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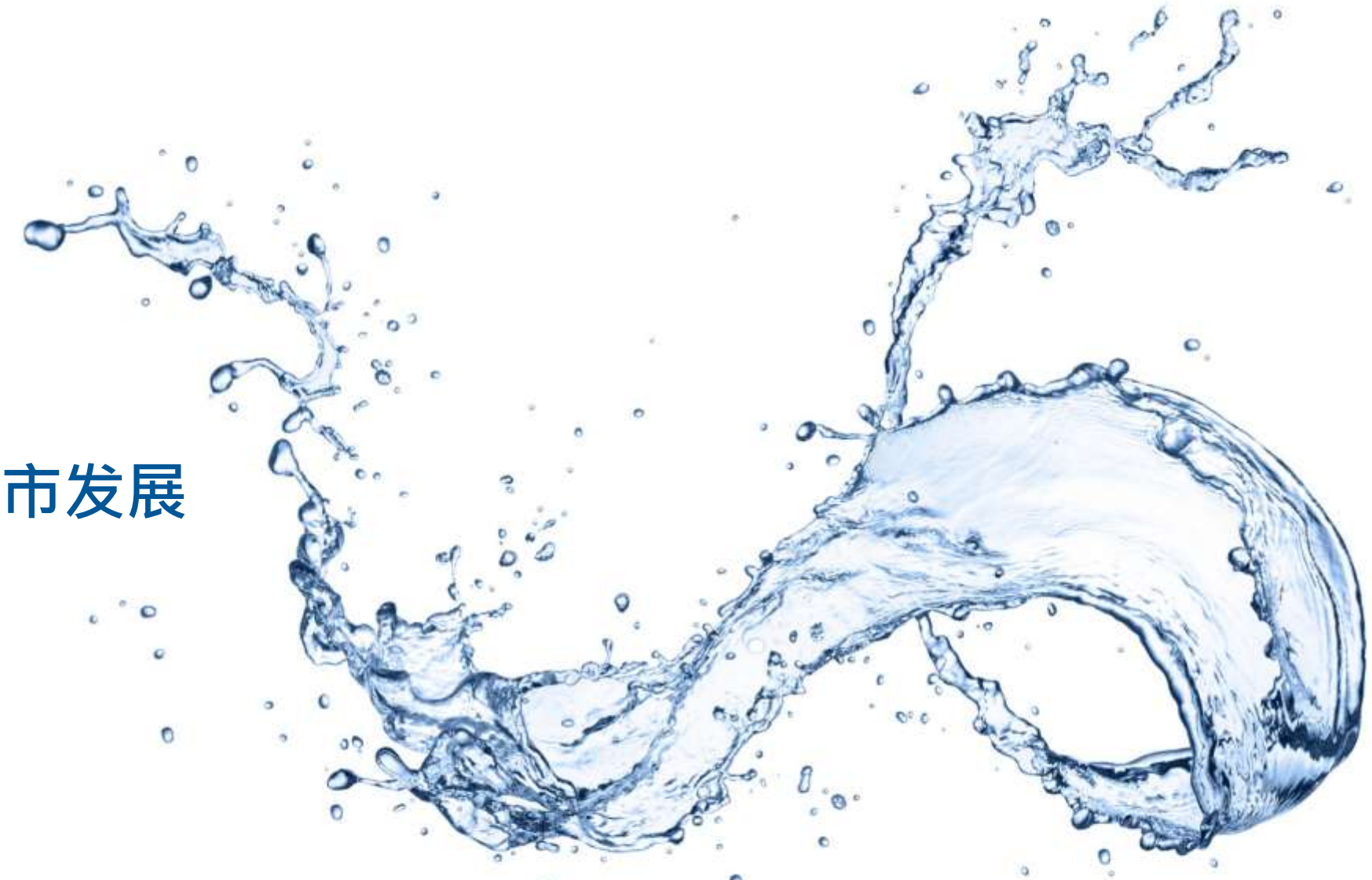
中欧水资源平台（CEWP）

Flood resilience and sponge city development
洪涝韧性与海绵城市发展



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EMBRACE WATER in the urban enviroment

***China-Europe Water Platform** - Thematic collaboration session; Resilience and flood management*

中欧水资源平台 - 专题协作会议；韧性与洪水管理

3 February 2026

2026年2月3日

Co-funded by the European Union and P.R. China

Flooding more serious
洪水问题日趋严重

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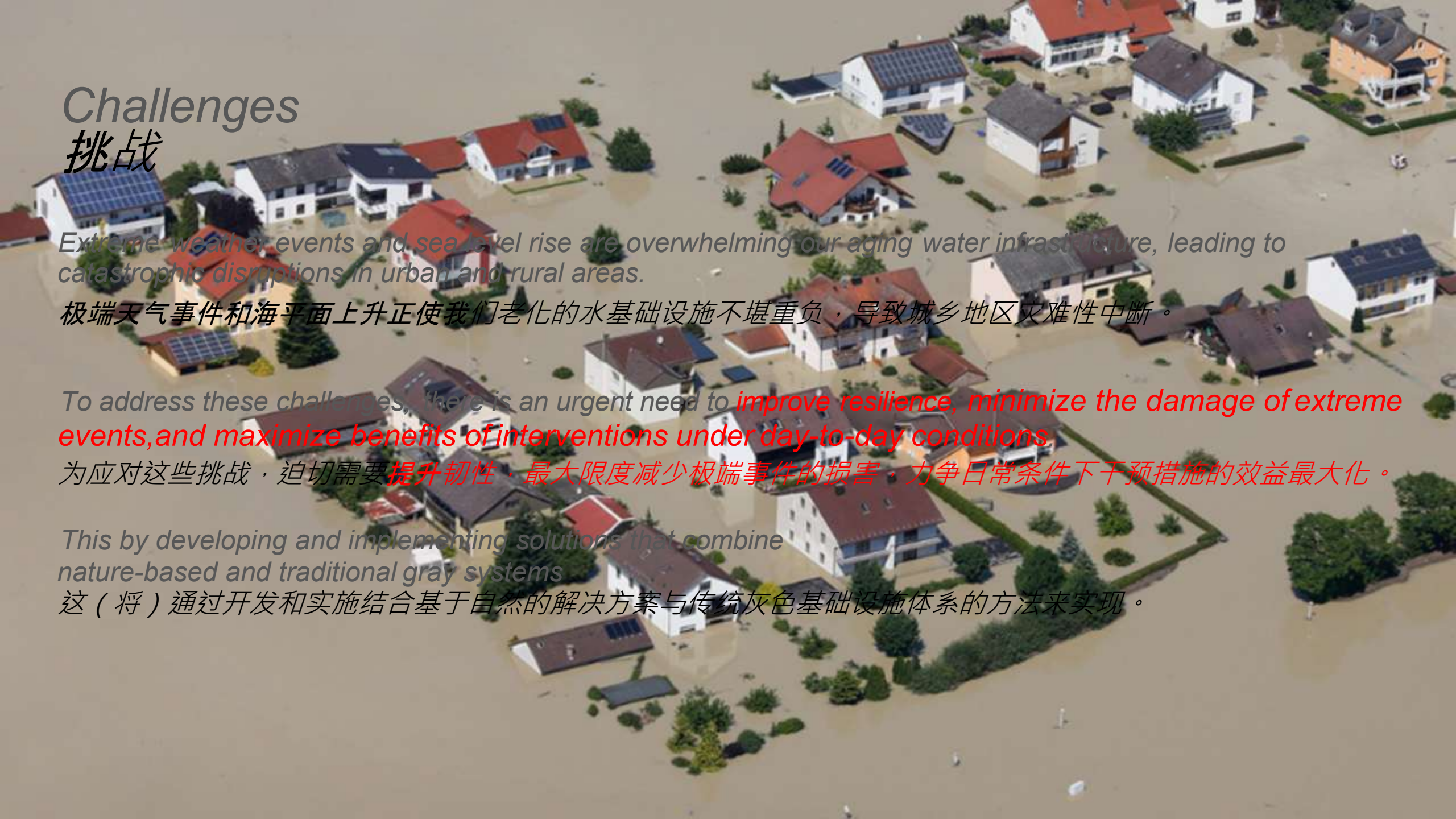
Environmental impact

Extreme weather in 2025 could cost the EU up to €126bn

2025年的极端天气可能使欧盟损失高达1260亿欧元

in 2025, and as much as €126 billion by 2029



Challenges
挑战

Extreme weather events and sea level rise are overwhelming our aging water infrastructure, leading to catastrophic disruptions in urban and rural areas.

极端天气事件和海平面上升正使我们老化的水基础设施不堪重负，导致城乡地区灾难性中断。

To address these challenges, there is an urgent need to improve resilience, minimize the damage of extreme events,and maximize benefits of interventions under day-to-day conditions.

为应对这些挑战，迫切需要提升韧性，最大限度减少极端事件的损害，力争日常条件下干预措施的效益最大化。

This by developing and implementing solutions that combine nature-based and traditional gray systems

这（将）通过开发和实施结合基于自然的解决方案与传统灰色基础设施体系的方法来实现。

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How to address these challenges:

如何应对这些挑战：

Three-Points Sponge Policy approach (3PSPa)

三点海绵政策法（3PSPa）

3-Points Approach (3PA)
三点法（3PA）

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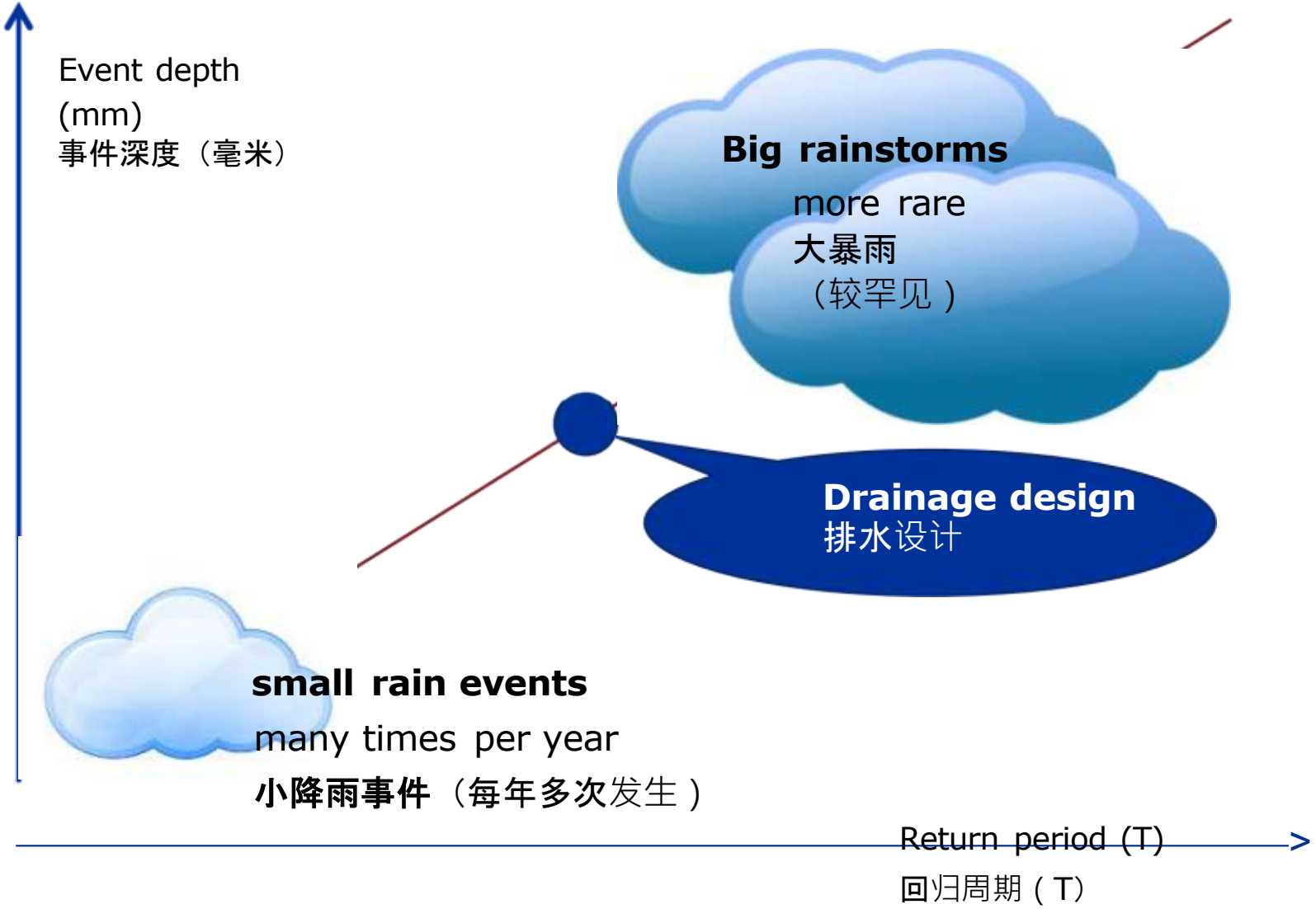
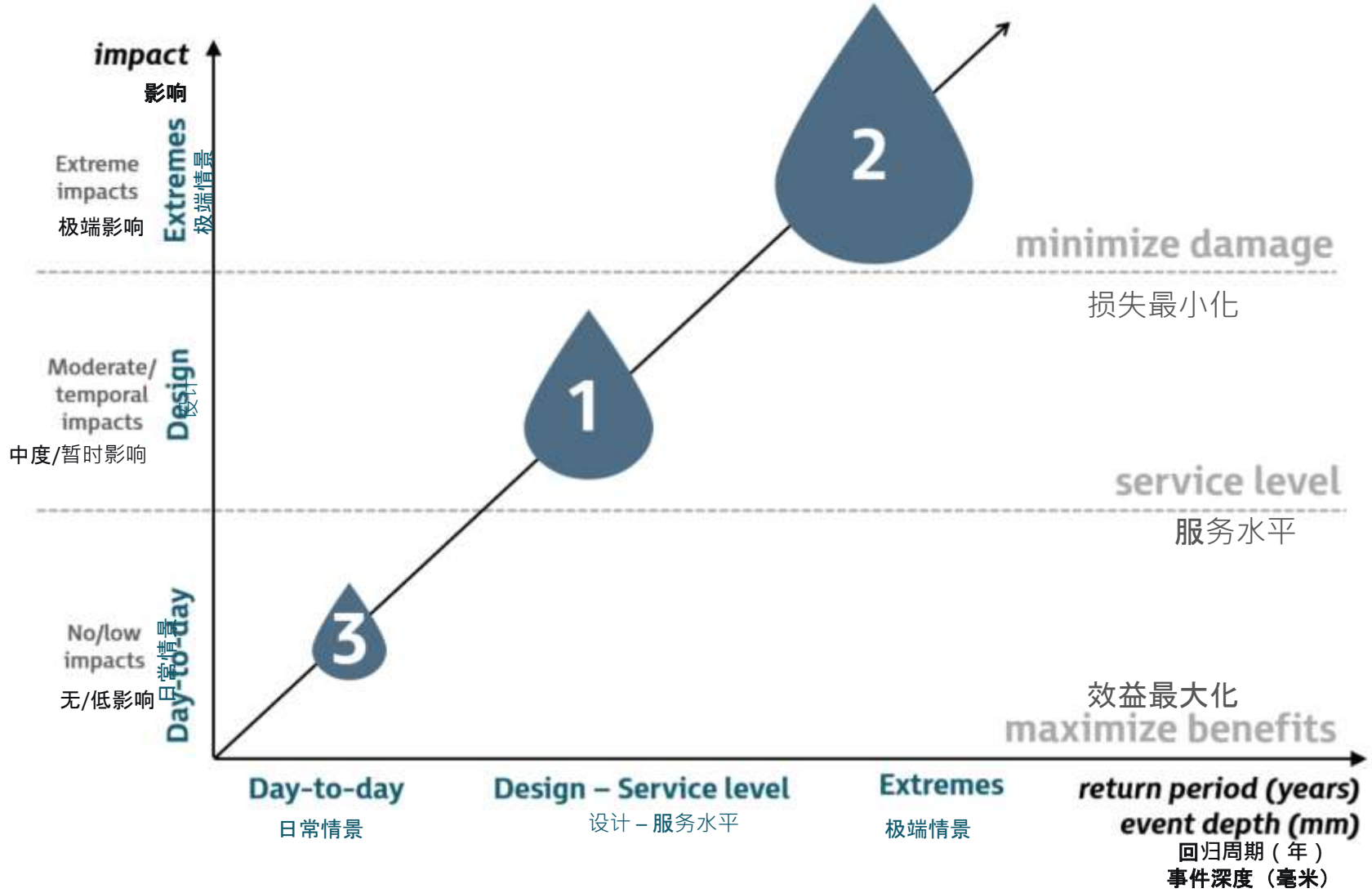


3-Points Approach (3PA)
三点法（3PA）



弗拉蒂尼 CF、GD 赫尔多夫、J 克拉克 & PS 米克尔森（2012）城市洪水风险管理的三点方法（3PA）：一种通过跨学科性和多功能性支持气候适应变化的工具，

Fratini CF, GD Geldof, J Kluck & PS Mikkelsen (2012) Three Points Approach (3PA) for urban flood risk management: A tool to support climate change adaptation through transdisciplinarity and multifunctionality, Urban Water Journal, 9:5, 317-331, DOI: 10.1080/1573062X.2012.668913

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1. Design domain

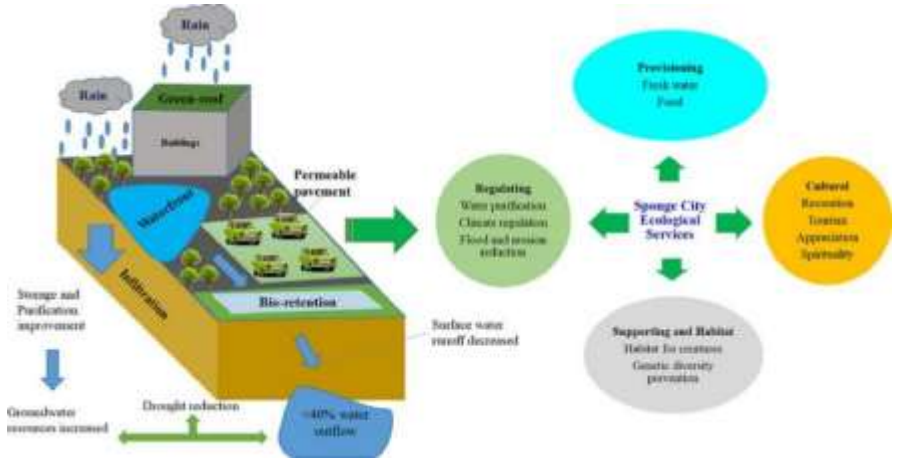
1. 设计范畴

drainage service level

排水服务水平

3. Day-to-day domain

3. 日常范畴



Maximise water benefits

水效益最大化

- Water harvesting,
  雨水收集,
- Ecosystem services
  生态系统服务
- Landscaping; water sensitive urban design
  景观美化；水敏性城市设计

=> Blue-Green Infrastructure

=> 蓝绿基础设施

2. Extreme domain

2. 极端范畴

Minimise damage of floods and droughts

最大限度减少洪涝和干旱损失

- Spatial planning
  空间规划
- Building design
  建筑设计
- Vital infrastructure protection
  关键基础设施保护
- Vulnerable people and animals protection
  脆弱人群和动物保护

Sponge Policy approach (SPa)
海绵政策法（SPa）

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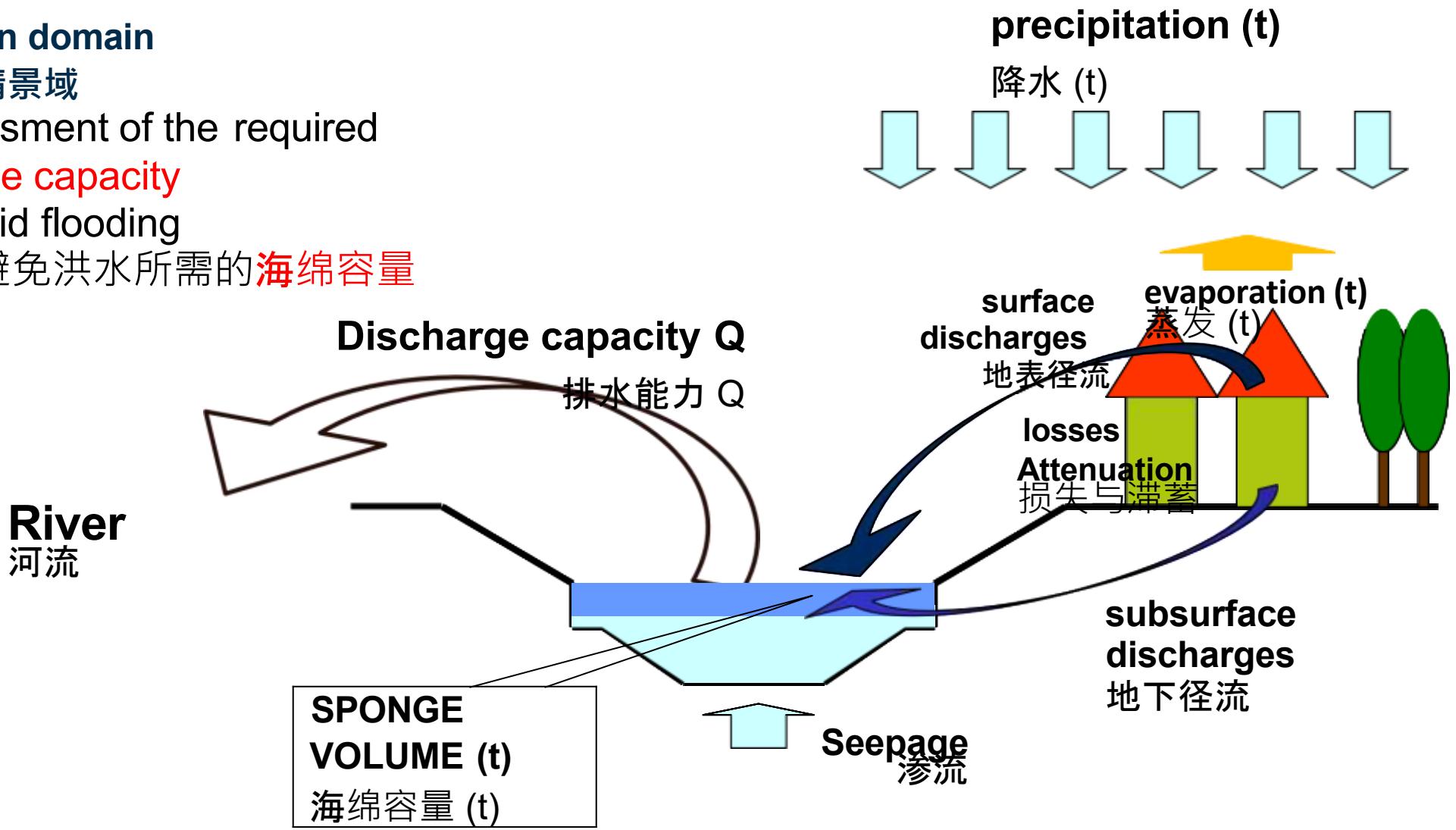
Design domain
设计情景域

Assessment of the required sponge capacity to avoid flooding
评估避免洪水所需的海绵容量



Balancing Detention (sponge) capacity
平衡调蓄（海绵）容量

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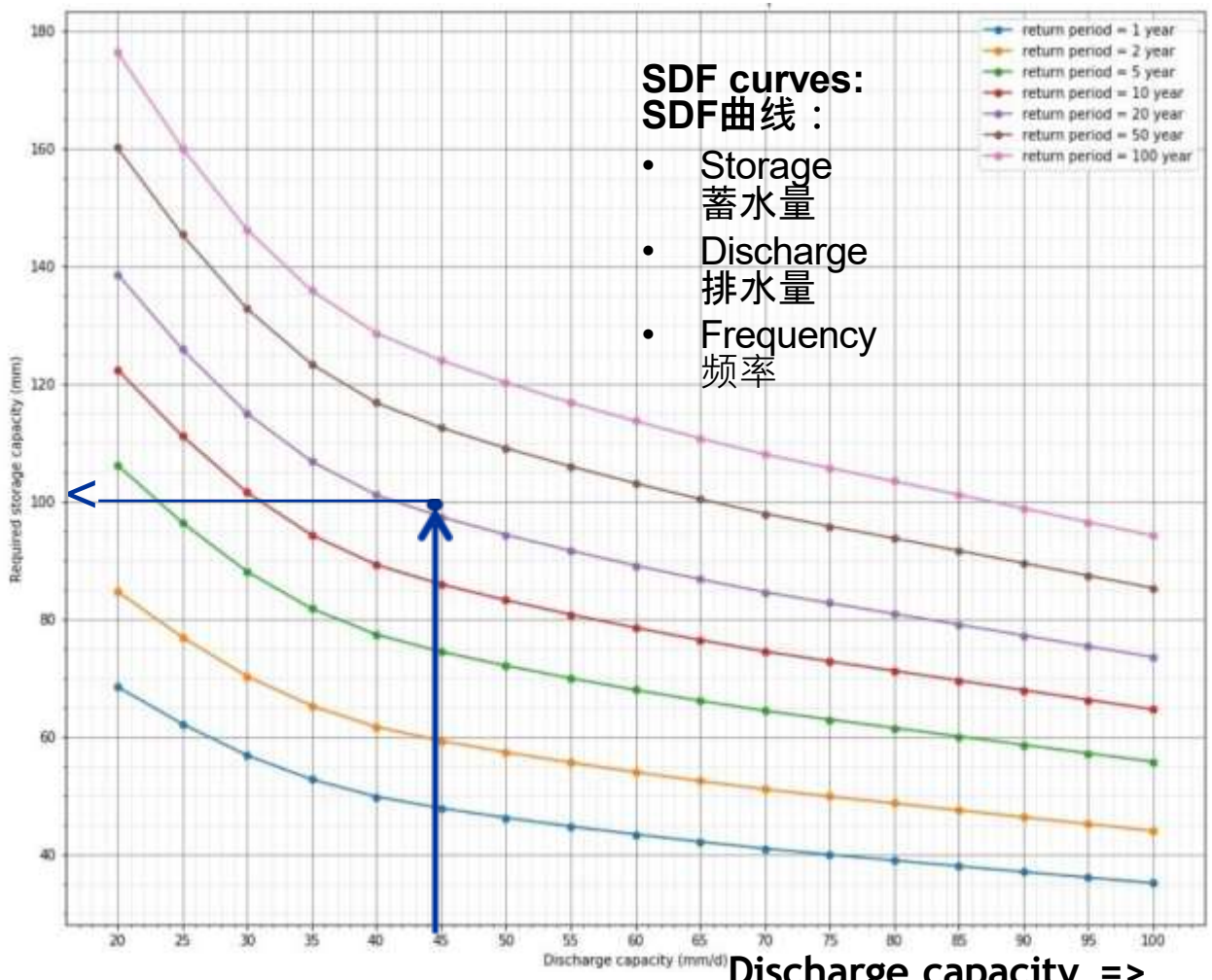
Discharge capacity
排放容量

Detention capacity =>
调蓄容量 = ?



SDF curves:
SDF曲线：

- Storage
  蓄水量
- Discharge
  排水量
- Frequency
  频率

Return period

回归周期

Discharge capacity =>

排水能力（毫米/天）

DESIGN
for
为“绿色”而设计

Five Capacities for Climate Resilience

and their Enabling Conditions
气候韧性五能力与赋能条件框架

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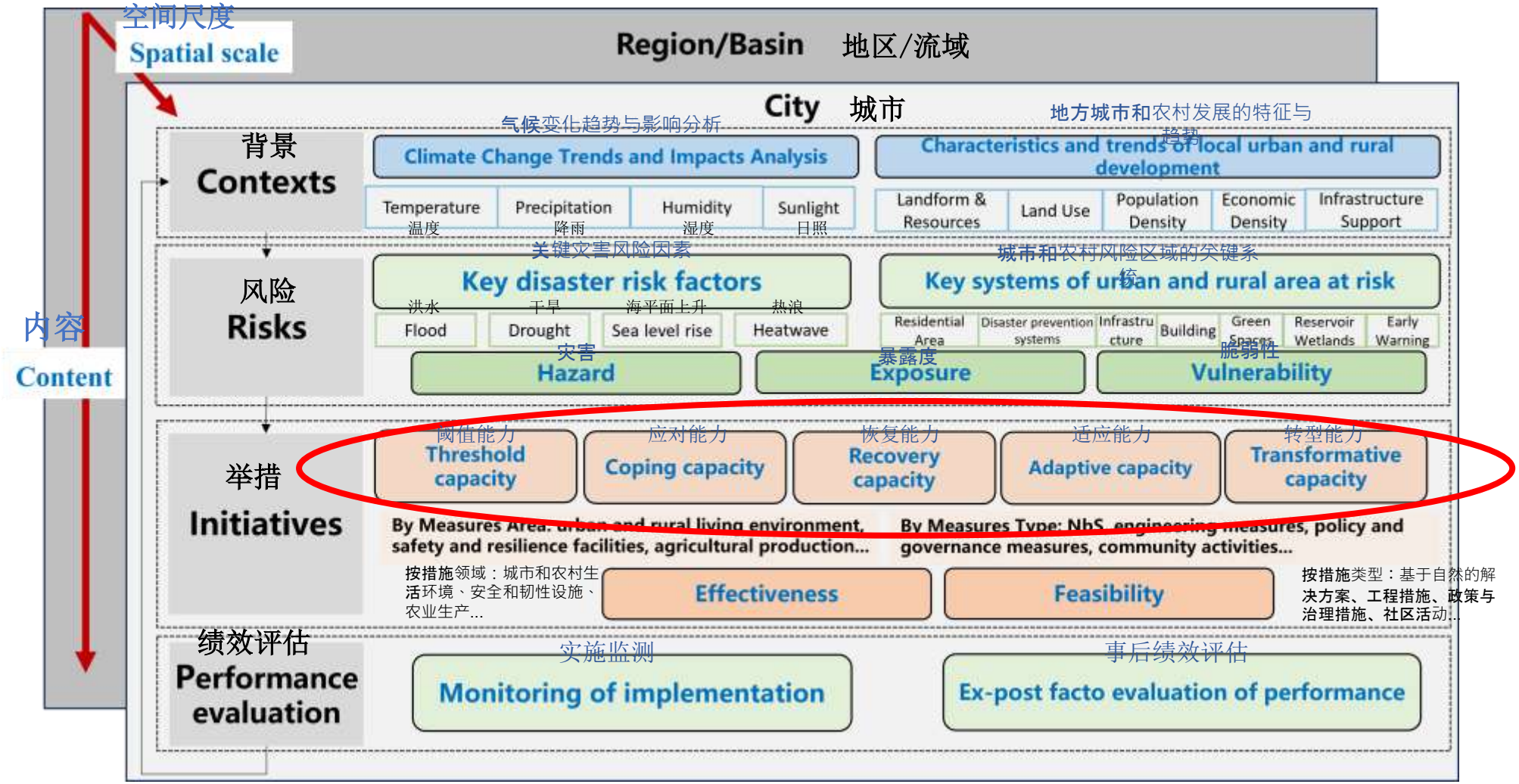
赋能条件

- ❖ 紧迫感
- ❖ 系统方法
- ❖ 能力发展
- ❖ 可信的知识、数据和信息
- ❖ 融资
- ❖ 公民参与
- ❖ 政策、法律和监管框架
- ❖ 公私合作
- ❖ 公平 -（公正地）分担风险和共享回报
- ❖ 创新

CCICED, 2024, Green Development and Climate Adaptation for Urban and Rural areas, Special Policy Study,
CCICED, 2024, 绿色发展和气候适应性城市与农村地区，特别政策研究
https://cciced.eco/research/ special-policy-study/green-development-and-climate-adaptation-for-urban-and-rural-areas/

FC4R as climate and extreme weather resilience assessment framework
FC4R可作为气候和极端天气韧性评估框架

Evaluate the Five Capacities and their Enabling Conditions on local AND on regional / river basin scale
(in addition to risk assessment / climate stress test)
在地方和区域/江河流域尺度上评估五能力与赋能条件（作为风险评估/气候压力测试的补充）



CCICED, 2024, Green Development and Climate Adaptation for Urban and Rural areas, Special Policy Study, https://cciced.eco/research/special-policy-study/green-development-and-climate-adaptation-for-urban-and-rural-areas/

Co-creation
共同创造

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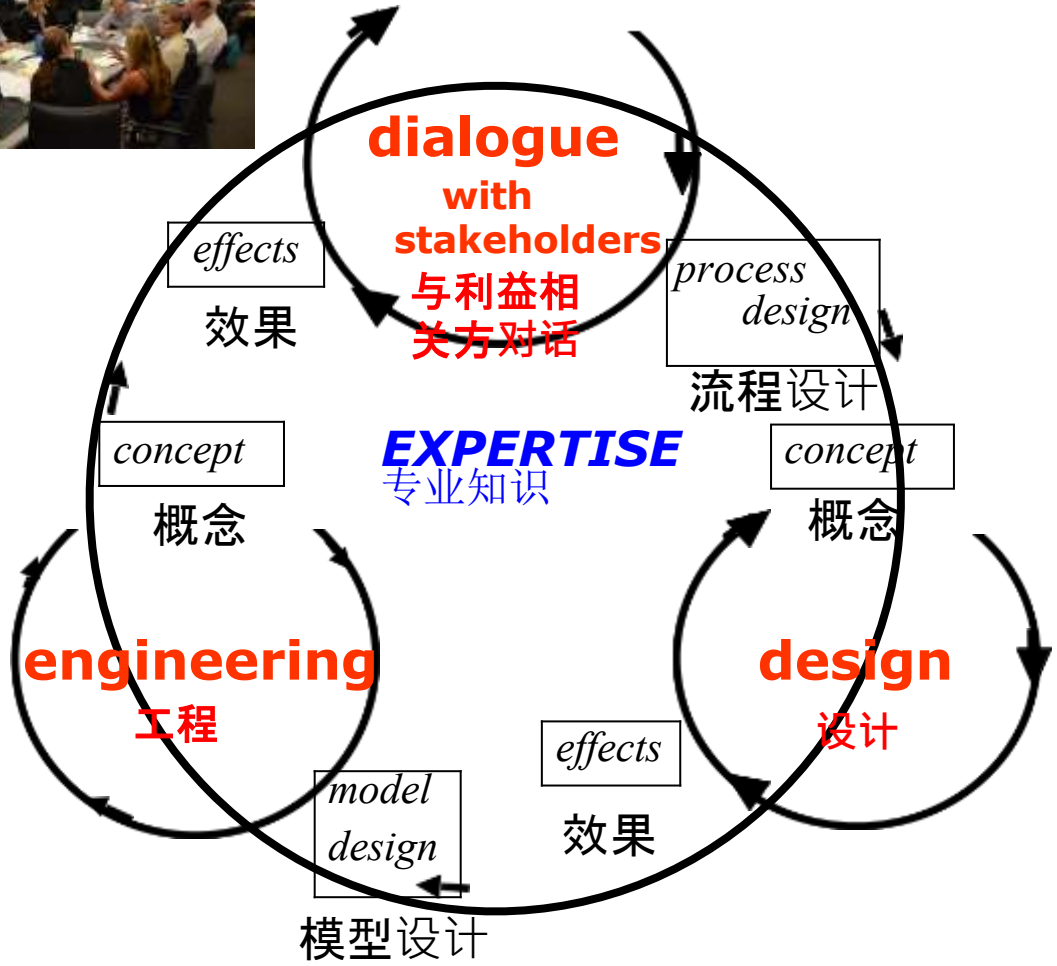
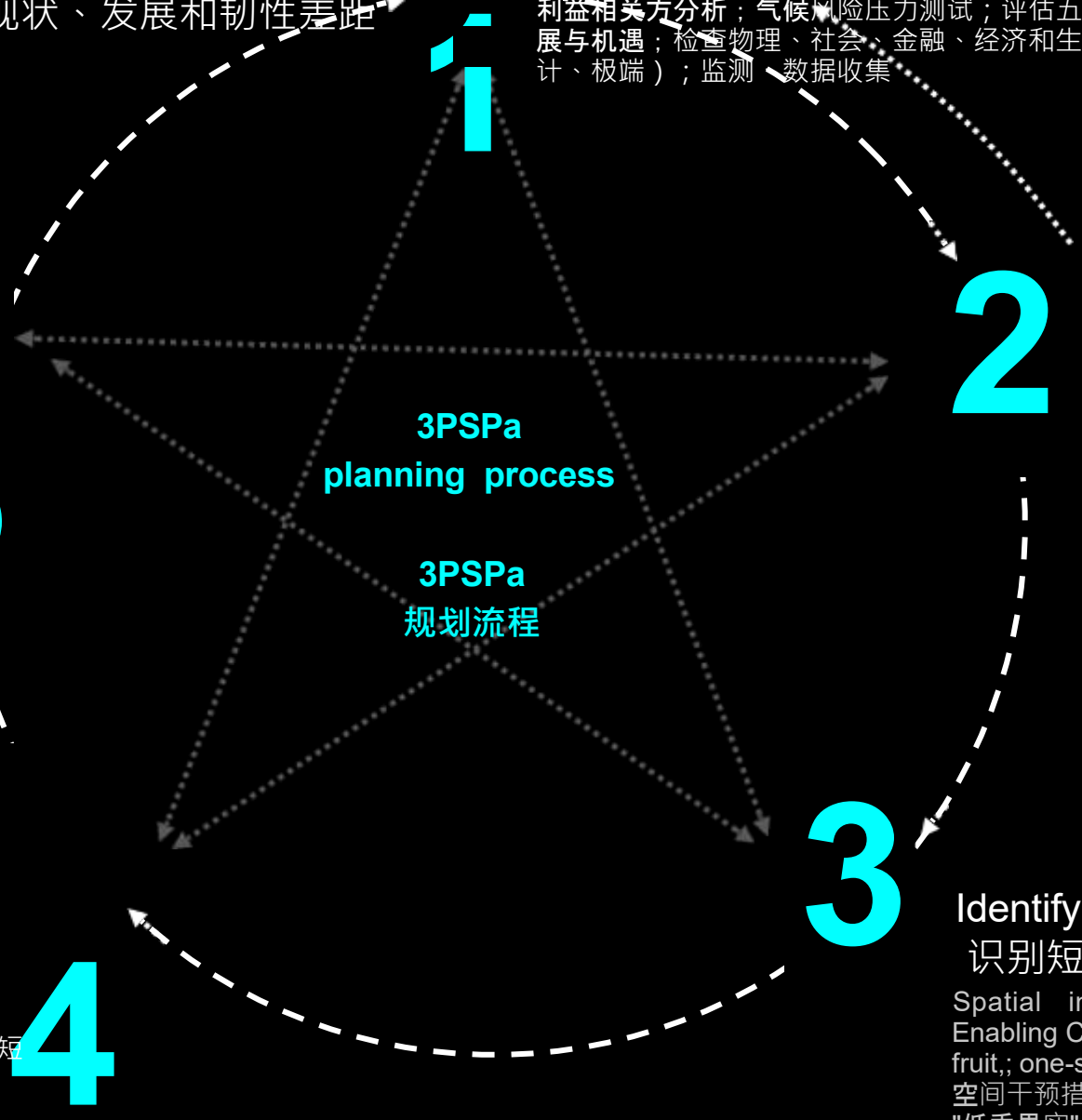


范·德·芬 F.H.M.、S.P. 喜林吉、P. 班、P. 范·艾克及 M. 赖斯伯曼（2005）《三重水：城市水管理规划方法》，Eburon出版社，代尔夫特，ISBN 90 5972 096

Van de Ven F.H.M., S.P. Tjallingii. P. Baan, P. van Eijk en M. Rijsberman (2005) *Water in Drievoud; benaderingen voor stedelijke waterplannen* .(Triple Water; approaches for urban water management planning), Eburon, Delft, ISBN 90 5972 096

为极端而设计

应对海牙海平面上升的遗产保护策略



Current situation, Developments and Resilience gaps
现状、发展和韧性差距

Stakeholder analysis; Climate risks stress test; Assessment of the five capacities and their enabling conditions; Demands of various stakeholders; Trends, developments and opportunities; Check physical, social, financial, economic and ecological domain. Look across spatial scales and 3 domains (day-to-day, design, extreme); monitoring, data collection

利益相关方分析；**气候**风险压力测试；评估五种能力及其赋能条件；各利益相关方需求；趋势、发展**与机遇**；检查物理、社会、金融、经济和生态领域。审视不同空间尺度和三个情景域（日常、设计、极端）；监测、数据收集

Envision an appealing future (integrating the perspective of social, health, economic, environmental, technological domains)
构想宜人未来（整合社会、健康、经济、环境、技术领域视角）

Objective: maximize the day-to-day benefits while minimizing the damage of extreme events. Look 20 – 100 years ahead; Take extreme scenarios into account;

Next: Define priorities and transformative change challenges

目标：日常效益最大化，同时最大限度减少**极端事件的**损失。展望20-100**年**；**考**虑极端**情景**；**下一步**：**确定**优先事项和转型变革挑战

Identify short-term Interventions
识别短期干预措施

Spatial interventions and actions strengthening Enabling Conditions Up to 10 years ahead, low-hanging fruit,; one-shot or incremental adjustments

空间干预措施和加强赋能条件的行动，着眼于未来10**年**，**"低垂果**实"；**一次性或**渐进式调整

Identify Pathways to realise step 2
确定实现第二步的路径

Define incremental adjustments via an interactive process of forecasting – back casting. Short term action and longer-term vision will be aligned.

Identify financing schemes and stakeholders to be mobilized and ways to trigger and stimulate them

通过预测-**回溯**预测的互动过程，确定渐进式调整。短**期行**动将与长期愿景保持一致。

确定需要

Decide on a plan (and update it timely)
决定一项计划（并及时更新）

Result: a comprehensive plan, approved by the political decision makers, including the long-term goals, the strategy (how to try and reach the long-term goals) and a coherent action plan for the short-term interventions by all relevant stakeholders.

成果：**一份由政治决策者批准的**综合计划，包括长期目标、实现长期目标的战略，以及所有相关利益相关方为短期**干**预措施制定的连贯行动计划

Closing
结束

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Thank you for your attention!
感谢您的关注！

Frans van de Ven

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Acknowledgements:
致谢：

Europe China Cooperation on Water
中欧水资源合作项目

. Li Yinghao

- 李英浩

The Netherlands Ministry of Infrastructure and Water Management; Rijkswaterstaat . Jasmin Sch
荷兰基础设施与水管理部；荷兰水务局 - 雅丝敏·斯豪斯
. Natalie Oonk
- 纳塔莉·翁克

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