The Hague Centre
for Strategic Studies

# Propelling Green Ambitions
## Policy Cycles and Priorities in China and the Netherlands

**Fiona De Cuyper, Ardi Bouwers and Laura Birkman**

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# List of Abbreviations

| | |
|---|---|
| AFIR | Alternative Fuels Infrastructure Regulation |
| BES | Building and Energy Systems |
| CCfD | Carbon Contracts for Difference |
| CCICED | China Council for International Cooperation on Environment and Development |
| CEPI | Central Environmental Protection Inspection |
| CNSF | China's National Science Foundation |
| COASTAR | Coastal Aquifer Storage and Recovery |
| CROW | Centre for Regulations and Research in Ground, Water, and Road Construction and Traffic Engineering |
| CSTC | China Sustainable Transportation Centre |
| EV | Electric vehicle |
| EZK | Netherlands Ministry of Economic Affairs and Climate |
| IenW | Netherlands Ministry of Infrastructure and Water Management |
| IPDC | International Panel on Deltas and Coastal Areas |
| IWWC | Inclusive Wise Waste Cities |
| LAP3 | National Waste Management Plan |
| MEE | Ministry of the Ecology and Environment of China |
| NECP | National Energy and Climate Plan |
| NEV | New energy vehicle |
| NOW | Dutch Research Council |
| PBL | Netherlands Environmental Assessment Agency |
| PIB | Partners for International Business |
| PFAS | Per- and polyfluoroalkyl substances |
| PRC | People's Republic of China |
| RVO | Netherlands Enterprise Agency |
| SOE | State Owned Entreprises |
| STOWA | Foundation of Applied Water Research |
| UN SDG | United Nations Sustainable Development Goals |
| V2G | Vehicle-to-Grid |

# Executive Summary

The current decade has been the warmest on global record and its ensuing global sustainability challenges call for international collaboration, particularly between countries with complementary expertise. Both the Netherlands and China face pressing environmental challenges, including intensifying weather events, pollution, and ecological degradation. While these challenges manifest differently in each country, both nations must navigate trade-offs between development and ecological protection. In May 2025, both countries reaffirmed a shared intent to deepened practical cooperation on the green transition and climate change.[1]

In this context, this report presents a forward-looking analysis of how sustainability policy is conceived and operationalised in both countries, and identifies potential openings for deepening Sino-Dutch cooperation. Two central questions guide the work:

(1) What differences and similarities exist in the Dutch and Chinese approaches to the policy cycle for achieving sustainability objectives in the areas of physical connectivity, environmental quality, and climate-related adaptation and resilience?

(2) What lessons can be learned from examples of successful cooperation?

## The policy cycle as an analytical lens

In addressing these questions, this study uses the policy cycle lens to make sense of how complex sustainability policies are designed, implemented, and adjusted over time. Both countries broadly follow the stages of the theoretical policy cycle (agenda-setting, policy formulation, decision-making, implementation, and evaluation) but their emphases and institutional contexts differ.

In the Netherlands, the 2023 "Policy Compass" (*Beleidskompas*) sets the framework for policymaking.[2] Here, agenda-setting and policy formulation are merged into one preparation phase, and an explicit reorientation phase at the end of the cycle ensures that policies can be continued, adapted, or discontinued.[3] Stakeholder engagement is integrated throughout the process, reflecting the Dutch 'polder model' of consensus-seeking.

In China, policymaking has often been described as "top-down", with central authorities playing a decisive role. Yet the reality calls for more nuance. The "Double Wheel" model of the Chinese policy cycle illustrates the interplay between central and local authorities: Beijing sets the agenda and overall direction, while provinces and municipalities adjust policies to local circumstances, implement them, and provide feedback to the central level, which may or may not act upon this feedback.[4] Local incentives, inter-city competition for projects, and

1 The State Council of the People's Republic of China, "China, Netherlands Pledge to Build Open World Economy, Strengthen Green Development Cooperation."

2 Kenniscentrum voor beleid en regelgeving, "Beleidskompas"; Koppenjan et al., *Het Gebruik van Het Beleidskompas Binnen de Rijksoverheid*.

3 Kenniscentrum voor beleid en regelgeving, "Infographic Beleidscyclus."

4 Liang et al., "Implementing Water Policies in China."

performance assessments of officials can impact this process. The result is a dynamic system where central guidance meets local experimentation, but where economic growth and political incentives sometimes outweigh environmental considerations.[5]

Regarding sustainability policy specifically, both systems put a greater emphasis on evaluation, monitoring and enforcement, since achieving climate and environmental objectives requires iterative course-correction with continuous adjustments and concrete follow-up.[6]

## Shared ambitions and complementary strengths

Despite differing concrete focus areas, China and the Netherlands share many long-term ambitions and both align with the Paris Agreement. The Netherlands is committed to a 55% emissions reduction by 2030 and pledged to become net-zero by 2050, while China aims to peak emissions before 2030 and achieve carbon neutrality by 2060.[7] Both recognise that such goals require large-scale investment in renewable energy, circular economy strategies, and climate adaptation.

The Netherlands focuses on green energy, circularity, climate adaptation through integrated spatial planning, and innovation.[8] China, facing vast regional inequalities and severe pollution legacies, frames its sustainability agenda in terms of "high-quality development", underpinned by five guiding concepts: innovation, coordination, green growth, openness, and shared prosperity.[9] When comparing their sustainability policies, three overlapping policy priorities become evident: both countries (1) focus on the green transformation of energy sources, (2) strive to create a more circular economy, and (3) aim for innovation as a driver of change. Since the territory of the Netherlands largely resembles a large Chinese city rather than the entire country, this study focuses on the urban environment.

## Priority domain 1: Physical connectivity

Transport and logistics lie at the heart of the green transition, both as sources of emissions and as enablers of sustainable urban and economic development. In the Netherlands, a long tradition of cycling and public transport integration has created one of the world's most advanced active mobility systems, with more than 35,000 kilometres of cycling paths and detailed design standards ensuring accessibility and safety.[10] Electric vehicle charging infrastructure is another area of Dutch leadership, with Utrecht's 'Smart Solar Charging' living labs showcasing how vehicle-to-grid technology can help stabilise renewable-heavy energy systems.[11] At the same time, the Port of Rotterdam has positioned itself as a global laboratory for green shipping, investing heavily in shore-based power and international green corridors.[12]

5 The Economist, "China's Local Governments Are Approaching a Fiscal Black Hole."

6 van der Kamp, "Governance by Uncertainty."

7 Erbach and Dewulf, *The Netherlands' Climate Action Strategy*, 1; Liu et al., "The Carbon Brief Profile: China."

8 PBL 2021, topsectoren beleid 2011 (a.o. energy, high-tech and logistics)

9 Jinping, "A Deeper Understanding of the New Development Concepts"; Kuhn, "5th Anniversary of the Five Major Development Concepts."

10 Ministry of Infrastructure and Water Management, "Cycling: A Driver for Positive Change"; Fietsberaad, "Design Manual for Bicycle Traffic 2016."

11 Dutch National Charging Infrastructure Agenda, "Dutch National Charging Infrastructure Agenda: Brochure," 2; gridX, *Europe's 2025 EV Charging Report: Growth, Gaps & Grids*; de Brey, "Smart Solar Charging: Bi-Directional AC Charging (V2G) in the Netherlands," 483.

12 Liang, "Rotterdam Sets Ambitious Goal for Shore-Based Power by 2030"; Port of Rotterdam, "Rotterdam and Singapore Strengthen Collaboration on Green and Digital Shipping Corridor."

China's achievements, though different in emphasis, are equally striking. The country has built the world's largest high-speed rail network, now exceeding 43,000 kilometres, which has reshaped inter-city travel and reduced reliance on short-haul flights.[13] It has also become the largest market for electric vehicles, with nearly half of all new cars sold in 2024 being electric.[14] Ports such as Shanghai's Yangshan have pioneered automation, digitalisation, and electrification.[15] Meanwhile, national policies are reviving walking and cycling infrastructure, reversing earlier declines in active mobility.[16]

Both countries also recognise that decarbonisation of transport must go hand-in-hand with circularity. In the Netherlands, policy is gearing towards reuse and recycling of batteries, shared mobility, and infrastructure designed for disassembly and reuse.[17] China, building on its Circular Economy Promotion Law, has introduced producer responsibility and national battery-tracking systems, complemented by innovative models such as NIO's battery-swapping ecosystem.[18]

Side by side, Dutch expertise in integration and standards complements China's ability to scale and mobilise rapidly. This creates scope for cooperation in areas ranging from cycling infrastructure design to smart charging protocols and port decarbonisation.

## Priority domain 2: Environmental quality and human wellbeing

Safeguarding air, soil, and water quality is central to the sustainability strategies of both China and the Netherlands, not only because of ecological integrity but also because of its direct impact om human health and urban liveability.

The Netherlands has made steady progress in reducing emissions, yet challenges remain and concentrations of fine particulate matter and ozone still exceed WHO guidelines in some areas.[19] The nitrogen crisis revealed the ecological fragility of Dutch nature reserves, while contaminants such as PFAS have raised concerns about long-term food and water safety.[20] Dutch responses increasingly rely on integrated solutions, such as Nereda's wastewater treatment technology, which reduces energy use and land requirements while improving nutrient removal.[21]

China's progress has been equally noteworthy. Since 2013, major clean-air campaigns have cut pollution levels in cities such as Beijing by more than half, though levels still exceed global health thresholds.[22] Soil and water pollution remain pressing concerns, but large-scale

13 Pamela, 'Vossloh Delivers Rail Fastening Systems in China', *Railway PRO*, 8 May 2024, https://www.railwaypro.com/wp/vossloh-wins-two-contracts-in-china-for-rail-fastening-systems/.

14 International Energy Agency, "Executive Summary – Global EV Outlook 2025"; Shepherd, "How China Pulled Ahead to Become the World Leader in Electric Vehicles."

15 Huawei, "Shanghai's Fiber-Networked Smart Port Lets Dock Hands Move Cargo, from a City Office."

16 Mengyuan, "Toward a Pedestrian and Bicycle Friendly City: Beijing Slow Traffic System Plan (2020-2035)."

17 Liao et al., "Mode Substitution Induced by Electric Mobility Hubs," 29; Van Buren et al., "Towards a Circular Economy," 2; Jonkeren et al., "Changes in External Costs and Infrastructure Costs Due to Modal Shift in Freight Transport in North-Western Europe," 40.

18 International Energy Agency, "Interim Provisions on the Traceability Management of Power Battery Recycling in New Energy Vehicles"; JATO, "How China Is Driving Battery Swapping as a Service in the EV Market."

19 NL Times, "Air Pollution in the Netherlands Exceeds WHO Limits in Many Areas."

20 National Institute for Public Health and the Environment, "Current Information about PFAS."

21 Stuart, "Treating Wastewater More Sustainably."

22 Jiang et al., "Government Environmental Governance, Structural Adjustment and Air Quality"; Myllyvirta, "Beijing's Air Quality Meets National Standards"; World Health Organization, "Air Pollution."

investments in wastewater treatment and reuse – such as Beijing's Huaifang underground plant – illustrate how pollution control and resource efficiency are being combined.[23]

Both countries are moving from linear to circular models of production and consumption. The Netherlands emphasises prevention, reuse, and repair, supported by extended producer responsibility, pay-as-you-throw incentives, and circular construction experiments. China embeds circularity into its 'ecological civilisation' vision, rolling out zero-waste city pilots and eco-industrial parks such as Guangxi's Guitang park, where waste streams from one industry become inputs for another. Nevertheless, challenges remain on both sides: in China, over-production and uneven enforcement risk undermining prevention, while in the Netherlands, scaling circular practices beyond niche sectors is difficult.

The complementarities here are strong. Dutch governance frameworks for upstream prevention and circular design can enrich China's large-scale deployment capacity, while Chinese experience in mobilising circular infrastructure quickly can help the Netherlands scale its pilots.

## Priority domain 3: Resilience and adaptability

Urban resilience has become an urgent priority for China and the Netherlands. Rising seas, more extreme floods, heatwaves, and droughts threaten infrastructure, economies, and human wellbeing.

The Netherlands, with centuries of water management experience, has adopted a risk-based approach to flood protection. The Delta Decision requires that mortality risk from flooding be kept below 1 in 100,000 by 2050, driving continuous investment in dikes and hydraulic structures.[24] Programmes such as Room for the River and Water Sensitive Rotterdam illustrate how nature-based solutions such as green roofs, permeable paving, and water squares are integrated into spatial planning to enhance both safety and liveability.

China has pioneered the "Sponge City" concept, which seeks to retain 70-90% of rainfall in urban areas through infiltration, detention, and reuse.[25] More than 250 cities now apply these principles, with Wuhan emerging as a leading case. Large-scale infrastructure such as the South-to-North Water Transfer Project demonstrates how resilience is embedded in basin-scale planning, albeit with ecological and social trade-offs.[26] China's strong central coordination also enables rapid crisis response, as seen during the 2024 Guangdong floods.[27]

Complementarities stand out here as well. The Netherlands' emphasis on long-term planning, risk standards, and participatory governance aligns well with China's ability to scale solutions rapidly. Together, the two countries can co-develop adaptive drainage systems, multifunctional dikes, and circular retrofits for buildings while sharing digital tools for real-time water and energy management.

23 Infrastructure Global, "Huaifang Water Reclamation Plant."

24 National Delta Programme, "Delta Decision for Flood Risk Management"; Netherlands Environmental Assessment Agency, "Low Probabilities - Large Consequences."

25 Li et al., "Sponge City Construction in China," 2.

26 Aquatech, "China's South-North Water Diversion Project."

27 Ng, "Guangdong: Tens of Thousands Evacuated from Massive China Floods."

## Integrated analysis

While China and the Netherlands operate in vastly different contexts, they navigate similar pressures across the three priority domains. Both countries must reconcile rapid technological change with entrenched economic structures, balance national priorities with local realities, and translate broad ambitions into practical solutions.

An important similarity is the **role of knowledge institutes** in the policy process. Dutch planning bureaus and applied research organisations provide independent analysis that feeds into decision-making. In China, institutes like Tsinghua University, the Energy Research Institute, and the National Centre for Climate Change Strategy play a comparable role in shaping five-year plans and pilot projects. In both countries, science is positioned not merely as technical advice but as an essential intermediary between politics and implementation.

Another commonality is the **use of pilot projects** as testing grounds for innovation. The Netherlands has created 'living labs' such as Utrecht's smart charging districts and Rotterdam's water-sensitive urban design, while China has institutionalised the idea of large-scale demonstration zones, from sponge cities to zero-waste pilots. These pilots are more than symbolic; they function as laboratories of innovation where new governance models, technologies, and standards are trialled before being scaled nationally.

Nevertheless, important **divergences** remain. The Netherlands' policy cycle is embedded in legal commitments, independent evaluation, and stakeholder consultation, and produces relatively stable and transparent pathways, albeit through slower implementation. China's cycle is more directive, with rapid mobilisation, large-scale subsidies, and inspection mechanisms that drive visible results but sometimes create uneven enforcement at local levels or overemphasis on economic growth. However, these contrasts can also present **opportunities**: Dutch evaluation frameworks can add depth to Chinese pilot assessments, while China's scaling capacity can stress-test Dutch approaches under high-growth, high-risk conditions.

## Strategic directions and recommendations

The analysis suggests three overarching lessons: **(1)** Effective cooperation requires identifying the right **actors** at the right levels: ministries, local governments, research institutes, and pilot regions. **(2) Instruments** must be tailored: combining Dutch regulatory and evaluative strengths with China's industrial and fiscal mobilisation can generate hybrid solutions. **(3) Pilots** are the most effective drivers of cooperation: they connect high-level goals with concrete implementation and allow for mutual learning.

When designing future cooperation possibilities and projects, **innovation** is a must-have, a core element to arouse the interest of Chinese and Dutch partners. Two commonalities are particularly noteworthy when developing joint projects, as they help to lay a solid foundation for these projects: (1) Reliance on knowledge institutes as bridges between high-level strategy and local implementation, and (2) the use of pilot projects, where new technical solutions and governance models can be trialled before scaling up. Moreover, projects where both partners bring specific technology and gain from the knowledge of the other are preferable. Building on these lessons, the report offers a set of process and thematic recommendations:

## Process recommendations

- In the preparatory phase of a joint project, identify all **relevant actors** and map their hierarchical position and influence in different stages of the policy cycle. Be aware that an actor's position within the Communist Party prevails over the state hierarchy. Given China's size, local actors play an important role, adjusting national policies to local circumstances, and in the implementation phase.
- Identify sectors of future cooperation by making use of **China's industrial policy**, laid out in its five-year plans and state subsidy policies. China's strategy of 'high-quality development' is to make optimal use of advanced technologies such as AI and robotics to realise a green-energy-powered transformation. China's long-term policy planning documents provide concrete starting points in various (high-tech) sectors.
- Leverage **long-term institutional ties** between Dutch and Chinese governmental institutions, universities, and business communities.
- As a result of the much smaller size of the Netherlands, Dutch actors proposing projects in China need to consider the option to combine forces. The Partners for International Business instrument is a good example of the advantages of scale when multiple partners participate in a project proposal.
- Focus on complementarity in methods. Dutch monitoring and evaluation frameworks can add depth to Chinese pilot assessments, while China's scaling capacity can stress-test Dutch approaches under high-growth, high-risk conditions.

## Thematic recommendations

- Focus on the shared problems regarding the green transformation, for example finding innovative solutions for grid congestion. Both countries are expanding renewables rapidly, so topics like flexible markets, V2G, and storage could be optimised together.
- When planning future projects on redirecting the economy to a more circular path, it is advisable to focus on the **upper stages of the waste hierarchy**, such as avoiding, reducing, reusing, and repairing. These stages are currently underdeveloped in both countries and has a much bigger impact in minimising harm to the environment than current joint projects focusing on recycling, recovering, and disposing.
- There are many opportunities to cooperate on **engineering resilience** (maintaining or quickly restoring infrastructure functions following disturbances) for example, by sharing expertise on the development of smart buildings. **Socio-ecological resilience** (the capacity of integrated human-nature systems to respond to shocks) seems to be a somewhat overlooked field, where the Netherlands can contribute expertise by applying its extensive experience in dealing with stakeholders across all levels of society.
- The Netherlands has developed an internationally renowned system of **spatial planning** for housing, infrastructure, nature, and agriculture, coordinated across national, provincial, and municipal levels. This expertise is valuable in a wide range of projects where diverse aspects of the green transformation need to be tackled in densely populated urban areas.

# 1. Introduction

The current decade is the warmest on global record.[28] Human-induced environmental changes, including biodiversity loss, resource depletion, and rising temperatures across the globe, demand urgent systemic transitions. The complexity and widespread impact of these crises call for comprehensive policy responses that go beyond isolated interventions. Comparative analyses of how sustainability policy is made and implemented are therefore of strategic value and can aid in identifying opportunities for cooperation and shared learning.

Global sustainability challenges call for international collaboration, particularly between countries with complementary expertise. Both the Netherlands and China face pressing environmental challenges, including intensifying weather events, pollution, and ecological degradation. While these challenges manifest differently in each country, both nations must navigate trade-offs between development and ecological protection. In response, China and the Netherlands have committed to ambitious sustainability trajectories, reaffirmed in May 2025 through a collective commitment to enhance practical cooperation on the green transition and climate change.[29]

At the same time, China's pursuit of technological leadership – often likened to earlier periods of European industrial dominance – shapes the global landscape in ways that present both opportunities and risks.[30] Within the European policy context, China is regarded simultaneously as a partner, competitor, and systemic rival.[31] This complex positioning underscores the importance of carefully identifying areas where cooperation can bring mutual benefit, while recognising that such collaboration unfolds within a complex and sometimes contested geopolitical environment.

China's transition is increasingly defined by synergistic investments in green infrastructure, connectivity, and scientific research. It has become a global leader in renewable energy deployment, installing more solar capacity in 2023 than the rest of the world combined and boasting a large number of wind installations while expanding its high-speed rail system. Such dynamics highlight both the scale of China's domestic transformation and its growing role in shaping the international contours of the green transition.[32]

Against this backdrop, this report presents a forward-looking study of how sustainability governance is conceived and operationalised across two different political systems and what it portends for deepening Sino-Dutch cooperation. Specifically, the study addresses two central research questions:

(1) What differences and similarities exist in the Dutch and Chinese approaches to the policy cycle for achieving sustainability objectives in the areas of physical connectivity, environmental quality, and climate-related adaptation and resilience?

(2) What lessons can be learned from examples of successful cooperation?

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28 Erdenesanaa, "Earth's 10 Hottest Years on Record Are the Last 10."

29 The State Council of the People's Republic of China, "China, Netherlands Pledge to Build Open World Economy, Strengthen Green Development Cooperation."

30 Matthews, "The World Should Take the Prospect of Chinese Tech Dominance Seriously, and Start Preparing Now."

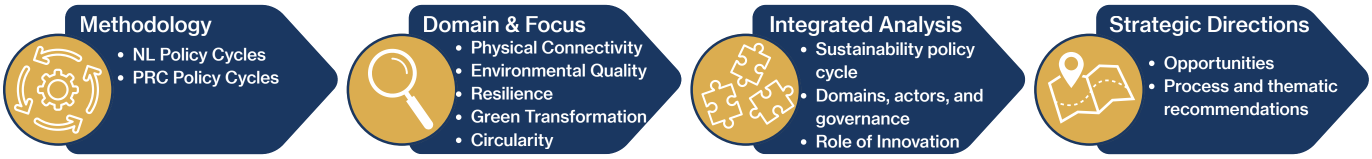
31 European External Action Service, "EU China Relations," 1.

32 Huiyao, "Critics Are Missing the Big Picture on China's Economic Transition."

The study examines the roles of key actors and instruments shaping policy, how policies align with stakeholder interests, and how knowledge informs decision-making. It also explores a wide range of examples of successful Dutch-Chinese collaboration and considers how these cases can guide further cooperation. This report highlights opportunities for deepening Sino-Dutch cooperation but does not address wider geopolitical risks. Ultimately, the report provides strategic directions and recommendations to strengthen bilateral efforts in advancing shared sustainability objectives.

The report is structured as follows: The analytical framework offers insight into how sustainability policy cycles function, with a focus on Dutch and Chinese approaches. Then, the report examines the shared ambitions and priorities of both countries to identify high-potential areas for collaboration. This is followed by an in-depth assessment of three shared objectives - physical connectivity, environmental quality, and resilience - and existing options for cooperation. The findings are mapped onto the (sustainability) policy-making processes in both countries, highlighting relevant actors and entry points for collaboration. Based on this analysis, the report proposes strategic directions and actionable recommendations.

## Figure 1: Report Flowchart



# 2. Analytical Framework

This chapter explores the policy cycle, a framework for the analysis of policy development at the national level. By examining the form and role of the policy cycle in both the Netherlands and China, viable areas of cooperation can be better understood and realistic recommendations can be enacted.

## 2.1. The policy cycle

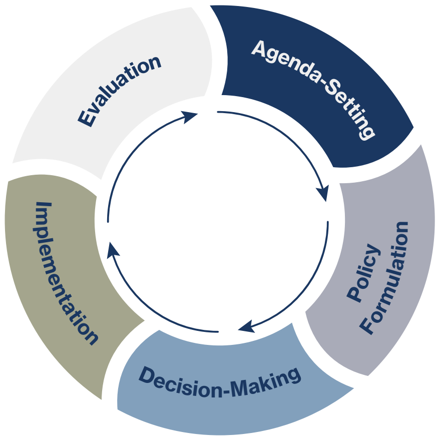
### 2.1.1. Theory

Emerging from public policy scholarship, the policy cycle has become a well-established conceptual framework for organising and understanding the complex nature of policymaking. The current academic consensus agrees on five main stages in the policy cycle model:[33]

(1) During the **Agenda-Setting** phase, relevant actors identify public problems in need of government attention. This is often based on an interplay among media, public opinion, expert networks, and political institutions.
(2) Once the issue is on the agenda, the **Policy Formulation** phase starts, identifying objectives and paths of action, thereby turning the problems into concrete government programmes.
(3) Then, in the **Decision-Making** phase, authorities decide which policies to pursue.
(4) Subsequently, the **Implementation** phase involves the execution of the proposed policy by the relevant organisations and institutions. These are often, but not always, part of the public sector.
(5) Lastly, the **Evaluation** phase examines whether or not the policy has achieved its intended outcomes. The findings of the evaluation can then be used as the foundation for new policy development. As such, policy cycles are iterative.

33 Savard, "Policy Cycles," 1.; Jann and Wegrich, "Theories of the Policy Cycle," 45–53.

## Figure 2: Visual representation of the policy cycle




In practice, the stages often overlap and interact, but the core phases serve as a useful analytic lens for comparative governance studies.[34] Nevertheless, each country varies in their approach to policymaking, so assessing specific policy cycles allows for a better understanding of the Dutch and Chinese approaches and how both countries can collaborate and share expertise.

### 2.1.2. The Dutch policy cycle

In 2023, the "Policy Compass" (*Beleidskompas*) was adopted as the core of the Dutch policy cycle. It guides all parts of the Dutch policy-making process and has become the national method for developing new policies and legislation, thereby replacing the "Integral Assessment Framework".[35] In the Dutch cycle, the phases of Agenda-Setting and Policy Formulation are combined into one phase: Policy Preparation. During this phase, the objective and options are identified, after which a policy proposal is sent to the Parliament. At the end of the cycle, a phase of Reorientation is added, which involves either the continuation, cessation, or adaptation of the policy.[36]

## Figure 3: The Dutch policy cycle


[34] Howlett and Giest, "Policy Cycle," 291.

[35] Kenniscentrum voor beleid en regelgeving, "Beleidskompas"; Koppenjan et al., *Het Gebruik van Het Beleid-skompas Binnen de Rijksoverheid*.

[36] Kenniscentrum voor beleid en regelgeving, "Infographic Beleidscyclus."

The Policy Compass is structured around five core questions:

1. What is the problem?
2. What is the intended objective?
3. What are the options to achieve that objective?
4. What are the consequences of the options?
5. What is the preferred option?

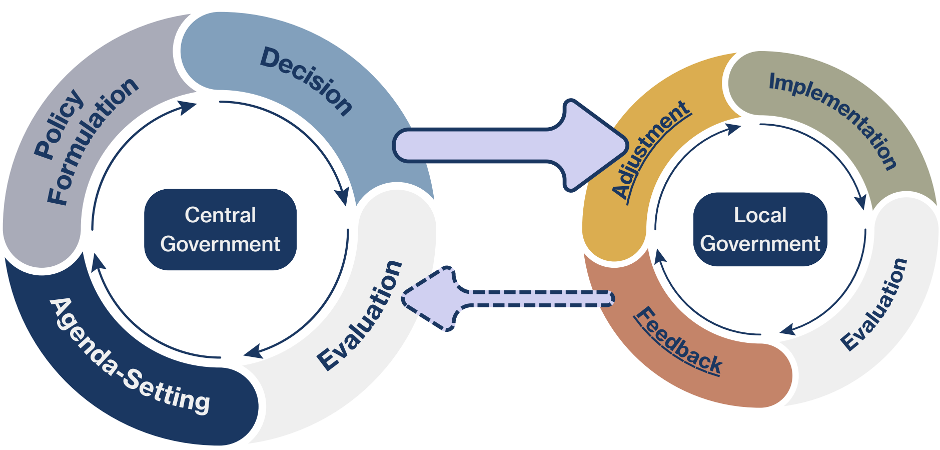
One recurring question throughout the process is “Who are the stakeholders and why?”, emphasising the fact that **stakeholder engagement** is considered a core element throughout the policy cycle.[37] Interaction with stakeholders is integrated in all phases in the Dutch cycle. This is also visible in the Dutch ‘polder model’, resulting in slower decision-making but more public acceptance with the final result.

### 2.1.3. **The Chinese policy cycle**

The general policy cycle outlined above (Agenda-Setting, Policy Formulation, Decision-Making, Implementation, and Evaluation) also applies to China. However, circumstances specific to China need to be taken into account. China’s policy cycle is generally characterised as ‘top-down’, with a decisive role for the central authorities in Beijing. However, the reality is much more complex, as the role of local governments should not be overlooked.

The central state and communist party authorities set the agenda and formulate general policy directions. However, due to China’s scale and its regional diversity, the implementation of central policies displays local variations. A study on the policy cycle of Sponge City Programs presents the insightful **‘Double Wheel’ policy cycle** model to describe the interplay between central and local - in hierarchical order: provincial, city, and county/township - policy cycles.[38]

**Figure 4: The Chinese policy cycle**
(Adapted from: Liang, et. al., 2020)




[37] Kenniscentrum voor beleid en regelgeving, “Beleidskompas.”

[38] Liang et al., “Implementing Water Policies in China.”

In this model, a phase of **Adjustment** to local circumstances is added after Agenda-Setting, Policy Formulation, and Decision-Making by the central authorities. After the local Implementation and Evaluation phase, Feedback can flow back to the central authorities (it is up to the central authorities whether or not to make use of the local input).

It is important to note that the agendas of all stakeholders involved do not necessarily align. Local authorities want to promote the local economy and deal with local stakeholders. Provinces and cities compete for prestigious innovation hubs, industrial parks, and high-speed railway stations. This, in turn, causes Beijing to worry about the possible 'fiscal irresponsibility' of local governments.[39]

## 2.2. **Methodology**

Based on the logic outlined above, this study employs a comparative policy analysis approach to examine similarities and differences across Dutch and Chinese policy cycles in three interconnected sustainability-focused domains: connectivity, environmental quality, and resilience. Rather than merely listing existing policies, the research evaluates how they work in practice, guided by the logic of the policy cycle. The study draws on extensive desk research, including official policy documents, legislative frameworks, academic articles, and interviews. In line with the scope of this study, the emphasis is placed on identifying shared ambitions and opportunities for cooperation, rather than on assessing broader geopolitical risks.

39 The Economist, "China's Local Governments Are Approaching a Fiscal Black Hole."

# 3. **Shared ambitions**

The Netherlands and China share a strong commitment to addressing global sustainability challenges. A sustainable development vision calls for a shift from rapid growth to what China calls 'high-quality development'.

Both countries have set ambitious climate targets in line with the global climate objectives identified by the 2015 Paris Agreement. The Dutch Climate Act, adopted in 2019 and updated in 2023, stipulates that Dutch greenhouse gas emissions shall be cut by 55% by 2030 and reach net-zero by 2050.[40] China has pledged to reach carbon neutrality by 2060, with peak emissions by 2030.[41] Thus, both countries need to focus on large-scale decarbonisation, expansion of renewable energy, deployment of carbon capture systems, and significant efforts at ecosystem restoration. China's so-called 30-60 pledge is 'largely consistent' with the Paris Agreement's 1.5°C global warming limit.[42]

As a result of climate change, the Netherlands, like many other countries, faces more extreme weather events. This means the probability of drought, heat, waterlogging, and flooding is increasing.[43] The rise of sea levels forms an existential risk to the Netherlands, leading to a special focus on water-related infrastructure. Climate change obviously has many more consequences, e.g. public health, safety, and the economy. Generally, in its sustainability policies, the Netherlands focuses on:

1. Green energy transition,
2. Achieving a circular economy, including waste management and spatial planning
3. Climate adaptation, with complex spatial challenges
4. Investing in innovation to achieve those goals.[44]

China's economy is transitioning from a focus on high growth towards a more sustainable economy. In 2016, China's President Xi Jinping presented his broad vision for sustainable development as the 'Five Major Development Concepts'.[45] These five core elements of sustainable development are:

1. Innovation as the primary driving force for development;
2. Coordination, addressing regional and rural-urban inequalities;
3. Green, focus on the harmonious coexistence of humanity and nature;
4. Open, committed to economic globalisation and free trade;
5. Shared, people-centred, promoting rural revitalisation.

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40 Gregor Erbach and Noor Dewulf, *The Netherlands' Climate Action Strategy* (European Parliamentary Research Service, 2024), 1.

41 Hongqiao Liu et al., "The Carbon Brief Profile: China," Carbon Brief, November 30, 2023, https://interactive.carbonbrief.org.

42 Liu et al., "The Carbon Brief Profile: China", https://www.carbonbrief.org/chinas-2060-climate-pledge-is-largely-consistent-with-1-5c-goal-study-finds/

43 https://klimaatadaptatienederland.nl/en/knowledge-dossiers/themes/climate-change/what-effects-climate-change/

44 PBL 2021, topsectoren beleid 2011 (a.o. energy, high-tech and logistics)

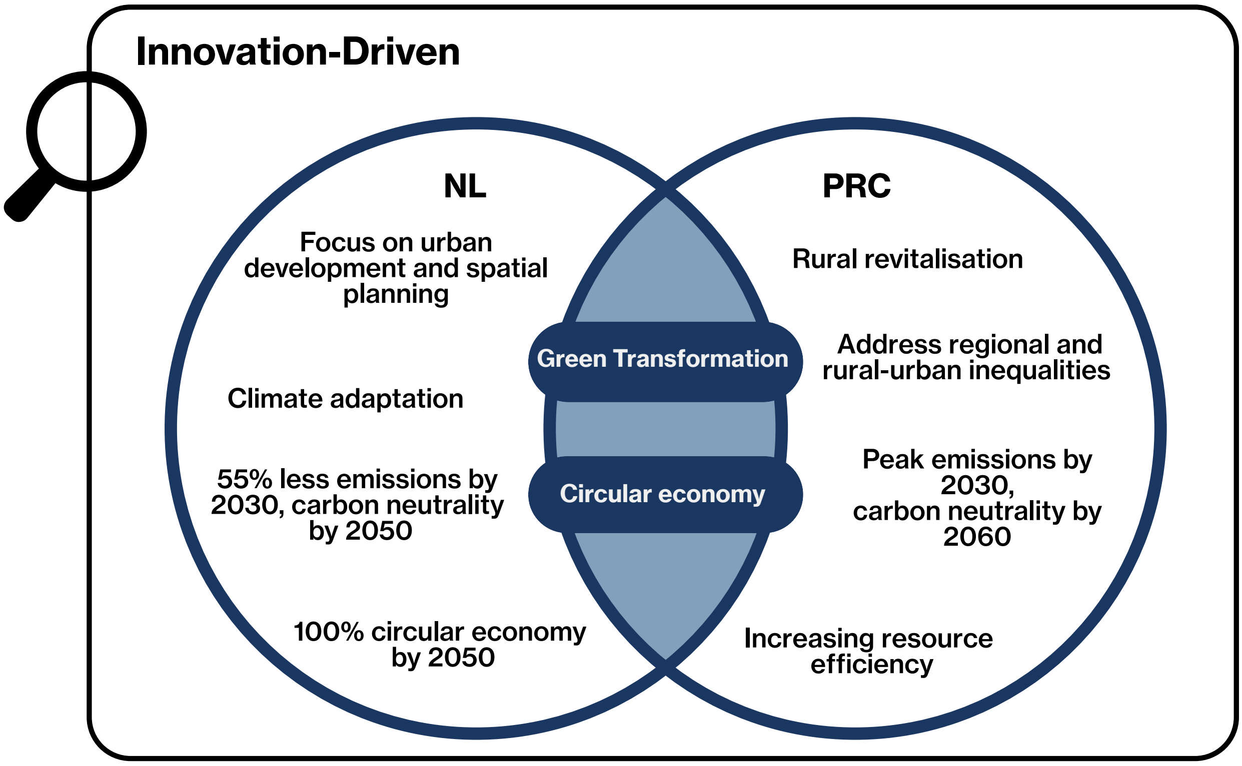
45 Jinping, "A Deeper Understanding of the New Development Concepts"; Kuhn, "5th Anniversary of the Five Major Development Concepts."

These principles align with the UN 2030 Agenda for Sustainable Development and were highlighted as guiding principles in China's National Plan for Implementation of the 2030 Agenda, issued in 2016.[46] By setting ambitious goals, China seeks to play a significant role in global climate efforts. China is now a world leader in renewable energy. It produces renewable power and is leading in solar, wind, and hydro energy. However, China also faces numerous challenges, like large-scale pollution of air, water, and soil (it currently is the world's leading emitter of greenhouse gases), and the slowing down of its economy.

Comparing the sustainability policies of the Netherlands and the PRC, two **overlapping policy priorities** become evident. Both countries (1) focus on the green transformation of energy sources and (2) strive to create a more circular economy. In this context, the lens of innovation is considered as the main driver of change.

Of course, the scale of the Netherlands and the PRC is vastly different; the territory of the Netherlands is 230 times smaller than that of China, and its population 77 times smaller. When it comes to sustainability projects, it thus seems more appropriate to compare the densely populated Dutch territory to a large Chinese city than to the entire PRC. In this study, we therefore focus on ambitions and challenges in the **urban** environment in both countries.

## Figure 5: Intersecting ambitions




[46] Government of China and United Nations System China, "United Nations Sustainable Development Cooperation Framework for the People's Republic of China: 2021-2025."

Innovation is a top priority for both China and the Netherlands and presents a key pillar in both countries' responses to complex sustainability challenges. Technological breakthroughs, institutional experimentation, and cross-sectoral system innovations are essential to translate ambitious targets into practical solutions. Moreover, innovation functions as a bridge between science, policy and practice.

Scientific collaboration between China and the Netherlands is already strong: all Dutch research universities have ongoing collaborations with Chinese counterparts, with joint PhD programmes, visiting fellowships, and joint research projects. Therefore, the **lens of innovation** as the driver of Sino-Dutch collaboration is applied throughout this study.

# 4. Priority domains

This report highlights three themes central to the transition agendas of both the Dutch Ministry of Infrastructure and Water Management (IenW) and its counterparts in China: physical connectivity, environmental quality, and resilience to climate impacts. These areas reflect shared challenges and complementary expertise, offering promising potential for cooperation between the two countries.

First, **physical connectivity** is at the heart of their transitions, with both nations investing heavily in clean transport, EVs, and cycling infrastructure, thereby recognising the critical role of innovative green mobility on the road to decarbonisation. Second, principles of **environmental quality** drive their pursuit of circular economy models and reduced resource use, decoupling economic growth from environmental degradation in the process, thereby ensuring human wellbeing in urban areas. Finally, **resilience and adaptability** stand out as critical areas where Dutch expertise and Chinese priorities converge, especially in water-related issues and nature-based solutions.

## 4.1. Physical connectivity

Physical connectivity shapes the way societies move, interact, and trade, and forms a critical lever for achieving sustainability ambitions. In this context, physical connectivity refers to the organisation and operation of transport and logistics systems that enable the movement of people and goods. It encompasses infrastructure such as streets, cycling paths, railways, ports, and logistics corridors, as well as their use.

China and the Netherlands have defined ambitious long-term climate targets, exerting pressure on the transport sector to decarbonise. Decarbonising transport systems and improving the quality of physical connectivity – from walkable cities to high-speed rail and green shipping routes – are essential for meeting climate objectives, and for advancing a circular and innovation-driven economy. In 2022, transport accounted for about 21.4% of greenhouse gas emissions in the Netherlands, while in China the share was approximately 8.3% in 2022.[47] Urban growth, congestion, air pollution and rising $CO^2$ emissions from transport thus present shared concerns. Transport accounts for a significant proportion of greenhouse gas emissions and resource use, which underscores why both countries are adopting ambitious measures to reduce car dependence, electrify vehicles, improve public and active mobility, and “green” ports and logistics corridors.

The Netherlands and China approach this challenge from different starting points with complementary strengths. The Netherlands is a small, densely populated country with a strong tradition of cycling and public transport integration. Over one-quarter of all trips are

[47] Maria Kottari, ‘Promoting Sustainable Mobility: A View from the Netherlands | Heinrich-Böll-Stiftung | Tel Aviv - Israel’, 30 March 2023, https://il.boell.org/en/2023/03/30/promoting-sustainable-mobility-view-netherlands; ‘China - Countries & Regions’, IEA, accessed 15 September 2025, https://www.iea.org/countries/china/emissions.

made my bicycle, and the railway network is extensive. However, car use remains dominant, and reducing car dependence continues to be a major challenge.[48] At the same time, the Port of Rotterdam, one of the Netherlands' main ports and Europe's largest port, handled over 435 million tonnes of cargo in 2024, making the decarbonisation of port operations and logistics a national priority.[49]

China has seen rapid changes in its transport sector, driven by large-scale investment in urban transit, electrification, high-speed rail, and port infrastructure. Shanghai is now the busiest container port in the world, handling approximately 580.5 million tonnes of cargo in 2024.[50] Once referred to as the 'Kingdom of Bicycles', China had a historically strong cycling culture, yet this has declined since the 1990s when motor vehicles gained popularity.[51] However, recent policies have sought to revive active mobility as part of wider carbon neutrality strategies.[52] Together, these developments show that both countries are reshaping physical connectivity to align with their broader sustainability ambitions.

### 4.1.1. **Decarbonisation of transport**

Accelerating a shift towards low-carbon transport modes and more sustainable urban and freight systems is a cornerstone of the green transformation in both the Netherlands and China.

The Netherlands has long leveraged its extensive cycling culture as a foundation for sustainable mobility. With more than 35,000 kilometres of cycling infrastructure, systematically integrated with public transport through secure parking and station-based bike-share schemes, cycling is treated as a mainstream mode of transport rather than a niche activity.[53] National design standards, such as the CROW and Policy Manual for Bicycle Traffic, ensure that infrastructure remains safe, accessible and consistent across regions, making cycling and public transport natural complements.[54]

The Netherlands has become a leader in the deployment and management of electric vehicle charging infrastructure. It boasts the highest charging-point density in Europe, supported by coordinated planning, joint procurement, and efficient permitting processes.[55] Regional consortia such as MRA-Elektrisch drive equitable rollout across municipalities, while pilot districts showcase innovative smart charging and vehicle-to-grid technologies that help stabilise renewable-rich power systems.[56] Insights from user research are feeding back into policy and business models, allowing pilots to scale into practice.[57]

48 Kottari, "Promoting Sustainable Mobility: A View from the Netherlands."

49 Port of Rotterdam, "Facts and Figures: The Port of Rotterdam in Numbers."

50 Si, "Shanghai Retains the World's Busiest Container Port Crown in 2023"; Transport Corridors, "Shanghai Port Increased Cargo Throughput in Early 2025."

51 Tam, "In China's Cities, A Return to Cycling Prioritizes People and the Climate."

52 Gu et al., "The Two-Wheeled Renaissance in China—an Empirical Review of Bicycle, E-Bike, and Motorbike Development," 2021.

53 Euronews, "Cycling Nation"; Ministerie van Algemene Zaken, "Ways of Encouraging Bicycle Use"; Ministry of Infrastructure and Water Management, "Cycling: A Driver for Positive Change," 18.

54 Fietsberaad, "Design Manual for Bicycle Traffic 2016."

55 Dutch National Charging Infrastructure Agenda, "Dutch National Charging Infrastructure Agenda: Brochure," 2.

56 gridX, *Europe's 2025 EV Charging Report: Growth, Gaps & Grids*; de Brey, "Smart Solar Charging: Bi-Directional AC Charging (V2G) in the Netherlands," 483; Dutch National Charging Infrastructure Agenda, "Dutch National Charging Infrastructure Agenda: Brochure."

57 van Heuveln et al., "Factors Influencing Consumer Acceptance of Vehicle-to-Grid by Electric Vehicle Drivers in the Netherlands," 34; Ghotge et al., "Use before You Choose."

## Box 1: Lombok District in Utrecht

Utrecht's Lombok district has become a pioneering testbed for 'Smart Solar Charging', harmonising solar power, vehicle-to-grid (V2G) charging, and shared electric vehicles into a local energy ecosystem.[58] Residents can charge electric vehicles from rooftop solar energy and even return surplus energy back to the grid, helping to balance renewables and reduce peak demand. The pilot has expanded into five 'living labs' across Utrecht, each tailored to different neighbourhood types (emphasising the role of stakeholder engagement), and is seen as a blueprint for integrating clean mobility with decentralised energy storage.[59]

At the maritime frontier, the Port of Rotterdam is positioning itself as an innovation testbed for green shipping, particularly by reducing emissions through the deployment of shore-based power, allowing docked ships to turn off their diesel generators while drawing cleaner energy instead. By 2030, 90% of public quays in built-up areas will be equipped with shore power, cutting around 200,000 tonnes of carbon annually.[60] These efforts align with EU mandates under the Alternative Fuels Infrastructure Regulation (AFIR) and national air-quality goals, while also linking into global initiatives. Rotterdam's green corridor with Singapore, and similar partnerships such as Shanghai–Los Angeles, show how ports can act as laboratories for zero-emission fuels and setting operational standards across international shipping routes.[61]

China's trajectory highlights the role of scale in transformation, marked by large-scale investments in electrified public transport and high-speed rail. With over 43,000 kilometres of high-speed rail already in operation—set to grow to 70,000 by 2035—the country has redefined inter-city travel, shifting demand away from short-haul flights and private cars.[62] Its industrial policy, with a focus on innovation, has propelled China to become both the largest producer and consumer of electric vehicles, with electric vehicles (called New Energy Vehicles, or NEV, in China) accounting for nearly half of all new car sales by 2024.[63] Digitalised logistics and smart port operations are further improving efficiency and opening the door for integrating low-carbon technologies in freight systems.[64]

58 Dutch National Charging Infrastructure Agenda, "Dutch National Charging Infrastructure Agenda: Brochure," 2; gridX, *Europe's 2025 EV Charging Report: Growth, Gaps & Grids*; de Brey, "Smart Solar Charging: Bi-Directional AC Charging (V2G) in the Netherlands," 483.

59 Smart Solar Charging, *Smart Solar Charging - The Project*.

60 Liang, "Rotterdam Sets Ambitious Goal for Shore-Based Power by 2030."

61 Port of Rotterdam, "Rotterdam and Singapore Strengthen Collaboration on Green and Digital Shipping Corridor"; C40 Cities, "Ports of Los Angeles, Long Beach, and Shanghai Unveil Implementation Plan Outline for First Trans-Pacific Green Shipping Corridor."

62 Pamela, 'Vossloh Delivers Rail Fastening Systems in China', *Railway PRO*, 8 May 2024, https://www.railwaypro.com/wp/vossloh-wins-two-contracts-in-china-for-rail-fastening-systems/.

63 International Energy Agency, "Executive Summary – Global EV Outlook 2025"; Shepherd, "How China Pulled Ahead to Become the World Leader in Electric Vehicles."

64 Li and Wang, "Impact of the Digital Economy on the Carbon Emissions of China's Logistics Industry."

### Box 2: Shanghai Yangshan Port

Shanghai's Yangshan deep-water terminal is now one of the world's most advanced 'smart ports', combining digital automation with a strong push toward electrification and low-carbon logistics. Fully automated cranes and driverless trucks navigate the port area. The port uses fiber-optic networks and 5G connectivity to enable remote control of cranes and automate cargo handling, significantly improving operational efficiency.[65] In 2025, a strategic partnership between battery maker CATL and APM Terminals was launched to accelerate the electrification of container handling equipment.[66]

Urban planning standards now reinforce active mobility as part of this transition. National technical guidelines for walking and cycling networks are helping Chinese cities rebuild "slow traffic" systems to complement mass transit and reverse earlier declines in cycling.[67] Meanwhile, the global prominence of Shanghai as the world's busiest container port underscores the importance of integrating port electrification and low-carbon shipping into China's broader climate and energy strategy.

### 4.1.2. A circular approach

By minimising waste, reducing reliance on primary resources, and extending the lifecycle of materials and infrastructure, the transport and logistics sectors can deliver significant sustainability gains.

In the Netherlands, this ambition is anchored in the commitment to halve the use of primary raw materials by 2030 and to achieve a fully circular economy by 2050.[68] Within mobility and logistics, policy efforts focus on shifting travel and freight to more sustainable modes, expanding shared mobility services such as bike- and car-sharing linked to public transport, and improving material recovery systems, including recycling and reuse of batteries for electric vehicles.[69] Infrastructure projects are increasingly designed with lifecycle sustainability in mind, ensuring that components can be reused or recycled at the end of their service life.[70]

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65 Huawei, "Shanghai's Fiber-Networked Smart Port Lets Dock Hands Move Cargo, from a City Office."

66 Shanghai Metal Market, "CATL, APM Terminals Partner to Drive Electrification of Port Equipment, Global Logistics Decarbonization."

67 Mengyuan, "Toward a Pedestrian and Bicycle Friendly City: Beijing Slow Traffic System Plan (2020-2035)."

68 Ministerie van Algemene Zaken, "Nationaal Programma Circulaire Economie 2023 - 2030 - Beleidsnota," 9.

69 Liao et al., "Mode Substitution Induced by Electric Mobility Hubs," 29; Van Buren et al., "Towards a Circular Economy," 2; Jonkeren et al., "Changes in External Costs and Infrastructure Costs Due to Modal Shift in Freight Transport in North-Western Europe," 40.

70 Leffers et al., *Circular Infrastructure: The Road towards a Sustainable Future*, 34.

### Box 3: Circular batteries in Dutch electric mobility

The Netherlands strives to make electric vehicle batteries part of an innovative circular system – with reuse, traceability and recycling as core elements.[71] Players including public-private initiatives and research institutions are developing sustainable recycling processes for lithium-iron phosphate batteries (LFP) and forming a national battery value-chain strategy to reduce dependence on virgin materials.[72] Technologies for second-life battery use and advanced recovery of critical raw materials are under active development, with the goal of keeping batteries and their metals cycling through the economy rather than ending up as waste.

China embeds similar ambitions within the broader framework of 'ecological civilisation'.[73] The 2008 Circular Economy Promotion Law established a foundation for reducing, reusing and recycling across industries, paving the way for integration of circular objectives into sectoral planning. The 14th Five-Year Plan (2021–2025) sets targets to improve resource efficiency and expand recycling capacity by 2025.[74] In the transport and logistics sector, China's policy has centred on producer responsibility and traceability for batteries in new-energy vehicles: automakers and battery manufacturers must create collection and recycling systems, supported by a national platform that tracks batteries through their lifecycle.[75] Alongside recycling, China promotes battery-swapping as a service model, reducing charging times, facilitating fleet operations, and linking seamlessly into reuse and recycling chains.[76]

### Box 4: Nio's battery-swap ecosystem

Chinese electric vehicle manufacturer Nio has built an extensive battery-swap network, comprising over 3,300 swap stations across the country, allowing drivers to exchange depleted batteries for new ones in under five minutes.[77] This model decouples battery ownership from the vehicle, standardises battery pack formats for easier tracking and reuse, and enables centralised collection for refurbishment or recycling.

## 4.1.3. Findings

The Netherlands and China face a set of shared challenges. Both countries must decarbonise transport and logistics systems that continue to generate high levels of greenhouse gas emissions. Both countries also struggle with car dependence, despite strong policy efforts to promote public and active mobility. Finally, both economies rely heavily on major port

71 Abrahami et al., *Circular Batteries Charging the Future Collaborating for a Sustainable and Resilient Value Chain*, 5.

72 TNO, "Recovering Critical Raw Materials from LFP Batteries."

73 Xue et al., "Understanding Ecological Civilization in China."

74 Starz, *China's 14th Five-Year Plan: Implications on Ecosystems & Biodiversity*; International Energy Agency, "14th Five Year Plan on Circular Economy."

75 International Energy Agency, "Interim Provisions on the Traceability Management of Power Battery Recycling in New Energy Vehicles"; Gan et al., "A Study on the Coupled and Coordinated Development of the Logistics Industry, Digitalization, and Ecological Civilization in Chinese Regions."

76 JATO, "How China Is Driving Battery Swapping as a Service in the EV Market."

77 Liu, "A New Fully Charged EV Battery in Five Minutes: Are China's Swap Stations the Future of Electric Cars?"

complexes, which are indispensable for global trade but also major sources of local air pollution and carbon emissions.

Against these challenges, the Netherlands and China bring complementary expertise that can mutually reinforce their sustainability ambitions. The advantage of the Netherlands lies in governance, standards and integration. The Dutch lead in designing safe and accessible active mobility networks, integrating cycling seamlessly with public transport, and embedding detailed design and operational standards (for example, via the CROW bicycle traffic manual). Its system-wide approach to charging infrastructure—smart charging, vehicle-to-grid pilots and joint procurement consortia—demonstrates how innovation and coordination can accelerate real-world deployment.

China contributes a striking capacity for scale, speed, and strategic coordination. It has built the world's largest high-speed rail network, created the largest electric vehicle market globally, and advanced port electrification through national mandates and fiscal incentives. China's industrial policy and hierarchical planning, codified in successive Five-Year Plans and national plans such as Made in China 2025 and China Standards 2035, enable the swift build-out of infrastructure, including EV networks and port electrification, mobilising considerable investment and aligning national standards within tight timelines.

### Box 5: Signature project – Cycling infrastructure in Tongzhou district (Beijing, China)

Dutch consultancy company Haskoning was chosen by Beijing's local government to lead a project and lend their expertise in creating green cycling infrastructure in the new Tongzhou district of Beijing.[78] A long term project, Tongzhou aims to have a bicycle network exceeding 2,300km by 2035. Haskoning collaborated with China Sustainable Transportation Centre (CSTC) to create a pilot project: a 2.7km cycling highway which allows for tangible alternatives to driving in the local neighbourhood.[79]

In designing the pilot project, Haskoning was inspired by Chinese culture, elegance, and 'frozen silk' designs. This resulted in a project which blended Dutch cycling expertise with Chinese culture, allowing the project to fit seamlessly in the neighbourhood. The project is part of China's larger plans to improve cycling infrastructure. From 2017 to 2021 there was a 47.8% increase in non-motorised transport in Beijing's urban centre.

The collaboration in creating high-quality, people-centred cycling infrastructure is a good match for the Netherlands and China. Both have a history of widespread bicycle use, with China once nicknamed the "Kingdom of bicycles".[80] However, whilst the Netherlands kept up with a cycling culture, China is currently experiencing a 'cycling renaissance'.[81] Moreover, the project combines Dutch technical knowledge of cycling infrastructure with Chinese expertise in constructing large projects quickly and efficiently.

78 Haskoning, "Enabling Beijings Vision in Creating a Cycling Friendly City."

79 Haskoning, "Enabling Beijings Vision in Creating a Cycling Friendly City."

80 Xu Tao, 'The Rise of the Kingdom of Bicycles', in *Routledge Companion to Cycling* (Routledge, 2022).

81 Bruntlett, "Accelerating China's Resurgence as the 'Kingdom of Bicycles' at Intertraffic"; Gu et al., "The Two-Wheeled Renaissance in China—an Empirical Review of Bicycle, E-Bike, and Motorbike Development," 2021.

## 4.2. **Environmental quality and human wellbeing**

Environmental quality, encompassing the integrity of soil, water and air, is a key aspect of sustainable development policy in both the Netherlands and China. Because these dimensions directly shape suitable living conditions (liveability), health, and food safety, environmental quality cannot be separated from human wellbeing. In recent decades, rising environmental pressures in urban areas have given rise to an increased need for integrated strategies.[82] Urban environments across China and the Netherlands face escalating pressures on environmental quality due to densification, intensified agriculture, and legacy pollution, and residents increasingly face degraded air, contaminated soils, and strained water systems.[83]

In the Netherlands, the nitrogen crisis has demonstrated the limits of traditional agricultural and spatial planning practices, while urban air pollution from nitrogen dioxide, fine particulate matter, and ozone remains a concern for respiratory health and overall quality of life.[84] Another layer of complexity is added to the contamination of soils and waters with per- and polyfluoroalkyl substances (PFAS), which poses risks to both ecosystem integrity and the safety of food and drinking water.[85]

In China, sustained improvements in air quality over the last decade has not yet fully eliminated severe pollution episodes, while industrial and agricultural legacies continue to affect soil and water systems.[86] Moreover, urbanisation has intensified challenges related to stormwater and urban heat island effects, which directly affect the liveability of certain urban areas and can pose health risks.[87]

Urban environments are now considered to be at the centre of multiple intersecting sustainability challenges: rapid densification, infrastructure expansion, intensified agriculture and industrial legacies can concentrate air, soil and water pressures while simultaneously disrupting natural cycles of resources. Growing populations amplify resource demand and waste-generation, making innovative and integrated strategies essential to balance economic dynamism with ecosystem integrity and human wellbeing.

### 4.2.1. **Integrated approaches to air, soil and water quality**

Given their direct impact on human health, food safety, and the liveability of urban environments, cleaner air, soil and water are considered central pillars of the green transformation policies in China and the Netherlands.

82 UN Environment Programme, "Cities and Climate Change."

83 Yu et al., "Urbanization and the Urban Critical Zone," 2–3; Das et al., "Unraveling the Urban Climate Crisis: Exploring the Nexus of Urbanization, Climate Change, and Their Impacts on the Environment and Human Well-Being – A Global Perspective," 964.

84 Ministerie van Algemene Zaken, "The Nitrogen Strategy and the Transformation of the Rural Areas"; NL Times, "Air Pollution in the Netherlands Exceeds WHO Limits in Many Areas."

85 National Institute for Public Health and the Environment, "Current Information about PFAS."

86 Fuller, "Beijing Air Pollution Study Could Unlock Solution to Persistent Smog"; Mancl, "Reclaiming China's Worn-out Farmland."

87 Xu et al., "Mitigation of Heat Island Effect by Green Stormwater Infrastructure," 2.

In the Netherlands, air pollution concentrations have steadily declined over the past decades, yet concentrations of fine particulates and ozone still exceed the stricter 2021 World Health Organisation (WHO) guidelines in certain areas, posing ongoing health risks.[88] National and local authorities therefore continue to treat air quality as a priority, even though legal EU limit values are largely met.[89]

A more persistent challenge lies in soil and ecosystem health: intensive livestock farming[90] has driven high nitrogen deposition on protected nature areas, leading to the annulment of the previous permitting framework in 2019 and a subsequent tightening of national nitrogen policies.[91] While emissions have decreased, they remain well above thresholds for vulnerable ecosystems, with cascading effects on biodiversity, agriculture, and ultimately food security.[92]

Water and soil quality are further complicated by chemical contaminants, notably PFAS, which have been widely detected in Dutch inland and coastal waters as well as drinking-water sources.[93] At the same time, excess nutrients from agriculture continue to impair the ecological status of rivers and lakes and put drinking-water supplies under pressure, highlighting risks to both ecosystems and human consumption.[94]

The Dutch response increasingly relies on innovation and integrated approaches. Technologies such as Nereda's aerobic granual sludge treatment cut energy use while improving nutrient removal, illustrating how climate and water-quality objectives can be aligned while safeguarding public health.[95] Programmes like the Delta Programme and applied research initiatives such as COASTAR extend this vision by linking aquifer storage, water quality protection and resilient supplies.[96]

## Box 6: Nereda wastewater treatment process

Originating from a partnership between TU Delft, the Dutch water boards, STOWA, and Haskoning, Nereda uses aerobic granular sludge – dense microbial granules that settle rapidly and combine multiple treatment functions in a single reactor tank.[97] Compared to conventional activated sludge systems, Nereda plants require roughly 50% less energy, occupy much less land, and eliminate the need for secondary clarifiers and extensive sludge recirculation, making them more compact, robust, and efficient.[98] One full-scale Dutch installation in Epe doubled its treatment capacity while cutting power consumption by about 30% and substantially reducing chemical inputs.[99]

88 NL Times, "Air Pollution in the Netherlands Exceeds WHO Limits in Many Areas."

89 European Environment Agency, "Netherlands – Air Pollution Country Fact Sheet."

90 The Netherlands, with its population of 18.3 million, hosts no less than 15.1 million livestock animals.

91 National Institute for Public Health and the Environment, "Nitrogen and PFAS Suddenly Big Societal Issues in the Netherlands."

92 National Institute for Public Health and the Environment, "Natura 2000 Sites: Nitrogen Deposition on the Decline, but Still Too High for Much of Nature."

93 National Institute for Public Health and the Environment, "REACH."

94 RIVM, "Still Too Much Nitrogen and Phosphorus in Groundwater and Surface Water."

95 Haskoning, "Nereda Changes Wastewater Treatment with the 100th Plant"; Bahgat et al., "Integrated Resource Recovery from Aerobic Granular Sludge Plants."

96 Deltares, "COASTAR: een zoetwaterappeltje voor de dorst."

97 Dutch Water Sector, "Nereda."

98 Stuart, "Treating Wastewater More Sustainably."

99 Haskoning, "The Netherlands - Epe."

China has pursued a progressive clean-air trajectory since 2013. Heavy air pollution in its major cities became front-page news both inside and outside China, not least due to its dramatic effects on public health such as reduced life expectancy and increased risk of premature death.[100] Under the Air Pollution Action Plan and the Blue Sky Defence Campaign, pollutant concentrations in major cities have fallen sharply: Beijing's annual averages in 2022-2023 were about two-thirds lower compared to 2013 levels, though still above WHO guidelines.[101] Working on the basis of the Air Pollution Action Plan, the central authorities in Beijing decided to tackle soil and water pollution as well. China's soil and water policies have likewise tightened. The 2016 Action Plan for Soil Pollution Prevention and Control and subsequent legislation set targets for risk control and remediation, while investments in wastewater treatment and reuse have expanded, thereby reducing human exposure to harmful contaminants.[102]

China also seeks to connect environmental quality with resource efficiency. The "Concept Wastewater Treatment Plant" vision promotes energy-neutral, resource-recovering facilities.[103] Beijing's Huaifang Water Reclamation Plant exemplifies this shift (see *Box 7*).[104] Reclaimed water has become the city's second-largest water source, underscoring how innovation in treatment infrastructure is being used not only to reduce pollution but also to secure resilient supplies for megacities, improving water security and urban wellbeing.[105]

### Box 7: Huaifang Water Reclamation Plant

The Huaifang Water Reclamation Plant is Asia's largest underground membrane bioreactor wastewater recycling facility, located beneath a 16-hectare wetland park in Beijing. It treats up to 600,000 $m^3$ of sewage per day, recycling around 200 million $m^3$ of wastewater annually for non-potable uses such as environmental replenishment, industrial cooling, landscaping and urban greening. By integrating sludge-to-energy systems, the plant also generates electricity, reducing its overall carbon footprint and contributing to the city's energy goals.[106]

## 4.2.2. Circularity improves environmental quality

In both the Netherlands and China, circularity has become a guiding principle for tackling environmental quality challenges. This calls for the systemic transformation of consumption and production patterns, aiming to close material loops (keeping materials in use indefinitely through recovery, reuse, refurbishment, remanufacturing or recycling), and thereby reducing

100 Yin et al., "Particulate Air Pollution and Mortality in 38 of China's Largest Cities"; Yin et al., "The Effect of Air Pollution on Deaths, Disease Burden, and Life Expectancy across China and Its Provinces, 1990–2017."

101 Jiang et al., "Government Environmental Governance, Structural Adjustment and Air Quality"; Myllyvirta, "Beijing's Air Quality Meets National Standards"; World Health Organization, "Air Pollution."

102 State Council of the People's Republic of China, "China Announces Control Standard for Soil Contamination"; Hayward, "Towards the New Era of Water Reuse in China"; International Trade Administration, "China - Environmental Technology."

103 Qu et al., "Ideas for Building the Concept Wastewater Treatment Plants in China," 73.

104 Infrastructure Global, "Huaifang Water Reclamation Plant."

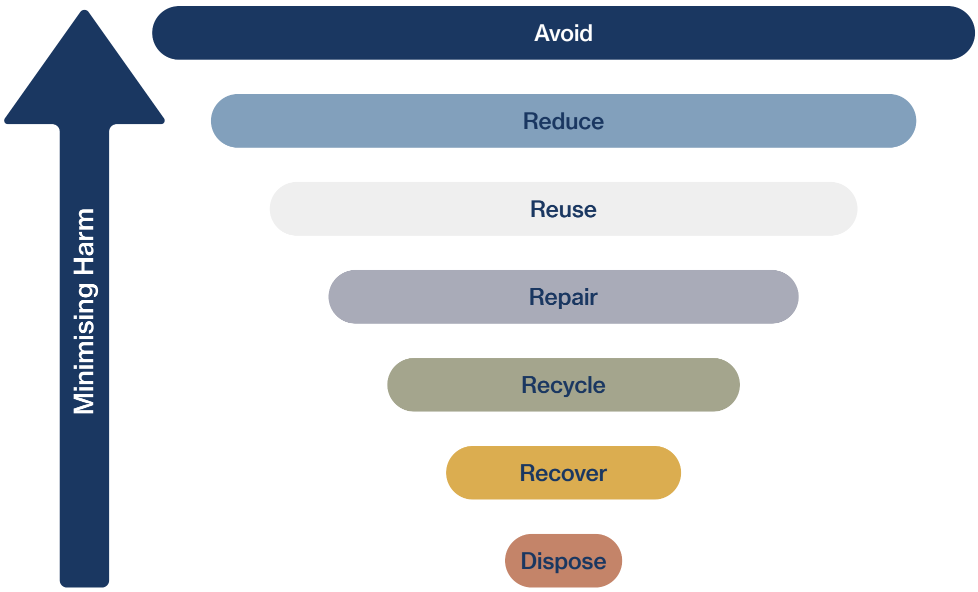
105 The State Council of the People's Republic of China, "Recycled Water Becomes Beijing's Stable Second Water Source."

106 Infrastructure Global, "Huaifang Water Reclamation Plant."

resource use and limiting health and environmental burdens.[107] Circularity thus goes far beyond recycling: it calls for systemic redesign of production and consumption, aiming to keep materials in use as long as possible while minimising harmful emissions and waste.

In practice, this means narrowing material loops by reducing raw material use, slowing them by extending product lifetimes, closing them through high-grade recovery and remanufacturing, and substituting finite resources with renewable or secondary inputs. This thinking builds on the so-called **Waste Hierarchy**, which ranks prevention, reuse and repair above recycling and disposal. Avoiding waste altogether is much more impactful in minimising environmental harm than recovering or recycling. Systematically developing innovative designs and new materials is considered essential to reach a circular economy.

## Figure 6: Waste Hierarchy in a Circular Economy
(Adapted from: Closed Loop, n.d.)




The Netherlands has embedded these principles into a government-wide circular economy programme that commits to halving the use of primary abiotic raw materials by 2030 and achieving full circularity by 2050.[108] This goes beyond recycling or waste management: products and materials are designed for durability, repair, refurbishment and reuse, and renewable or secondary inputs replace fossil and finite resources. In this way, harmful emissions are prevented from entering into the environment, and waste can be virtually eliminated. In doing so, the Netherlands aims to integrate diverse policy strands—from biomass and raw materials strategies to programmes on waste prevention and resource efficiency—into a coordinated framework.[109]

107 European Parliament, "Circular Economy."

108 Rijksoverheid, "Nationaal Programma Circulaire Economie 2023 - 2030," 27.

109 Rijksoverheid, "A Circular Economy in the Netherlands by 2050," 6.

At the system level, the waste hierarchy concept and high recycling rates provide a solid foundation for moving further upstream toward waste prevention and high-quality reuse.[110] The National Waste Management Plan (LAP3) and the Circular Materials Plan place waste prevention as a top priority for any government authority handling waste.[111] Concrete tools include extended producer responsibility, pay-as-you-throw systems (rewarding households for reducing residual waste), bans on single-use plastics, and the expansion of deposit-return schemes.[112] Public procurement rules and building standards ensure that material efficiency, reuse potential and lower embodied emissions are considered in the design phase, contributing to healthier living environments.

The construction sector in the Netherlands plays an important role in circularity thinking. Regulations and pilot projects promote modular design, material passports and biobased alternatives, exemplified by the 2018 "circular viaduct" experiment (see Box 8). Technological innovation plays a growing role: wastewater treatment plants, adopting Nereda granular sludge and sludge-to-biogas systems, combine emissions reduction with nutrient and water recovery, while biomass conversion pilots turn agricultural residues into renewable fuels and materials.

### Box 8: Circular construction in the Netherlands

In the Netherlands, the construction sector recognises that building and infrastructure can be designed, used and disassembled for multiple lifecycles with minimal waste. Circular construction is one of five priority transition agendas in the Netherlands. It is supported by regulations (e.g. *MilieuPrestatie Gebouwen*) and national programmes promoting modular and biobased design and material passports.[113]

In 2018, Rijkswaterstaat in collaboration with Van Hattum & Blankevoort, VolkerWessels, and Consolis Spanbeton built a 20-metre trial "circular viaduct" near Kampen, using 40 prefabricated concrete elements assembled into five girders and a 7.4m-wide deck.[114] After ten months of service, the bridge was fully dismantled and relocated to Almere. The design strives for near 100% material recovery: the only non-reusable part is the grout between the elements, accounting for less than 0.5% of total mass. Each part is expected to last up to 200 years through repeated reuse cycles, dramatically cutting material waste, embodied emissions and demolition debris.[115]

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110 The 'Ladder van Lansink', named after Dutch politician Ad Lansink who introduced this way of working, essentially embodies the Dutch waste-management hierarchy. It prioritises prevention and (re)use first, followed by recycling and energy recovery, with incineration and landfill as last-resort options. It has been at the core of waste management in the Netherlands since 1979.

111 Rijkswaterstaat, "National Waste Management Plan."

112 Afval Circulair, "Extended Producer Responsibility (EPR)"; van Eijk et al., *Waste Management as a Catalyst to a Circular Economy*, 22.

113 Leffers et al., *Circular Infrastructure: The Road towards a Sustainable Future*.

114 Consolis, "First Circular Viaduct in the Netherlands."

115 Coates, "Infrastructure Needs To Square The Circle – We Must Embrace The Excitement And Challenge Of Delivering More Sustainable Infrastructure."

China has embedded circular economy principles within its national development strategy under the broader concept of 'Ecological Civilisation', stressing the "harmonious coexistence of man and nature".[116] The 14th Five-Year Plan includes a circular economy development plan, aiming for a 20% improvement in resource productivity and growth in the recycling industry, while sectoral plans target material substitution and waste reduction, contributing to safer and healthier cities. [117]

China has made strides in establishing circular economy policy measures, especially in industrial sectors such as steel and manufacturing. Large-scale pilot projects, such as Zero-Waste Cities, aim to reshape urban and industrial flows, focusing on prevention, by-product reuse and stricter controls on dumping. This fosters benefits for human wellbeing in urban environments.

The central authorities in Beijing have established a mix of policy tools to reduce and prevent waste at the source. The 2021 Anti-Food Waste Law created enforceable obligations across the food sector, and phased bans on single-use plastics and new green packaging rules for the booming logistics sector reduce disposable materials. Industrial policy reinforces governance efforts through eco-design standards and extended producer responsibility schemes that require manufacturers to design for durability, facilitate reuse, and ensure product take-back and recovery.

Critics argue that China's overproduction in many industrial sectors undermines efforts made towards establishing a circular economy. In the Waste Hierarchy mentioned above, avoidance of waste has the maximum impact. Recycling, although important, could be described as what the Dutch call "Mopping the floor while the tap is running". The sometimes weak local enforcement of reuse and high-grade recycling measures is another factor that challenges the principle of narrowing and closing loops.

### Box 9: Guangxi Guitang Eco-industrial Park

The Guangxi Guitang Group is one of China's leading examples of industrial symbiosis: sugarcane residues, molasses and other by-products from its sugar refinery are fed into a connected network of downstream facilities, including alcohol production, fertiliser manufacturing, cogeneration of power and heat, and paper milling.[118] Waste streams from one process become raw material inputs for another, closing the loop and sharply reducing virgin material use and emissions. This integrated industrial ecosystem has become a model for eco-industrial parks across China, showcasing how circular design and shared resource flows can turn 'waste' into multiple profitable streams.[119]

116 Hanson, "Ecological Civilization in the People's Republic of China: Values, Action, and Future Needs," 10.

117 International Energy Agency, "14th Five Year Plan on Circular Economy – Policies."

118 Shi and Chertow, "Organizational Boundary Change in Industrial Symbiosis," 3.

119

Together, these initiatives show how both countries are moving from linear resource use toward integrated circular systems, albeit in different ways. The Netherlands emphasises governance coherence, prevention, and design standards, while China demonstrates the ability to mobilise large-scale pilots and regulatory shifts at speed. Both trajectories highlight circularity as more than a waste-management strategy, but rather as a structural transformation, linking resource security, emissions reduction, environmental quality, and human wellbeing.

### 4.2.3. **Findings**

The Netherlands and China face shared challenges in safeguarding environmental quality while maintaining economic dynamism. Both countries continue to grapple with the legacy effects of rapid industrialisation, intensive agriculture, and urban growth, which have left air, water, and soils under pressure. Despite significant reductions in pollutant emissions, concentrations of particulates, ozone, and nutrients remain above health-based or ecological thresholds in many places. At the same time, new contaminants such as PFAS, greenhouse gas emissions from wastewater systems, and diffuse nutrient leakage highlight the complexity of pollution pathways that require innovative, integrated, and adaptive responses to protect ecosystems as well as public health.

Progress has been strongest in areas of reuse, recycling, and industrial symbiosis – the classic ‘repair and recycle’ phases of the Waste Hierarchy. Yet the greatest potential lies upstream. China is advancing national pilots and regulatory frameworks aimed at waste prevention and reduction, but these often emphasise downstream recovery over systematically redesigning consumption and production. The Netherlands, on the other hand, is increasingly orienting its circular economy strategy toward upstream avoidance and policy coherence to contain material throughput.

Each country brings complementary expertise that can inform joint approaches. The Netherlands has a long tradition of coupling environmental protection with planning and engineering standards, and has pioneered innovations in waste management, water treatment and circular economy governance that are internationally recognised. China, on the other hand, has demonstrated the capacity to scale solutions at speed, from air quality campaigns to large-scale water reuse, combining infrastructure investment with regulatory enforcement. By joining forces, China and the Netherlands can advance environmental quality objectives as well as ensure that their sustainability transitions translate into healthier, safer, and more liveable urban environments.

### Box 10: Signature project – Transnational Network for Wise Waste Cities

This joint project by the Dutch Research Council (NWO) and China's National Science Foundation (CNSF), with funding nearing €2 million, aims to build a knowledge network on waste management in cities across the Netherlands and China, focusing on environmental sustainability and social inclusion.[120] Under the name 'Inclusive Wise Waste Cities' (IWWCs), research has been done in improving circular construction and demolition management, especially in fast-growing urban areas. Research on 'urban metabolism', a framework to measure material flows in cities, as well as the use of AI in smart waste management, is part of the project.[121]

Through collaboration by Dutch and Chinese universities, such as TU Delft, Peking University, and Tongji University, the project has published articles to advance the theoretical base. Despite setbacks during the COVID-19 pandemic, IWWC presented at the 8$^{th}$ World Sustainability forum, and the 16$^{th}$ International Conference on Waste Management & Technology.[122] A book on best practices and strategies in achieving a circular economy, written by Dutch and Chinese experts, will be released later in 2025.[123]

China has made strides in large-scale waste management through the 'Zero Waste Cities' policy launched in 2019. Considering that China produces over 10bn tonnes of solid waste every year, this policy has deepened China's expertise and standardised waste management.[124] The Netherlands has similar policies, with Rotterdam and Amsterdam working towards 'zero waste'.[125] The collaboration in IWWCs, with Chinese expertise alongside Dutch and Chinese innovation, will lead to modern and widespread waste management in both countries. However, effective waste management requires a cultural shift as well; both bottom-up and top-down responsibility is needed. In this respect, the focus in Chinese culture on societal responsibility might prove an advantage.

## 4.3. Resilience and adaptability

Cities today must navigate a convergence of intensifying climate pressures, accelerating urban growth, and aging infrastructure – all while preserving human well-being, ecosystem health, and service continuity. Resilience thus calls for a layered approach, encompassing **engineering resilience**, focused on maintaining or quickly restoring infrastructure function after disturbances, and **socio-ecological resilience**, emphasising the capacity of integrated human-nature systems to absorb change, adapt, and even transform in response

120 NWO, "Towards Inclusive Circular Economy."

121 Erasmus University Rotterdam, "Inclusive Wise Waste Cities."

122 de Jong and Zisopoulos, "Inclusive Wise Waste Cities - A Summary for 2021."

123 de Jong et al., *The Inclusive Circular Economy*.

124 Xu, "Welcome To China's Zero Waste Cities."

125

to shocks.[126] In this context, resilience thus transcends disaster recovery, while it also offers opportunities to reconfigure cities to use fewer materials, produce less waste, and embed adaptability.

In both the Netherlands and China, rising urbanisation and denser living environments amplify exposure to floods, heatwaves, water stress, and emissions. Integrating circular economy principles – such as avoiding new raw material inputs, extending infrastructure life via modular and reused materials, and closing loops in urban water and waste systems – turns resilience planning into a forward-looking transformation agenda rather than a series of crisis responses. Circular approaches to the built environment can strengthen urban systems against shocks, while simultaneously reducing carbon footprints and improving adaptability and resource efficiency by reusing building components, adaptive drainage systems, and resilient modular infrastructure.

Moreover, resilience is a social endeavour as much as a technical one. Raising awareness and engaging citizens in planning and fostering circular-economy thinking are critical to enhancing resilience. They help align behavioural norms with technical innovation, build legitimacy for preventive strategies, and improve the durability of transformative interventions.

### 4.3.1. **Resilience as a driver of the green transformation**

Both the Netherlands and China are aligning their green transformations around a dual objective: reducing emissions while strengthening resilience and safeguarding ecosystems. In both countries, resilience is no longer seen as separate from climate and sustainability goals but as an integral part of strategies for energy, water, and the built environment.

The Netherlands has set ambitious standards for flood protection through the Delta Decision for Flood Risk Management, which requires that the probability of flood-related mortality behind dikes does not exceed 1 in 100,000 by 2050.[127] This commitment drives ongoing reinforcement of 1,500 kilometres of dikes and hundreds of hydraulic structures, combined with spatial adaptation measures that integrate climate scenarios for heat, drought, and pluvial flooding. Programmes like Room for the River lower peak Rhine levels while balancing upstream–downstream interests, and the country's water authorities (*waterschappen*) provide legitimacy and continuity in decision-making.[128] The participatory polder model supports stakeholder legitimacy and has informed international collaborations such as Rebuild by Design in the US after Hurricane Sandy, where Dutch firms like Deltares, Haskoning, and Arcadis helped shape $1 billion in local resilience projects.[129]

126 Scordato and Gulbrandsen, "Resilience Perspectives in Sustainability Transitions Research."

127 National Delta Programme, "Delta Decision for Flood Risk Management"; Netherlands Environmental Assessment Agency, "Low Probabilities - Large Consequences."

128 Klijn et al., "Room for Rivers"; STOWA, "Room for the river."

129 Rebuild by Design, "Hurricane Sandy Design Competition: Rebuild by Design."

## Box 11: Rebuild by Design

In the aftermath of Hurricane Sandy, the United States launched *Rebuild by Design*, a multidisciplinary design competition and task-force process to rethink regional resilience. The Netherlands played a prominent role: Henk Ovink served as Special Envoy for International Water Affairs and Principal of the initiative, bringing Dutch design-and-planning principles directly into the recovery effort. Dutch firms and research institutes, such as Deltares, TU Delft and Arcadis, led or contributed to four of the winning design teams, developing integrated strategies to "live with water" in places like Long Island, Hoboken, and New Jersey bayside communities.

Resilience is also increasingly linked to the built environment in the Netherlands. With buildings accounting for around 40% of national energy use, programmes such as TNO's Building and Energy Systems (BES) initiative, alongside subsidies and energy-savings funds, promote retrofitting and innovation in positive-energy design.[130] These measures reduce demand, improve indoor comfort during heatwaves, and ease pressure on power systems during extreme conditions—aligning resilience with decarbonisation.

Another relevant pillar of the Dutch resilience approach is the increasing use of nature-based solutions and blue-green infrastructure as integral components of climate adaptation and urban design.[131] Research shows that integrating green roofs, wetlands, groundwater level management, and landscape restoration into urban, agricultural, and aquatic settings can significantly enhance water security, biodiversity, and effectiveness of flood-management, often with greater benefits than purely engineered responses.[132] By treating landscapes as adaptive systems, with water storage, infiltration and ecological connectivity as structural elements, Dutch planning increasingly weaves resilience into everyday spatial development.[133]

China embeds resilience into its broader vision towards a green economy. The national Sponge City Programme, launched in the mid-2010s, set targets in pilot cities to retain 70-90% of annual rainfall through infiltration, detention, and reuse, moderating flood peaks while improving water quality.[134] At the basin scale, coordinated reservoir operations on the Yangtze—tested during the 2020 floods—demonstrated how upstream regulation can protect megacity regions downstream.[135] In China's centrally coordinated system, such measures can be scaled rapidly: the combination of national sponge-city guidelines, the emergency-response law, and flood-control headquarters enables standardisation, rapid mobilisation, and learning across cities. Central authorities like the State Flood Control and Drought Relief Headquarters orchestrate tiered responses, deploy teams, and integrate real-time monitoring of reservoirs and drainage networks, reducing disaster losses during extreme seasons.

130 TNO, "Buildings and Energy Systems."

131 NL2120, "Elevating Nature-Based Solutions"; Dolman and Verlinde, "Achieving a Water-Resilient Rotterdam," 170–72.

132 De Knegt et al., "Exploring the Contribution of Nature-Based Solutions for Environmental Challenges in the Netherlands."

133 TU Delft, "The Landscape as a Starting Point for Sustainable Urbanisation."

134 Zhao, "Industrial Symbiosis," 58.

135 Zhang et al., "Realizing the Full Reservoir Operation Potential during the 2020 Yangtze River Floods."

Large-scale infrastructure remains a hallmark of China's resilience strategy. Projects such as the Three Gorges Dam and the South-to-North Water Transfer Project stabilise hydrological variability within the country. The Sponge City concept has so far been adopted in over 250 cities, illustrating China's ability to scale up nature-based solutions alongside engineered systems.[136]

### Box 12: South-to-North Water Transfer Project

As one of the world's most ambitious water infrastructure schemes, the South-to-North Water Transfer Project is designed to redirect up to 44.8 billion $m^3$ of water annually from the water-rich Yangtze River basin in central China to the arid north via three major routes. The Project has been operational since the early 2010s and supports industrial and agricultural uses in China's northernmost provinces. Despite its scale and benefits, the project raises challenges related to ecological disruption, water loss, and large-scale population resettlement, highlighting the trade-offs of mega-infrastructure in climate-sensitive basins.[137]

China's strong central authority underpins rapid crisis response. During the 2024 Guangdong floods, authorities evacuated 110,000 people and restored power to 80% of the 1.16 million residents who were affected within a week.[138] Similarly, China's 'zero-COVID' approach showed its capacity for decisive national action in emergencies, particularly before vaccines were available. Internationally, this crisis-response capacity has been extended as well, by dispatching rescue teams and assistance within 24 hours of the 2025 Myanmar earthquake.[139]

## 4.3.2. **Circularity as an enabler of long-term resilience**

The Netherlands increasingly links circularity to resilience in water and spatial policy. Under the Delta Programme, flood safety, freshwater availability, and spatial adaptation are treated in an integrated framework. Emphasis is placed on strategic retention, collection, and storage of water, efficient water distribution, and water-sensitive urban design.[140] Together with national, provincial, municipal, and water authorities, *Rijkswaterstaat* now applies adaptive delta management: a forward-looking approach that uses climate scenarios and flexible pathways to anticipate long-term risks.[141] Research institutes extend this capacity by testing innovative approaches—ranging from multifunctional dike concepts to urban water-sensitive design.[142] These projects illustrate how circular and green objectives can reinforce one another, combining safety, ecological value and spatial quality.

136 Choi, "Why Turning Cities into 'Sponges' Could Help Fight Flooding."

137 Aquatech, "China's South-North Water Diversion Project."

138 Ng, "Guangdong: Tens of Thousands Evacuated from Massive China Floods."

139 McPherson et al., "With US Absent, China Steps in for Earthquake-Hit Myanmar."

140 Rijkswaterstaat, "Freshwater Delta Programme."

141 Haasnoot and Jeuken, "Dynamic Adaptive Policy Pathways."

142 De Botselier et al., "Explaining the Adaptation Gap in Dutch Coastal Risk Management through Lock-in Mechanisms."

### Box 13: Rotterdam's Water Sensitive Urban Design

Rotterdam embraced a water-sensitive urban design strategy through its *Water Sensitive Rotterdam* programme (in Dutch: *Rotterdams WeerWoord*), aimed at making the city climate-proof by 2030 by integrating stormwater management, heat mitigation, groundwater control, and flood resilience into everyday public spaces.[143] The programme includes a broad mix of interventions, including water squares to temporarily store excess rainwater, green roofs, tree planting, permeable paving, redesigned street profiles, and rooftop parks – turning excess water into an asset rather than a liability while enhancing urban liveability, biodiversity, and spatial quality.[144]

Increasingly, infrastructure projects in the Netherlands incorporate so-called 'material passports', modular construction, and nature-based enhancements to extend asset lifecycles and enable high-value reuse at the end of life – linking circularity to long-term resilience.[145]

China has integrated circular principles into water management at both urban and basin scales. Wastewater reuse has become a structural component of urban supply: in Beijing, reclaimed water is now the city's second-largest source. Large, digitally monitored plants such as the underground Huaifang Water Reclamation Plant combine advanced treatment with energy recovery, demonstrating how high-quality reuse can support water security in megacities. At the city scale, Sponge City-guidance and integrated "smart water" platforms aggregate sensor data from sewers, green-blue infrastructure, and treatment facilities to optimise detention, reuse and discharge of water. This embeds circular water management into daily operations, linking flood protection, drought resilience and improved water quality. At basin scale, redistribution complements local measures: the South-to-North Water Transfer Project stabilises supply for the Beijing–Tianjin–Hebei region, while central authorities use real-time data to coordinate reservoirs and transfer canals during extreme events—illustrating how circular use, storage, and conveyance are managed within a single operational framework.[146]

China's circular transition is also shaped by rapid urbanisation. Since 1949, the urban share of the population has risen from 11% to 66% in 2023, requiring cities to absorb vast rural-to-urban migration flows.[147] To manage these pressures, Chinese cities have adopted smart-city solutions that optimise infrastructure and services while embedding circularity and ecological design. Hangzhou's "City Brain," developed by the Chinese company Alibaba with headquarters in Hangzhou, uses AI to optimise traffic and urban operations in real time.[148] The southern city of Shenzhen applies similar systems to manage congestion dynamically.[149] At the same time, green buildings have become standard: 94% of new urban housing now meets national green building standards.[150] These digital and ecological infrastructures highlight how China uses smart governance and circular construction to manage the environmental footprint of rapid urbanisation.

143 Rotterdams Weerwoord, "Wat doen we."

144 Urban Green-blue Grids, "Water Sensitive Rotterdam."

145 Leffers et al., *Circular Infrastructure: The Road towards a Sustainable Future*.

146 Aquatech, "China's South-North Water Diversion Project."

147 Erasmus University Rotterdam, "Inclusive Wise Waste Cities."

148 Hangzhou China, "City Brain System Makes City Smarter."

149 Li, "Smart City and Sustainable Urban Development in China."

150 Bai and Shi, "China's Urbanization at a Turning Point—Challenges and Opportunities."

### Box 14: Sponge City Wuhan

Widely considered as a pioneer of China's Sponge City programme, Wuhan is investing heavily in green-blue urban infrastructure to build climate resilience. Since 2016, the city has implemented multiple sponge projects across 38.5km$^2$, including rain gardens, restored water channels, ecological parks and permeable surfaces that capture, slow down, and reuse stormwater instead of letting it flood streets or overwhelm drainage systems. These interventions have not only reduced waterlogging, but also improved water quality, replenished urban groundwater, and enhanced public space and urban biodiversity.[151]

### 4.3.3. **Findings**

For both the Netherlands and China, the central challenge of urban resilience lies in reconciling rapid environmental change with the demands of dense, complex city regions. Intensifying floods, droughts, and heat extremes expose the limits of existing infrastructure, while urban growth and competing land uses constrain the space available for adaptation. Both countries thus need to strengthen physical protections as well as embed climate scenarios and risk metrics into planning and governance. The difficulty lies in making resilience systemic rather than reactive, ensuring that emergency responses, spatial development, and water management are coordinated and continuously updated in line with shifting climate baselines.

Resilience in this context has two layers: engineering resilience, which ensures the continuity of critical infrastructure following shocks, and socio-ecological resilience, which enables human-nature systems to adapt and transform over time. Both perspectives increasingly align with circular economy principles, emphasising reduced raw material use, modular and reusable infrastructure, and closed loops in water and waste systems. This shifts resilience from being purely defensive to becoming a driver of sustainability, lowering carbon footprints while increasing adaptability. Public awareness and citizen engagement are critical enablers. Where residents are actively involved in planning and supported by awareness campaigns, cities achieve stronger outcomes in waste prevention, reuse, and preparedness. Resilience is thus as much about building legitimacy and behavioural change as it is about technical innovation.

151 C40 Cities, "Cities100: Wuhan - Waterlogging Prevented by Sponge Infrastructure"; Oates et al., *Building Climate Resilience and Water Security in Cities: Lessons from the Sponge City of Wuhan, China.*, 11.

### Box 15: Signature project – Weihei City as a Climate Adaptive Pilot City

The city of Weihei was chosen as a pilot at the centre of collaboration between the Dutch Ministry of Infrastructure and Water Management (IenW), International Panel on Deltas and Coastal Areas (IPDC), and the Ministry of Ecology and Environment of China (MEE).[152] The collaboration focused on increasing climate resilience measures in city development, in particular, combatting flooding caused by climate change.[153]

Through a series of workshops and seminars, with a focus on knowledge exchange between Dutch and Chinese partners, Weihei city created a report, *Supporting China's Pilot on Resilient Cities: Key Recommendations for Weihei's 2035 agenda*, that included recommendations on resilience building.[154] The coastal nature of Weihei, combined with Dutch expertise in flood risk management, resulted in a fruitful relationship for the Netherlands and China, with economic, ecological, and social benefits for both countries. The Netherlands has a long history of flood management, having moved from a reactionary to a preventative approach. This philosophy is integrated into the Climate Adaptive City Project and is a cornerstone of the theme of resilience.

152 Global Center on Adaptation, "GCA China."

153 Global Center on Adaptation, "Climate Risk Assessments to Improve Climate Resilience in Coastal Cities."

154 Global Center on Adaptation, "GCA China."

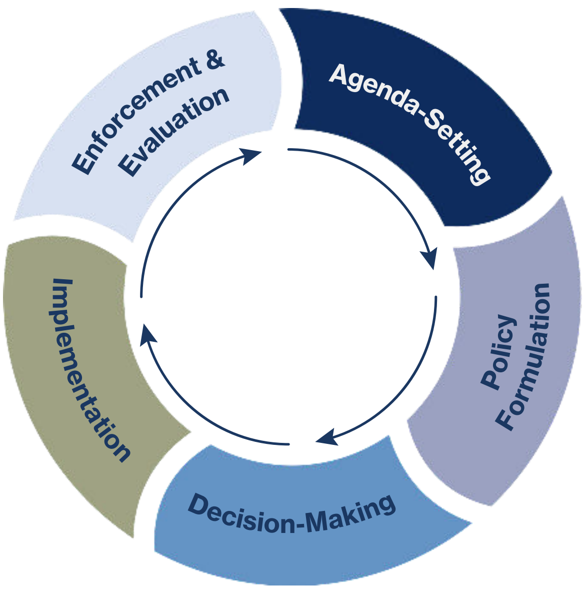
# 5. Analysis

The transition towards a greener society poses not merely technical challenges but also governance challenges: it requires the alignment of different actors, the balancing of instruments, and the continuous adaptation of strategies in line with changing circumstances. In this context, the sustainability policy cycle framework provides a structured way to examine how environmental, social, and economic ambitions are translated into practice. We then evaluate how decision-making processes of the many actors involved in the Netherlands and China can help realise the green transformation and circular economies, while fostering resilience and innovation.

## 5.1. Sustainability policy cycle

While the theoretical model of the policy cycle presented in *Figure 1* remains applicable to sustainability policymaking, the sustainability policy cycle distinguishes itself by placing greater emphasis on the evaluation, monitoring and **enforcement** of policy. In the evaluation phase, evaluation alone does not guarantee course-correction. When environmental protection and sustainability become policy priorities, as is apparent in both the Netherlands and China, a shift in enforcement behaviour may take place.[155] This is highlighted in *Figure 7* below.

### Figure 7: The sustainability policy cycle




[155] van der Kamp, "Governance by Uncertainty."

By tying findings and lessons learned to follow-up action, the evaluation becomes more concrete.

In the Netherlands, the **Agenda-Setting** stage of sustainability policy is strongly shaped by long-term commitments in the Climate Act, which legally anchored the goal of national climate neutrality by 2050. Landmark rulings such as the Urgenda case, together with advice from expert bodies like the Scientific Climate Council, have further pushed climate ambitions onto the political agenda.

## Box 16: Urgenda Climate Case in the Netherlands

In a landmark ruling, the Dutch Urgenda Foundation sued the national government together with 896 citizens, arguing that its climate policies were insufficient to protect human rights and public safety. In 2015, the court ordered the government to reduce greenhouse gas emissions by at least 25% below 1990 levels by the end of 2020 – a decision later upheld by both the Court of Appeal and the Supreme Court.[156] The courts held that the government has a legal duty of care, grounded in Dutch civil law and the European Convention on Human Rights, to act decisively against climate change, regardless of its small contribution to global emissions. This case has become a global precedent for climate justice litigation, constituting the first successful climate justice case against a government based on tort and human rights law.[157]

Building on this, the **Policy Formulation** and **Decision-Making** stages are characterised by a collaborative approach. The 2019 National Climate Agreement, for instance, was negotiated with several public and private 'social' parties, translating broad ambitions into sectoral roadmaps.[158] These outcomes are embedded in the EU-level National Energy and Climate Plan (NECP)[159], and are periodically reviewed through the Dutch Climate Plans. The Ministries of Economic Affairs and Climate Policy (EZK) and Infrastructure and Water Management (IenW) hold lead responsibility, while parliament and the Council of State ensure democratic scrutiny and legal soundness.

During the **Implementation** stage, the Netherlands relies on a combination of market-based instruments and devolved planning. The SDE++ subsidy scheme is an important financial instrument to stimulate large-scale renewable energy and industrial decarbonisation, while the Environment and Planning Act streamlines local permitting. Provinces and municipalities play a crucial role in the overall transition through Regional Energy Strategies, which translates the national agenda into concrete spatial and sectoral projects.

156 Lutak, "The Urgenda Decision."

157 In the NECPs, each member state (the Netherlands in this case) outlines their climate and energy objectives for the coming decade and elaborates on how they plan to achieve them. More information: Maxwell et al., "Standards for Adjudicating the next Generation of Urgenda-Style Climate Cases"; Kaminski, "Urgenda Two Years On."

158 Ministry of Economic Affairs and Climate Policy, "Integrated National Energy and Climate Plan," 153.

159 European Commission, "National Energy and Climate Plans."

Finally, **Enforcement** and **Evaluation** have become core elements of Dutch climate governance. The Human Environment and Transport Inspectorate oversees environmental law compliance together with local authorities, while independent assessments, such as the PBL's annual Climate and Energy Outlook, provide transparency on progress.[160] Courts also play an active role in enforcement, with landmark rulings such as the Urgenda case (see Box 16) holding the state accountable for its climate obligations.

China has made great efforts to kick-start the green transition. Central authorities play an important role in **Agenda-Setting**, **Policy Formulation,** and **Decision-Making**, with the main goal of pushing the development of cleaner energy to keep powering China's factories (and to become less dependent on the import of fossil fuels). The Renewable Energy Law adopted by the National People's Congress in 2009, the Energy Development Strategic Action Plan (2014-2020), and the focus on new energy development in all consecutive 5-year plans since 2006 are all cases in point. The 20th Chinese Communist Party Congress in 2022 stressed the need to "promote concerted efforts to cut carbon emissions, reduce pollution, expand green development, and pursue economic growth".[161] From a Dutch perspective, the large-scale use of subsidies in China to attain policy goals is a form of government-driven industrial policy.

Due to China's specific **'Double Wheel' policy cycle** (see section 2.1.3), the interplay between the central authorities in Beijing and local actors needs to be taken into account in the sustainability policy cycle as well. Provincial and local governments then **Adjust** the central policy to local needs and create their own energy development plans and policy measures. Streamlining administrative procedures and providing tax exemptions both play an important role in providing an attractive local investment climate.

In the **Implementation** stage, top-down policy support is extended to local levels, with state subsidies for pilot projects in policy priority areas. Local governments often compete to attract investors (so-called 'tournament-style' political competition).[162] They can offer to build infrastructure and industrial parks, for example, to attract state-owned (SOE) or private companies to invest in sustainability projects in their region. In practice, SOEs have higher levels of R&D investment, and they are more prepared to take risks, as they fulfill a political mission, so SOEs are often first movers. Privately-owned companies usually invest at a later stage, focusing on manufacturing. Smaller private companies might specialise in manufacturing parts or providing maintenance services.[163]

**Enforcement** and **Evaluation** have become increasingly important. China has strengthened its legal framework of environmental laws and implemented a central environmental inspection mechanism to expose accountability issues.[164] Although reporting systems have been established and environmental laws adopted, enforcement remains a challenge. Diverging interests of central versus local governments – where local governments want to invest in large infrastructure projects to support their local economy - sometimes exacerbate the problem. As the economic performance score plays a decisive role in the promotion of local officials, this may lead to overproduction and waste. This mechanism has a detrimental effect on achieving the goal of a circular economy.

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160 Hammingh et al., *Climate and Energy Outlook of the Netherlands 2024*.

161 Xi Jinping, "Report to the 20th National Congress of the Communist Party of China."

162 Fang et al., "Tournament-Style Political Competition and Local Protectionism."

163 Cao Mingran presentation on China's New Energy Transformation, China Knowledge Network, The Hague, 9 September 2025

164 Wang et al., "Does the Central Environmental Inspection Effectively Improve Air Pollution?"

## 5.2. **Actors and instruments**

To gain better insight into the climate governance systems and decision-making processes in the Netherlands and China, it is necessary to take a closer look at the many actors involved.

On a central level, the Dutch Ministry of Infrastructure and Water Management has (potential) counterparts in the Chinese Ministry of Ecology and Environment, the Ministry of Housing and Urban-Rural Development, and, to a lesser extent, the Ministry of Land and Resources. Both countries have national agencies focusing on water, transport, the environment, and many other areas.

China's National Development and Reform Commission (NDRC), responsible for the country's 5-year plans, is a ministerial-level department of the State Council, China's government. It does not have an equal counterpart in the Netherlands when comparing tasks, responsibilities, and influence. The China National Environmental Monitoring Centre and the State-owned Assets Supervision and Administration Commission, which oversees State-Owned Enterprises (SOEs), are also ministerial-level departments of the State Council.

Other notable actors are local governments, research institutes, universities, SOEs, the private sector, and civil society. As both countries prioritise innovation, the knowledge institutions (e.g., national research institutes and top universities) play an important role in joint Dutch-Chinese projects. On the Chinese side, the NSFC (National Natural Science Foundation) and CCICED (China Council for International Cooperation on Environment and Development) are examples. On the Dutch side, institutes like TNO, Deltares, and KNMI play a role. The cases in Chapter 4 provide examples of other relevant partners.

For clarity, the institutions of both countries, with a focus on the priority domains of this study (connectivity, environmental quality, and resilience), are presented side by side in *Table 1*.

## Table 1: Relevant actors across the sustainability policy cycle

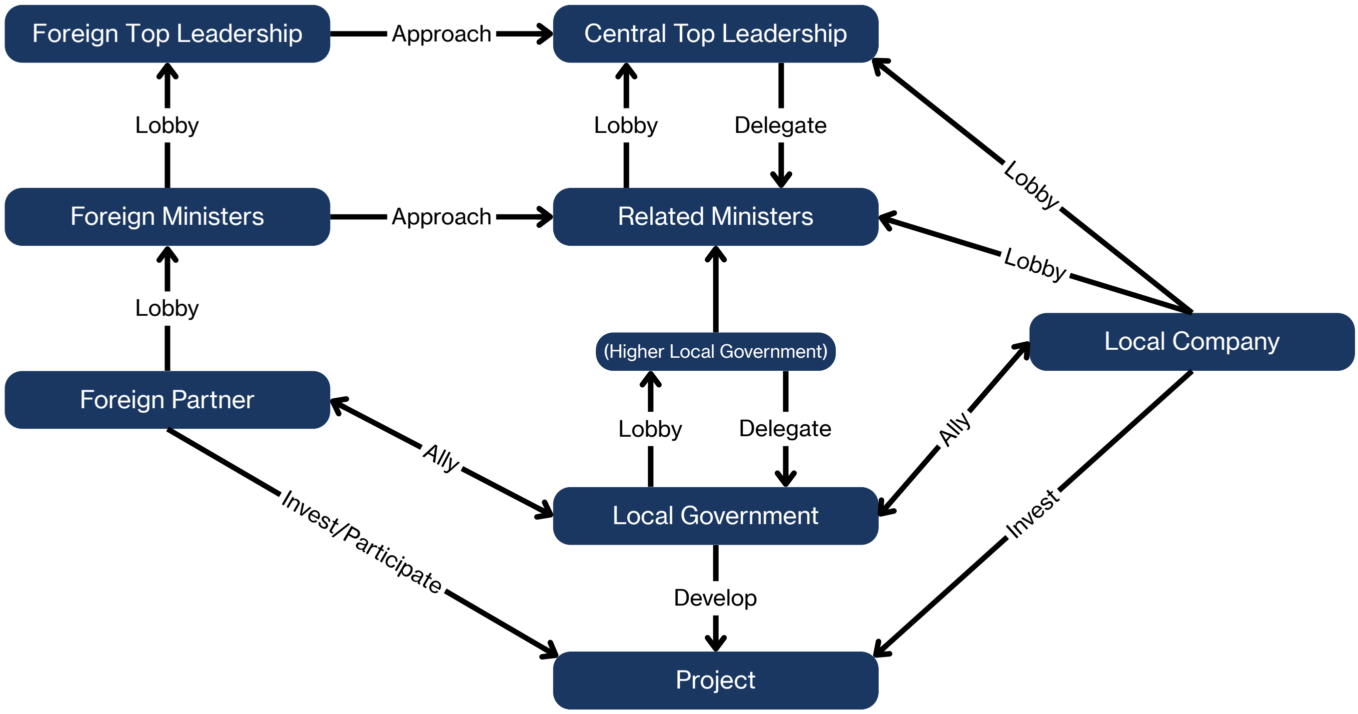
| | Netherlands | China |
|---|---|---|
| **Central Authorities** | • Parliament<br>• Government<br>• Ministries (e.g. IenW)<br>• Agencies under IenW (e.g. Rijkswaterstaat, KiM Institute for Transport Analysis) | • Communist Party of China<br>• National People's Congress<br>• State Council (+ NDRC for 5-year plans)<br>• Ministries (e.g. Ministry of Ecology and Environment, Ministry of Housing and Urban-Rural Development, Ministry of Land and Resources)<br>• Agencies (e.g. China National Environmental Monitoring Centre, State-Owned Assets Supervision and and Administration Commission (SASAC)) |
| **Local Authorities** | • Provinces<br>• Municipalities<br>• Regional bodies for specific domains (e.g. spatial planning, transport, water management) | • Provinces<br>• Municipalities<br>• Counties/Townships<br>• Regional bodies (e.g. provincial SASACs, environmental monitoring) |
| **National Research Institutes** | • Planning bureaus (Netherlands Bureau for Economic Policy Analysis, Netherlands Institute for Social Research)<br>• TNO<br>• Specialised institutes (e.g. KNMI for climate and weather, RIVM for public health, Deltares for water, Marin for maritime, NLR for aerospace) | • Chinese Academy of Sciences (CAS), with over 100 institutes (all affiliated with the State Council)<br>• Chinese Academy of Social Sciences (CASS)<br>• Specialised institutes (e.g. National Natural Science Foundation of China, CCICED) |
| **Universities** | • Delft (tech), Wageningen (agri), Amsterdam, Leiden, Utrecht, Groningen | • Top universities, e.g. Peking, Tsinghua, Fudan, Jiaotong, Zhejiang, etc. |
| **State Enterprises** | • Dutch state participates in entreprises for common good (e.g. National Railways, Rotterdam Harbour, and the energy grid)<br>• Public-private Partnerships | • National level (e.g. Sinopec energy, COSCO logistics, instrastructure, telecom)<br>• Provincial level SOEs |
| **Private Sector** | Wide range of players, national and local:<br>• Transport operators<br>• Logistics firms<br>• Utilities/distribution system operators<br>• Private contractors for projects | N.b.: the majority of the largest Chinese private companies have direct ties with state owners. |
| **Civil Society** | • Environmental NGOs<br>• Trade unions and sector associations<br>• Schools<br>• Media | • Environmental NGOs<br>• Trade Unions<br>• Poverty Alleviation NGOs |

An established feature of China's climate governance system is the integration of knowledge into the policymaking process. China relies heavily on a dense ecosystem of knowledge institutes and universities that provide data, modelling, and policy analysis. Influential bodies such as the Energy Research Institute (ERI) and the National Centre for Climate Change Strategy and International Cooperation (often referred to as the NCSC, National Climate Strategy Centre) play a key role in shaping national targets and programs. Universities like Tsinghua are closely engaged in providing technical expertise and long-term scenario studies.

For China, given its immense scale, there are numerous actors at the national, provincial, and local levels to consider. When foreign actors are involved, as is the case when China and the Netherlands collaborate, this leads to added layers of complexity, both in hierarchical (vertical) and horizontal dimensions.

The Local Alliance Model[165] (see *Figure 8* below) provides an insightful overview of the various actors and lobbying efforts involved when Chinese local governments need to persuade the central government to participate in international cooperation projects. This poses a challenge for all actors involved.

## Figure 8: Chinese Local-Foreign Alliance Model
(Adapted from: Xie, 2025)




Within the confines of this study, only general outlines can be given of the actors and governance structures. For each project, an assessment needs to be made of all relevant actors and specific procedures involving decision-making, implementation, and enforcement of policies.

China uses a broad mix of instruments to steer its green transition, combining market mechanisms, subsidies, industrial policy, and direct state oversight. For instance, the national emissions trading system (rolled out in 2021) introduces carbon pricing signals into the economy. Moreover, renewable energy development has been propelled by long-standing feed-in tariffs and more recently by renewable quota obligations at the provincial level, while transport electrification has advanced rapidly under a combination of purchase subsidies, tax exemptions, and dual-credit mandates for manufacturers.

At the same time, strong inspection mechanisms – most notably the Central Environmental Protection Inspection (CEPI) system – have been deployed to improve compliance and hold local governments accountable for implementation. China's governance is often described as dualistic. China's authorities combine institutional implementation and enforcement with

[165] Xie, "How Do Chinese Local Governments Persuade the Central Government in International Economic Cooperation Projects?"

so-called campaign-style enforcement, characterised by sudden regulatory campaigns to implement rapid changes.[166]

Pilot projects and regional demonstration zones, such as the Yangtze River Delta (Shanghai, Nanjing, Suzhou)), the Greater Bay Area (Guangzhou, Shenzhen, Hong Kong, and Macao), and Jiangsu Province (with links to the Dutch province of Noord-Brabant), are used as test-beds for green development strategies. This layered approach mixes market incentives with central planning and enforcement, reflecting China's hybrid governance model wherein industrial policy and political control remain central levers of the green transition.

The Dutch approach to the sustainability policy cycle involves a diverse array of actors operating at multiple levels of governance. At the central level, the parliament, government, and key ministries (e.g. Economic Affairs and Climate Policy, and Infrastructure and Water Management), set the overall agenda and legislative framework. These, in turn, are supported by specialised agencies such as Rijkswaterstaat and the KiM Institute. Regarding the translation of national targets into local and spatially grounded strategies, provinces, municipalities, and regional bodies play an important role; for instance, in the Regional Energy Strategies.

Knowledge institutes form a strong backbone, with national planning bureaus, applied research organisations, and specialised institutes providing data, models, and impact assessments, while universities contribute disciplinary expertise and innovation. The state also participates in enterprises for the common good of society, such as the railway and energy grid operators, as well as through public-private partnerships in transport and energy.

To steer the green transition, the Netherlands employs a mix of instruments. For instance, a rising carbon levy on industrial and power signals market actors to reduce emissions, while revenues often circulate back into subsidies and carbon contracts for difference (CCfD) to de-risk low-carbon investments and accelerate the deployment of clean technologies. Meanwhile, subsidy schemes for renewables and industrial decarbonisation support infrastructure programmes, such as grid expansion and carbon capture logistics. This is paired with voluntary agreements and green procurement policies to harness private sector action.

Dutch local governments also apply regulatory and planning-based instruments to facilitate community energy and spatially integrated renewables, while adaptive permitting processes are increasingly aligned under the Environment and Planning Act to reduce bottlenecks. Building on this domestic toolbox, the Netherlands Enterprise Agency (RVO) facilitates international coordination through its Partners for International Business (PIB) programme, enabling Dutch firms and knowledge institutes to form export-oriented public-private clusters that jointly bring sustainable technologies and services to foreign markets. Finally, modelling, independent assessment, and iterative evaluation feed back into the mix, helping to calibrate the balance of price signals, subsidies, and regulation over time to keep the transition on track.

[166] van der Kamp, "Governance by Uncertainty: Changing Patterns in China's Environmental Enforcement."

## 5.3. **Integrated analysis**

Although the Netherlands and China have different scales and political systems, both countries are navigating similar pressures across the domains of physical connectivity, environmental quality, and resilience. Examining how actors are mobilised and which instruments are applied in each country helps to identify complementarities and highlights opportunities for the Netherlands to engage in a more strategic way.

A first commonality is the reliance on **knowledge institutes** to bridge high-level strategy and local implementation. In the Netherlands, planning bureaus, such as the PBL, provide independent evaluation that feeds into decision-making. Chinese counterparts such as the Energy Research Institute, NCSC, and advisory platforms like CCICED, perform a similar role in shaping the Five-Year Plans and pilot zones. This scientific backbone matters directly to physical connectivity, where institutes provide models for EV uptake and freight decarbonisation, and to environmental quality, where they track pollution trends and test wastewater or soil remediation strategies. For resilience, both countries rely on scenario analysis—whether through Dutch adaptive delta planning or Chinese sponge city pilot projects—demonstrating how knowledge exchange can be institutional.

Another structural similarity lies in the use of **pilot projects** and demonstration regions. The Netherlands has developed living labs in Utrecht for smart charging, circular construction pilots, and water-sensitive urban design in Rotterdam. China, in turn, has scaled this to a larger magnitude: eco-city pilots, sponge city programmes, and green development demonstration zones, for example, in the Yangtze River Delta and the Greater Bay Area (specifically Shenzhen). These zones test mobility transitions such as electrified logistics and cycling revival, policies for environmental quality like waste reduction and wastewater reuse, and resilience measures such as integrated flood control.

For IenW, collaboration anchored in these pilots is particularly promising because they already align central targets with local implementation, creating space for experimentation and international cooperation. Pilot projects double as laboratories of innovation, where new governance models, digital tools, and technical solutions can be trialled before scaling nationally and beyond. The provincial links between Jiangsu and Noord-Brabant illustrate how sub-national pairings can translate abstract goals into tangible projects. The provincial cooperation focuses on high-tech (Brainport[167], AkzoNobel's energy-efficient coatings), health (Philips), and agriculture. The Netherlands Business Support Office (NSBO) in Jiangsu's capital Nanjing functions as a liaison office.

The **instrument mix** shows contrasts that matter across the domains. The Netherlands relies heavily on **regulatory coherence**, fiscal incentives, and evaluation: SDE++ steers renewable and industrial decarbonisation, charging infrastructure is supported through joint procurement and permitting, and nitrogen rules constrain land use to protect environmental quality. These instruments are embedded in broader governance frameworks, such as the Environmental Law (*Omgevingswet*) and Delta Programme, which link spatial planning, water safety, and resilience targets. China's approach is **more hybrid**: the national emission trading scheme (ETS), renewable portfolio quotas, and electric vehicle subsidies create economic signals, while central inspections, like CEPI, enforce environmental and resilience standards vertically.

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167 Hijink, "Waarom de Brabantse Brainport een broertje in China bouwt."

For physical connectivity, this means that Dutch pilots on charging infrastructure or port decarbonisation could be matched with Chinese large-scale electric vehicle or port electrification programmes. In environmental quality, Dutch wastewater resource recovery techniques align with China's rapid expansion of treatment and reuse plants. For resilience, Dutch risk-based safety standards complement China's ability to mobilise large-scale sponge city rollouts or basin-level water transfer schemes.

At the same time, **divergences** are clear. The Netherlands' policy cycle is embedded in legal commitments, independent evaluation, and **stakeholder consultation**, and produces relatively stable and transparent pathways, albeit sometimes leading to slower implementation. China's cycle is more **directive**, with rapid mobilisation, large-scale subsidies, and inspection mechanisms that drive visible results but sometimes create uneven enforcement at local levels or overemphasis on economic growth.

These differences affect (1) how physical connectivity projects are rolled out: bottom-up pilots versus centrally mandated programmes; (2) how environmental quality is safeguarded: strict legal enforcement versus inspection-led and campaign-style compliance; (3) and how resilience is embedded: risk-based standards versus large-scale infrastructure mobilisation. Recognising these divergences helps identify where joint projects should focus on **complementarity** rather than uniformity.

Critically, both systems show how **enforcement and evaluation** are essential to ensure that ambitions in connectivity, environment, and resilience translate into practice. The Dutch cycle, centred on the Climate Act and the annual Climate & Energy Outlook, provides transparency and legal accountability. In China, CEPI inspections, campaign-style enforcement, and performance assessments of local officials create strong incentives for compliance, albeit sometimes skewed toward economic growth.

The overlap here points to opportunities: Dutch evaluation frameworks can add depth to Chinese pilot assessments, while China's scaling capacity can stress-test Dutch approaches under high-growth, high-risk conditions.

# 6. Conclusions, strategic directions, and recommendations

## 6.1. Conclusions

Bringing the insights in this report together, three lessons for cooperation are highlighted:

1. **Actors matter**: effective engagement requires IenW not only to liaise with ministries but also with Chinese research institutes and pilot regions where transport, environmental, and resilience innovations are tested.
2. **Instruments travel best when tailored**: combining Dutch legal-regulatory strengths with China's fiscal and industrial mobilisation can produce hybrid approaches fit for both settings.
3. **Pilots are the hinge**: embedding cooperation in regions such as the Yangtze River Delta or Greater Bay Area ties knowledge to infrastructure and ensures that projects address all three domains simultaneously.

For cooperation to have added value to both countries, it is wise to link project proposals to China's industrial policy priorities, focus on **complementarity**, where each partner brings specific expertise to the table, and on shared problems.

The **governance systems** in China and the Netherlands differ. The Netherlands' policy cycle is embedded in legal commitments, independent evaluation, and stakeholder consultation, and produces relatively stable and transparent pathways, albeit sometimes leading to slower implementation. China's cycle is more directive, with rapid mobilisation, large-scale subsidies, and inspection mechanisms that drive visible results but sometimes create uneven enforcement at local levels or overemphasis on economic growth.

China's 'Double Wheel' policy cycle emphasises the important **role of local actors**. When dealing with international partners, layers of complexity are added, illustrated by the 'Local-Foreign Alliance Model'. For cooperation to succeed, the role and hierarchical position of all actors involved in the policy cycle must be established at an early stage.

Overall, the Netherlands and China share ambitious sustainability goals but embody different pathways: one country emphasises bottom-up governance, the other rapid deployment at scale. By connecting actors, instruments, and pilots across the domains of physical connectivity, environmental quality, and resilience—and by acknowledging both divergences and synergies — the Netherlands and China can learn from one another while advancing their own transitions. **Innovation** constitutes the connective tissue that allows policy goals to be translated into scalable practice, whether through Dutch living labs or Chinese mega-pilots.

## 6.2. **Strategic directions**

The Netherlands and China share a strong commitment to addressing global sustainability challenges. Both focus on the green transition of energy sources, strive to create a more circular economy, and see innovation as a driver of change. Structural similarities provide opportunities for collaboration between the two countries. When designing future cooperation possibilities and projects, **innovation** is a must-have, a core element to arouse the interest of Chinese and Dutch partners. Two commonalities are particularly noteworthy when developing joint projects, as they help to lay a solid foundation for these projects:

- Reliance on **knowledge institutes** as bridges between high-level strategy and local implementation.
- The use of **pilot projects**, where new technical solutions and governance models can be trialled before scaling up. Pilots align with government priorities, create space for experimentation and for international cooperation.

The world has changed. The Sino-Dutch relationship is no longer characterised solely by the Netherlands transferring technologies to China; rather, it has evolved into a more reciprocal dynamic in which the Netherlands recognises opportunities to learn from China: the country has become a high-tech powerhouse and a world leader in a number of technologies (e.g., solar panels, batteries, offshore wind, high-speed trains). As a result, there are now many areas of expertise in China that are of interest to the Netherlands and vice versa. Projects where both partners bring specific technology and gain from the knowledge of the other are preferable.

China's large scale has made it possible to optimise supply chains within its borders. As the scale of Netherlands is much smaller, it is advisable to focus on **niches** in the supply chains where Dutch technology excels. Chapter 4 of this study provides examples of successful niches. Protecting leading technology remains important, especially since China aims to become as self-reliant as possible.

As a side note, some cultural similarities between China and the Netherlands can be used to the advantage of both countries. A **pragmatic attitude**, combined with the ability to adapt to changing conditions, is widely regarded as a common trait among Dutch and Chinese people. On the occasion of celebrating 50 years of diplomatic relations in 2022, both governments spoke of an 'open and pragmatic partnership', where criticism is allowed, because "partners may disagree on certain issues, but practical cooperation is paramount".[168]

**Long-term orientation** is one of the six dimensions of national culture designed by culture expert Geert Hofstede.[169] Both countries score high on this dimension, implying that, as the

[168] Leiden University, "Fifty Years of Diplomatic Relations with China."

[169] The Culture Factor, "Country Comparison Tool."

world is in flux, preparing for the future is always needed.[170] Long-term thinking is a common feature of Asian cultures, but not of Western cultures. Some point to the Netherlands' historic struggle with water management, given that large parts of its territory lie below sea level, as a key reason why the Dutch – unlike most Western cultures – share an orientation toward long-term challenges, a perspective that is particularly relevant for the Dutch Ministry of IenW. Awareness of these common aspects can play a positive role in deepening relations between the two countries.

## 6.3. **Recommendations**

There are numerous opportunities for cooperation between China and the Netherlands in the areas of green transformation and circular economy. Joint projects in the past show the strengths and weaknesses of both sides. Important considerations for future cooperation include both process-based and thematic measures.

### 6.3.1. **Process recommendations**

Successful Sino-Dutch cooperation requires careful attention to how projects are prepared, organised, and embedded in long-term institutional frameworks. Past collaborations have demonstrated that adequate process design can enhance the effectiveness of a project and can help overcome differences in political systems, governance cultures, and scales of operation. The following considerations are key in setting up viable and sustainable partnerships:

- In the preparatory phase of a joint project, identify all **relevant actors** and map their hierarchical position and influence in different stages of the policy cycle. Be aware that an actor's position within the Communist Party prevails over the state hierarchy. Given China's size, local actors play an important role, adjusting national policies to local circumstances, and in the implementation phase. For instance, Wuhan's Sponge City pilot combined municipal bureaus, national technical guidelines, and international advisors to coordinate nature-based measures.[171]
- Identify sectors of future cooperation by making use of **China's industrial policy**, laid out in its five-year plans and state subsidy policies. China's strategy of 'high-quality development' is to make optimal use of advanced technologies such as AI and robotics to realise a green-energy-powered transformation. China's long-term policy planning documents provide concrete starting points in various (high-tech) sectors. The 14$^{th}$ Five-Year Plan and follow-on robotics/AI initiatives emphasise "high-quality development" with standards and roadmaps for deploying for robotics, which could present useful anchors for Dutch proposals in autonomous logistics and smart manufacturing.[172]
- Leverage **long-term institutional ties** between Dutch and Chinese governmental institutions, universities, and business communities as well as existing Dutch public-private partnerships operating in China. Recent examples include NWO-CAS water and wastewater

[170] The Culture Factor, "Country Comparison Tool."

[171] Oates et al., *Building Climate Resilience and Water Security in Cities: Lessons from the Sponge City of Wuhan, China.*

[172] Song, "Understanding the New Five-Year Development Plan for the Robotics Industry in China."

consortia and Sino-Dutch workshops on smart cities, which already convene ministries, universities, and the private sector.[173]

- As a result of the much smaller size of the Netherlands, Dutch actors proposing projects in China need to consider the option to **combine forces**. The Partners for International Business instrument is a good example of the advantages of scale when multiple partners participate in a project proposal. For instance, Dutch horticulture and hydrogen clusters have used PIB arrangements to enter Chinese markets, pooling government engagement and technological capabilities.[174]
- Focus on **complementarity in methods**. Dutch monitoring and evaluation frameworks can add depth to Chinese pilot assessments, while China's scaling capacity can stress-test Dutch approaches under high-growth, high-risk conditions. Dutch living-lab methods could be evaluated in China's larger pilot projects to validate performance at scale.

### 6.3.2. **Thematic recommendations**

Beyond strong processes, successful cooperation requires a clear focus on shared ambitions in the green transformation and circular economy. Both China and the Netherlands face similar transition challenges and can benefit from combining their complementary expertise. Future collaboration should concentrate on the following thematic areas:

- Focus on the shared problems regarding the green transformation, for example finding innovative solutions for **grid congestion**. Both countries are expanding renewables rapidly, so topics like flexible markets, V2G, and storage could be optimised together.
- When planning future projects on redirecting the economy to a more circular path, it is advisable to focus on the **upper stages of the waste hierarchy**, such as avoiding, reducing, reusing, and repairing. These stages are currently underdeveloped in both countries and has a much bigger impact in minimising harm to the environment than current joint projects focusing on recycling, recovering, and disposing. In this regard, China's "zero-waste city" pilots offer ready venues to test Dutch reuse and repair models alongside Chinese source-reduction policies.
- There are many opportunities to cooperate on **engineering resilience** (maintaining or quickly restoring infrastructure functions following disturbances) for example, by sharing expertise on the development of smart buildings. **Socio-ecological resilience** (the capacity of integrated human-nature systems to respond to shocks) seems to be a somewhat overlooked field, where the Netherlands can contribute expertise by applying its extensive experience in dealing with stakeholders across all levels of society. Concrete openings include near-zero-energy building exchanges and smart-city retrofit projects linking Chinese and Dutch cities and embedding stakeholder engagement alongside technical building controls.
- The Netherlands has developed an internationally renowned system of **spatial planning** for housing, infrastructure, nature, and agriculture, coordinated across national, provincial, and municipal levels. This expertise is valuable in a wide range of projects where diverse aspects of the green transformation need to be tackled in densely populated urban areas. In joint planning dialogues, Dutch multi-level spatial frameworks can be paired with China's large-scale demonstration zones. This allows for the co-development of spatial solutions, including transit systems, flood resilience measures, and industrial siting strategies.

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173 Klein Tuente, "Four Sino-Dutch Research Projects on Green Water Processes Awarded"; Beijing University of Technology, "The 2023 Sino-Dutch Workshop on Smart City Successfully Held at Beijing University of Technology."

174 Geerts, "Toward Building New Sino–Dutch Green Partnerships," 87.

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