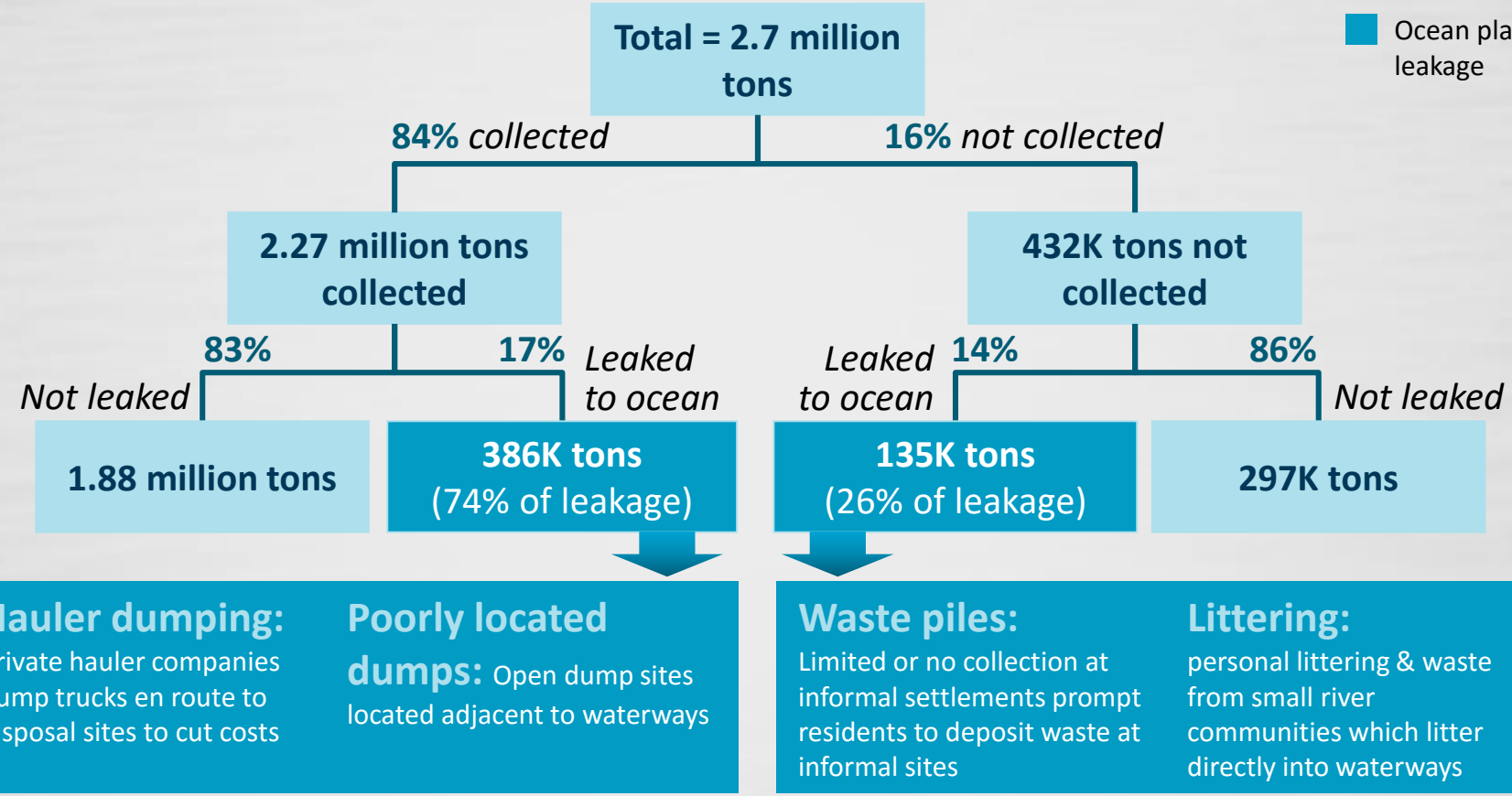
Our analysis quantified leakage and identified its drivers at a country level, based on field work in China and the Philippines (2/2)

Flows of plastic waste



SOURCE: "Plastic waste inputs from land into the ocean" - Jambeck, Geyer, Wilcox, Siegler, Perryman, Andrady, Narayan, Law (as published in Science Magazine, February 2015), World Bank, National Solid Waste Management Commission of the Philippines, Expert interviews, field visits, team analysis

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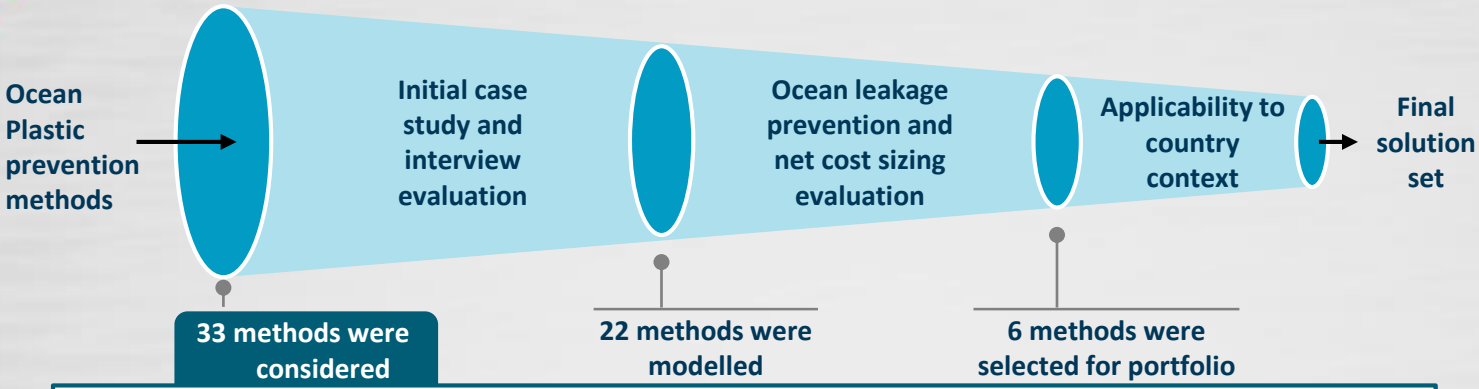
To do so, we considered numerous ocean plastic prevention methods



Reduction / elimination
- PAYT - Waste disposal fees
- Material design specifications
- Product/material bans (bag bans)
- Resin/product industry fees
- Extended producer responsibility

Collection
- Increased collection
- Street level refuse bins
- Low value plastic subsidy
- Drop off centers

Recycling
- Mandatory recycled content within products
- Mandatory recycling for industry
- Recycling MRFs (manual/mechanical/optical)
- Container deposits
- Advance recycling/disposal fees
- Consumer recycling campaigns
- Household separation bins
- Waste exchange programs

Conversion/Treatment
- Cement Kiln (RDF)
- Pyrolysis
- Gasification
- Incineration

Mitigation
- Close/cover/mine high risk dump sites
- Haul payment tied to waste drop off points
- Haul truck monitoring devices
- Storm water collection traps
- Littering and dumping fines
- Sewer outfall trash collection units
- Trash surface booms/interceptors/out-of-sea extraction devices
- Beach community clean-ups
- Total daily maximum loads
- Dumpsite fencing
- Dump site bans for poorly located sites
- Dump site bans for specific plastics

- **Methods were prioritized based on**
  - largest leakage potential at lowest net cost
  - Ease of implementation
  - Country relevance
- **Modeling data was gained from**
  - 22 regional case studies
  - 100+ expert consultations
  - Due diligence from entrepreneurial business models
  - National data from government authorities
  - Secondary research based on published white papers

SOURCE: Team analysis

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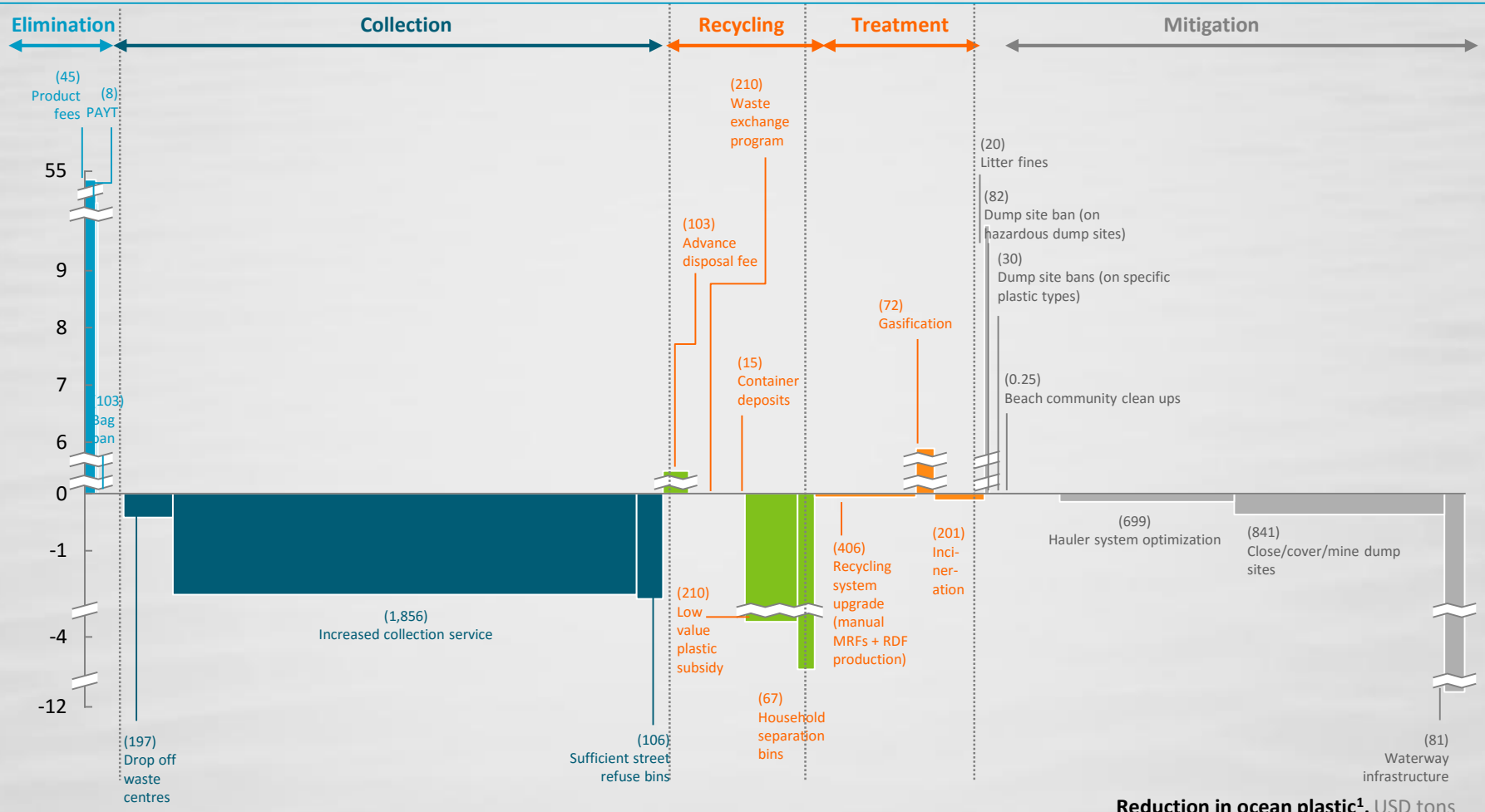
And produced the first ever cost curve of potential solutions, measuring their net benefit against their ability to reduce ocean plastic contribution

Net benefit per ton leakage reduction, '000 USD/ton



1 Plastic leakage estimates are not directly additive due to partially overlapping benefits across initiatives

SOURCE: Team analysis

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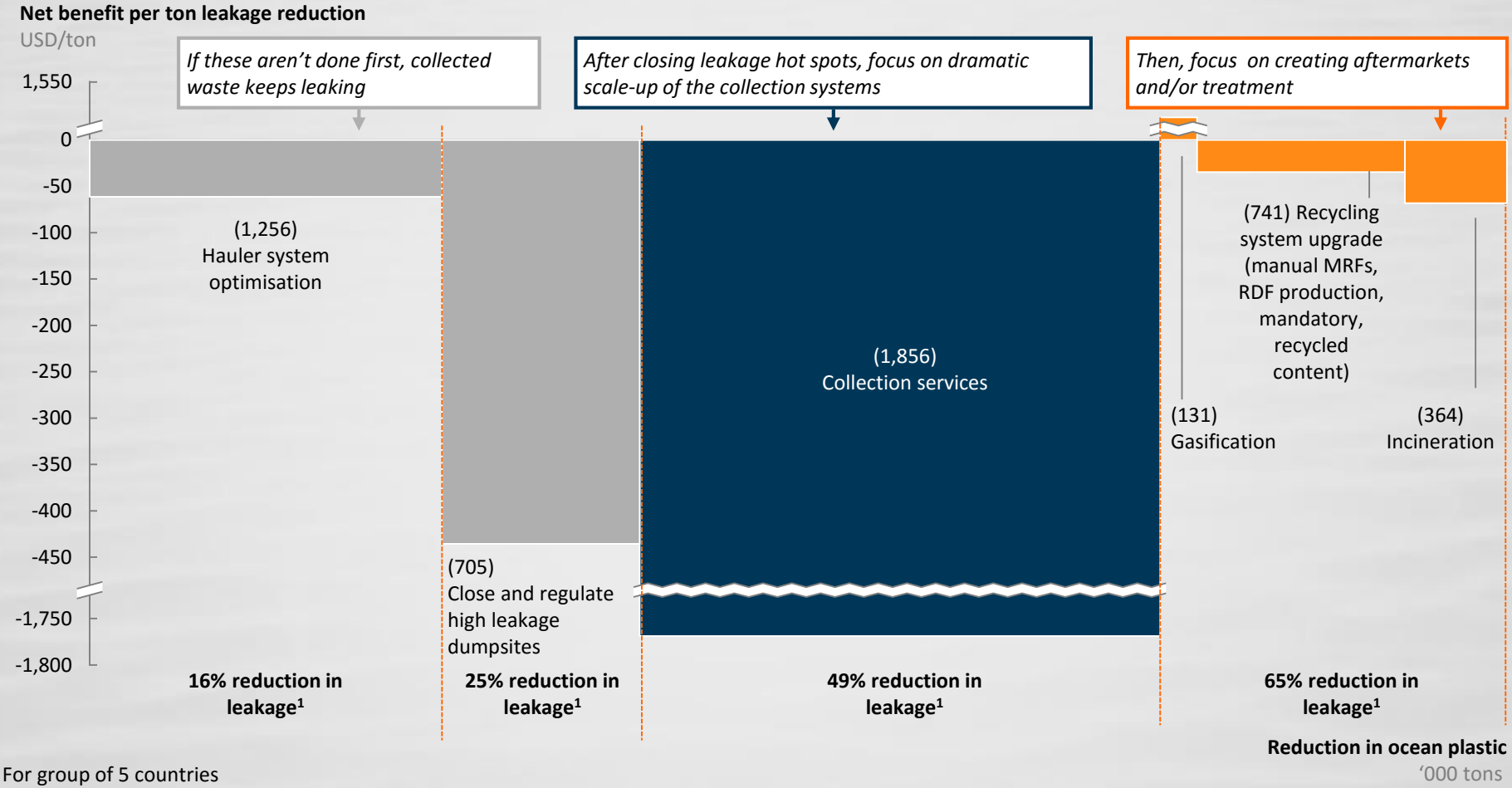
The prioritization results in a net benefit curve based on order of implementation that first closes leakage hotspots, then drives collection, then creates aftermarkets or waste treatment



1 For group of 5 countries

SOURCE: ICIS; World Cement; Columbia University; China Environment Statistics Yearbook; 100+ expert interviews; press search; Science Magazine data (Jambeck et al.2015) ; China Today; World Bank; case studies; team analysis

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Across the top 5 countries, we find that 3 sets of activities constitute the solution to 100% of the problem – these must be undertaken in parallel

OC focus

Accelerate development of local waste management:

- Raise collection rates from 40% to 80%
- Reduce post collection leakage from 7% to 1%

Incubate and pilot waste treatment options:

- Generate revenue to pay for waste management improvements
- Create commercial counterweight to waste dumping

Re-engineer plastic lifecycle through innovation:

- Minimize plastic waste in general
- Reduce ecological damage from post-consumer plastic

SOURCE: Team analysis

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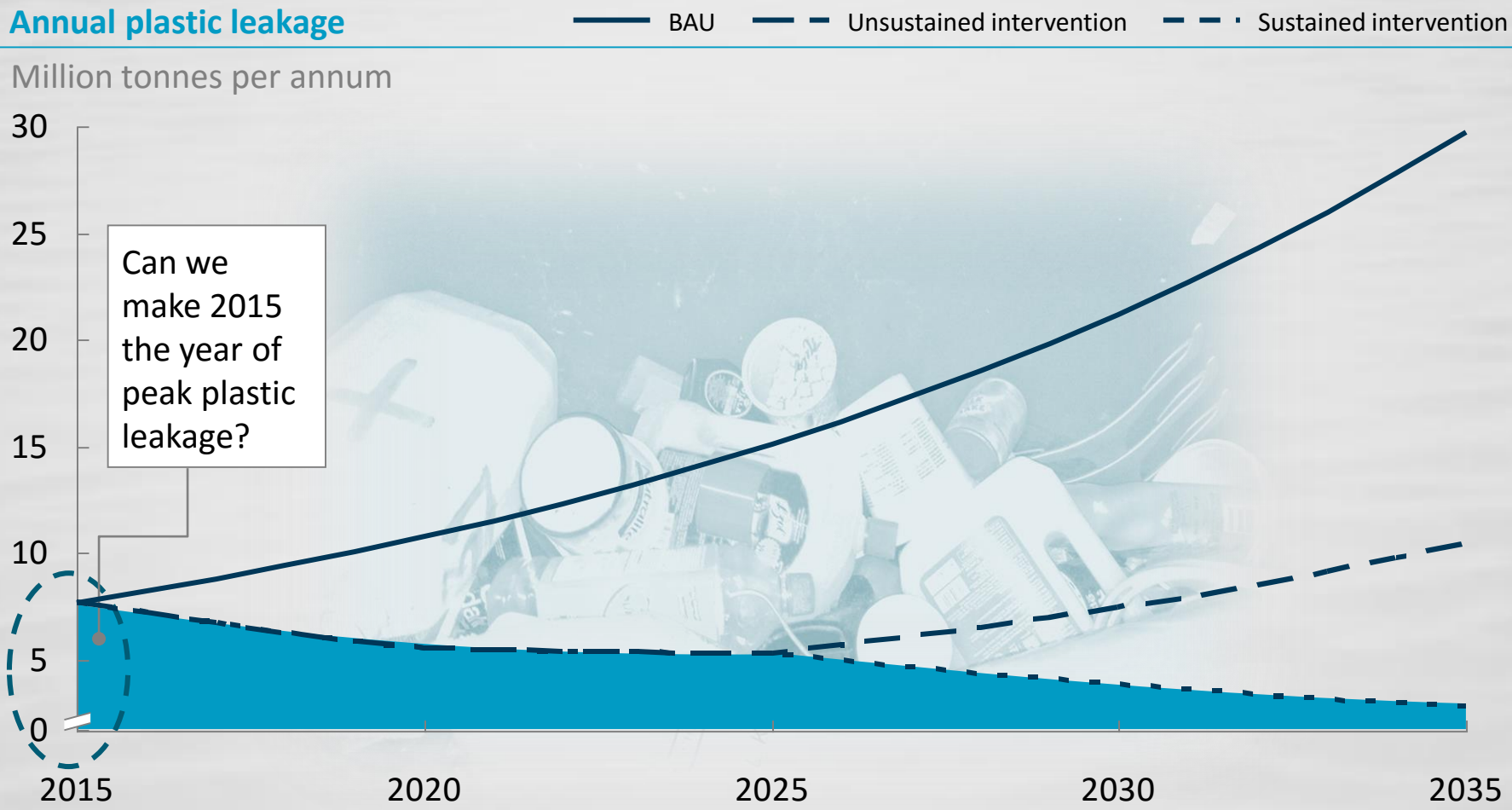
The first 2 sets of activities can achieve 65% of leakage reduction over 10 years, and sustained improvement can further reduce leakage

Annual plastic leakage



SOURCE: McKinsey analysis, ICIS database

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At the same time, this agenda will yield multiple other social and economic benefits

Mitigate spread of 20+ diseases, including hepatitis (on which China spends over $100 billion USD per year)

Secure revenues from eco-tourism, expected to contribute 7% to the growth of tourism in China

Reduce water pollution from dump site leachate, helping to rehabilitate water supplies to important agricultural areas such as the North China Plain

Create 350K – 700K jobs through expanded waste collection, treatment and recycling

Contribute a 6% average premium on real estate for homeowners by relocation adjacent dump sites

SOURCE: McKinsey analysis, 100+ expert interviews, EPA, WHO, World Bank, NECEC, University of Hong Kong, FAO, World Travel and Tourism Council

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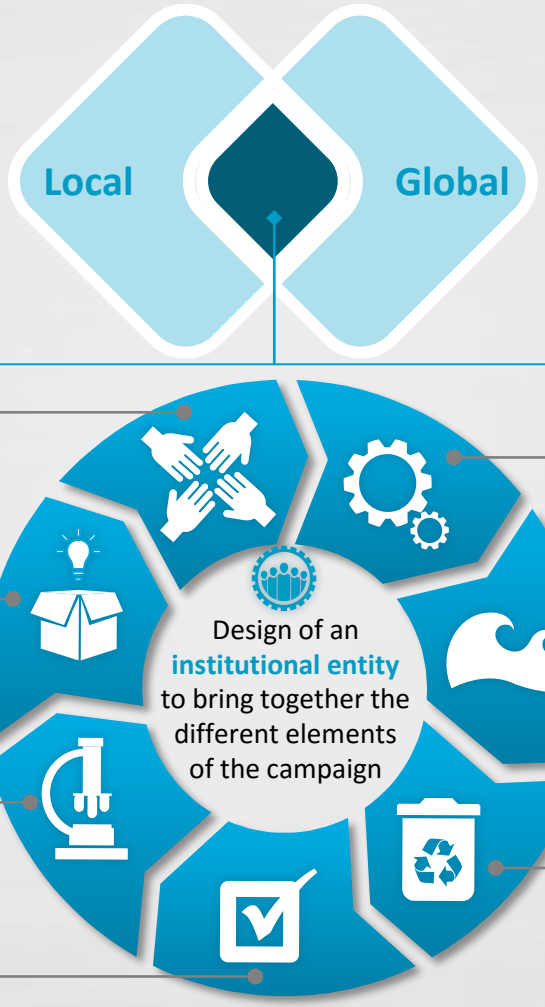
To achieve our targeted 65% leakage reduction, we have a holistic action plan ahead of us that must be facilitated by a central co-ordination unit



Obtain explicit Government mandates to set ambitious waste management targets

Provide "proof of concept" for integrated waste management in "beta" cities

Facilitate knowledge transfer on next-generation plastic waste treatment technology

Pave the way for funding and ensure project investment conditions are in place.

Accelerated on-ground implementation through **'delivery labs'**

Prioritization of the ocean plastic challenge on the **global agenda**

Consumer education efforts focused on waste minimization and responsible waste disposal

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Within an 18 month time frame, this co-ordination unit can achieve against each of the action plan's cornerstones (2/2)

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Action plan focus	18 month deliverable
Obtain Government mandates at all levels	National level endorsement of approach, with beta testing of solutions in 1-2 municipalities
Local "proof of concepts" accelerated on-ground implementation through **'delivery labs'**	5 delivery labs held in five locations on topics such as: ▪ Urban collection ▪ Rural collection and waste separation ▪ Waterway cleanups ▪ Landfill relocation ▪ Treatment plant acceleration
Industry commitment for aggressive **innovation in packaging**	Integration of global value chain initiatives to achieve plastic waste reduction
Facilitate knowledge transfer on next-gen plastic waste **treatment technology**	Provide state-of-the-art waste management providers with detailed data on waste composition, pathways, etc.
Pave the way for funding	Work with industry on innovative mechanism to de-risk waste management project finance investments.
Consumer education efforts focused on waste minimization and responsible waste disposal	25% increase in funnel gates (awareness to action) in all 5 countries through mixed campaigns (e.g., town halls, social and mainstream media)
Prioritization of the ocean plastic challenge on the **global agenda**	Anchor ocean plastic issue in global monitoring and review process through engagement with Global Ocean Commission, UN, etc.

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Next steps

- Finalize the report
- Negotiate APEC commitment (ongoing)
- Present at WEF Summer Meeting in Dalian (August)
- Launch the report (September)
- Present at 'Our Oceans' Conference (October)
- Discuss with funders (GEF, WPC, various industrials)

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