



WBG MOOC on “QII and green, resilient and inclusive development”

Infrastructure maintenance among G20 top priorities

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November, 2021

Session Outline

- I. NEGLECTED MAINTENANCE**
 - Reasons and consequences
- II. BENEFITS OF PROPER MAINTENANCE**
 - Examples and
 - Promising approaches
- III. POLICY PROPOSALS BY THE G20**
 - Key documents for reference



As countries' infrastructure stock grow, so does infrastructure O&M expenditure demand

Fig 1 *Accumulation of Infrastructure Stock and GDP (JAPAN)*

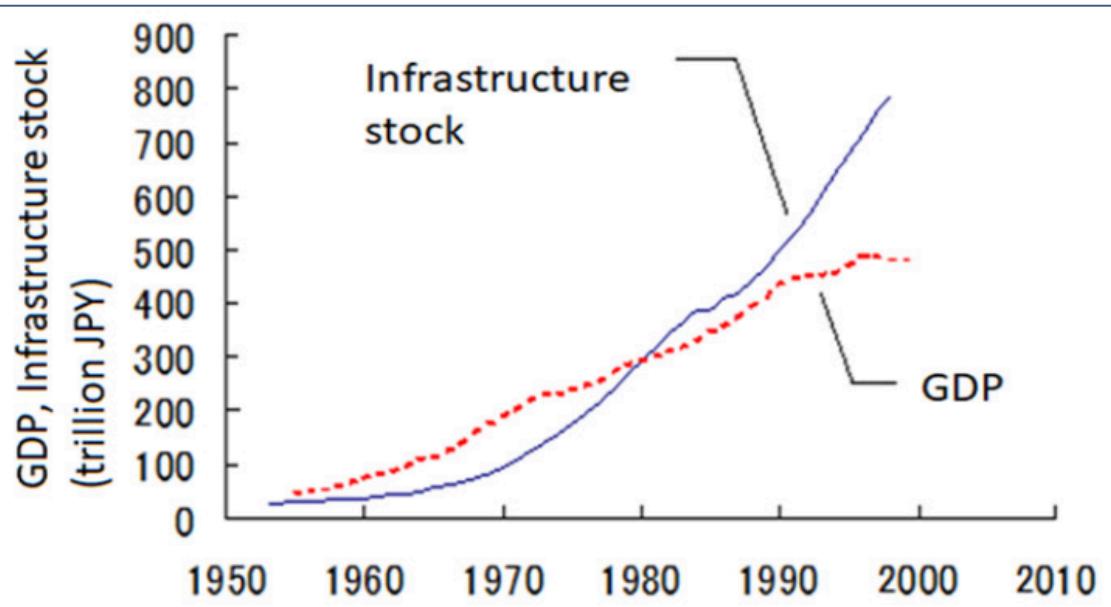


Fig 2 *Water & Wastewater O&M expenditures growing faster than capital ones (USA)*

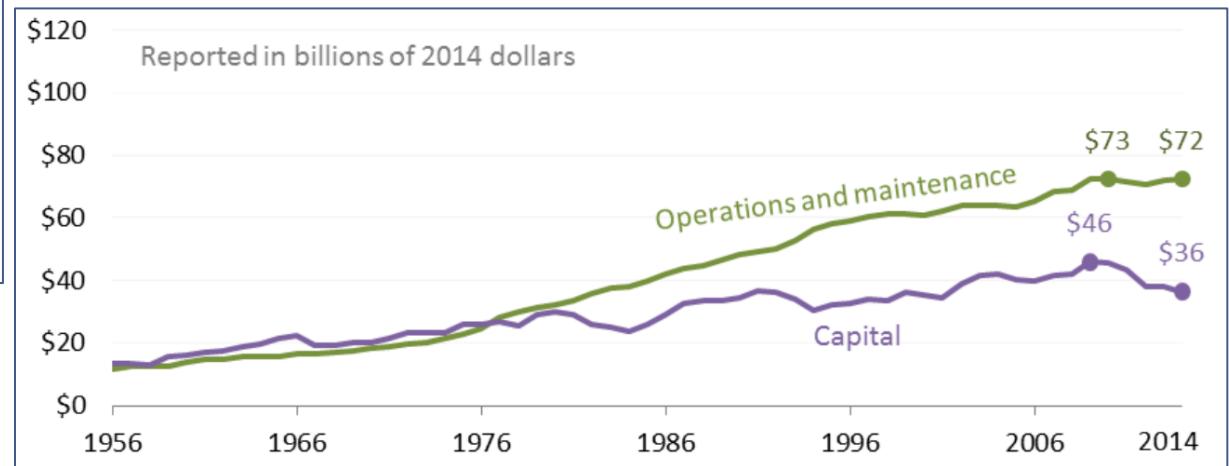


Fig1) Fujino, Yozo, and Dionysius M. Siringoringo. 2020. "[Recent Research and Development Programs for Infrastructures Maintenance, Renovation and Management in Japan](#)." *Structure and Infrastructure Engineering* 16 (1): 3–25.

Fig2) Eskaf, Shadi. 2015. "[Four Trends in Government Spending on Water & Wastewater](#)." The Environmental Finance Blog. *The Environmental Finance Blog* (blog). September 9, 2015

Cascading repercussions of neglected maintenance: the case of Nonrevenue Water (NRW)

Fig 3

NonRevenue
Water (NRW),
by region
2016
estimates

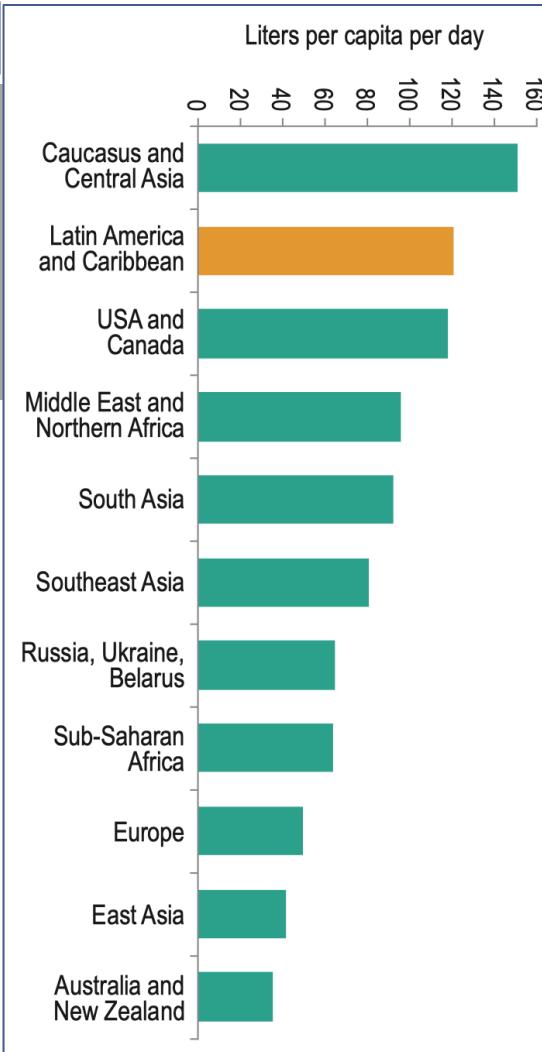


Fig 4

Improving maintenance of water pipes, Águas de Niterói (in BRAZIL) cut NRW from 40% (1999) to 16% (2014), and brought drinking water to 180,000 previously unserved residents.



Fig3) Cavallo, Eduardo, Andrew Powell, and Tomás Serebrisky. 2020. ["DIA - From Structures To Services - The Path to Better Infrastructure in Latin America and the Caribbean."](#) IADB.

Fig4) Paduan, Roberta. 2014. ["Com boa gestão, a água apareceu em Niterói."](#) Exame. June 14, 2014.

Why - despite being vital for resilience - is infrastructure maintenance often neglected?

The usual suspects...

...& other critical issues

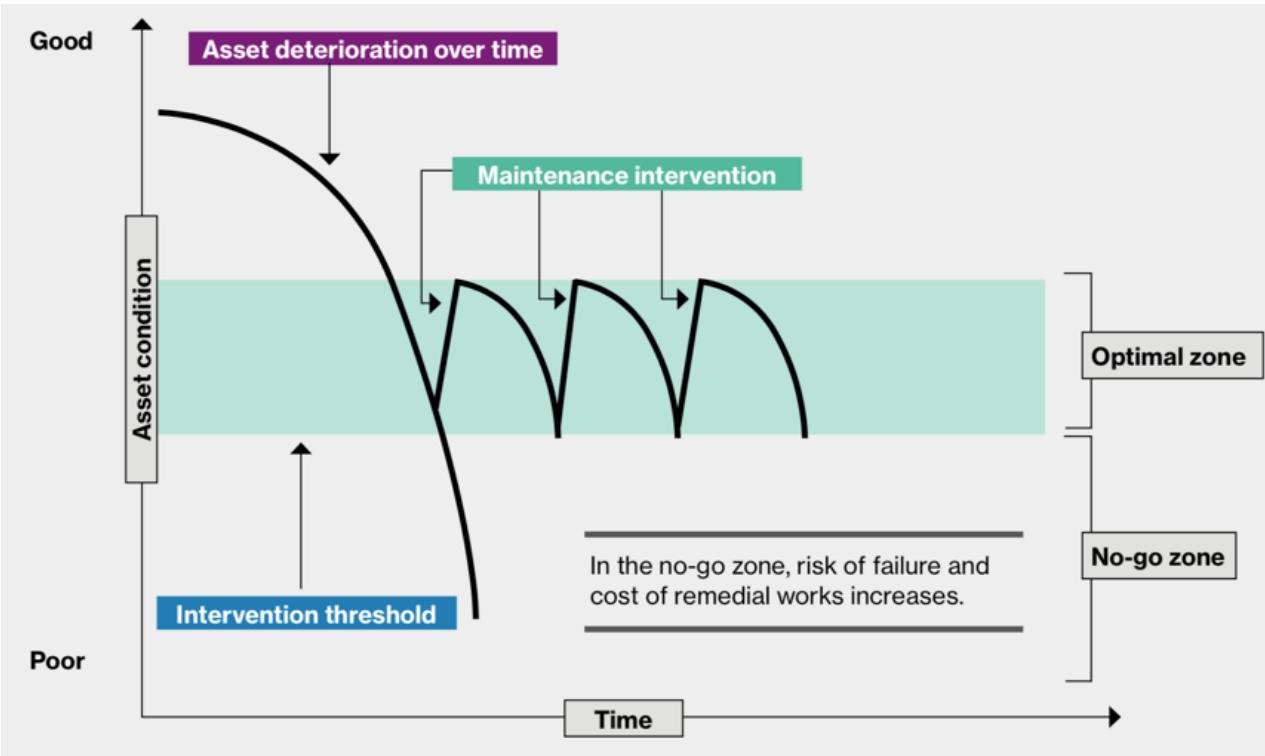
- Inadequate funding sources and/or inefficient public spending
 - Political bias in favor of greenfield projects
 - Regulatory/bureaucratic hurdles to care for existing assets
-
- Lack of accessible and consistent data on assets inventory/usage/ performance
 - no quantifiable maintenance backlog
 - Poor planning/institutional capacity and governance bottlenecks
 - Lack of coordination among sectors and/or administrative levels
 - disregard for interdependencies of sectors and how neglected maintenance impact other sectors
 - No prioritization criteria for maintenance of portfolio of assets



Different maintenance strategies → different cost/benefit ratios over life-cycle

Fig 5

*Timing and effect of maintenance on asset condition
see*



≠

maintenance strategies:

- Reactive
- Preventive/
condition-based
- Predictive



≠

**cost allocation
over time**

Benefits of proper maintenance at project and systemic level

MICRO LEVEL BENEFITS	MACRO LEVEL BENEFITS	
Project-level positive impact	Socio-economic impact and quality of service delivered to users	Environmental impact
<ul style="list-style-type: none">Reduced direct costs due to accident/malfunction/disasterMaximization of utilization and efficiency of assetExtended useful life of infrastructure asset (and value)Increased reliability of infrastructure systems	<ul style="list-style-type: none">Avoided mortality and morbidity (plus related medical costs)Safety and securityAvailability, continuity and quality of serviceAvoided coping costs (e.g. electricity generators, alternative drinking water purchases)Local economy developmentEmployment opportunities and easier access to jobs (e.g. accessible and reliable urban transportation)Higher productivity and competitiveness in international markets	<ul style="list-style-type: none">Higher energy efficiencyHigher noise protectionCurbed CO2 emissionsReduced waste of treated waterImproved water quality (by optimal wastewater treatments)Reduced damages resulting from extreme natural hazards (like floods or earthquakes)



EXAMPLE 1) Benefits/avoided costs at project level

COUNTRY: Singapore

AGENCY: Changi Airport Group Pte Ltd.

STRATEGY: Airport Engineering Asset Management
Strategy (e.g. Passenger Loading Bridge)



Reliability-centered
preventive
maintenance

50% savings in air-
conditioning energy
for 200 Passenger
Loading Bridges



Operators' trained
with testing
simulator for
higher performance

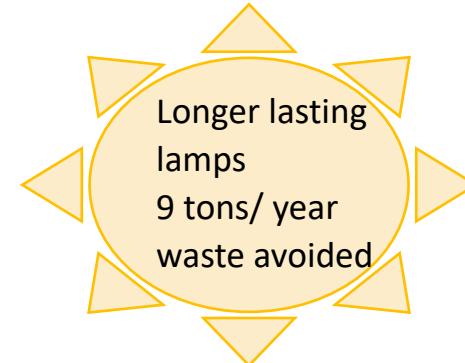
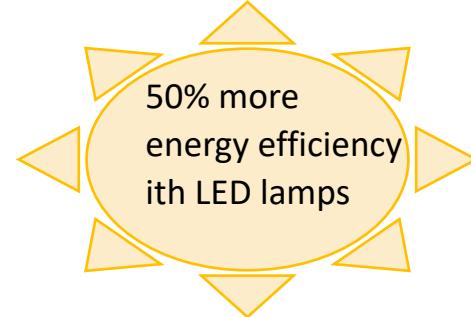
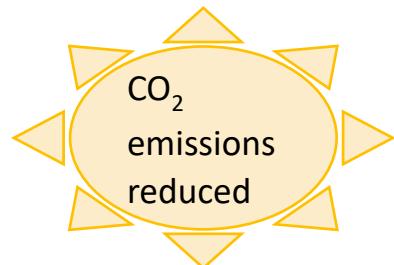
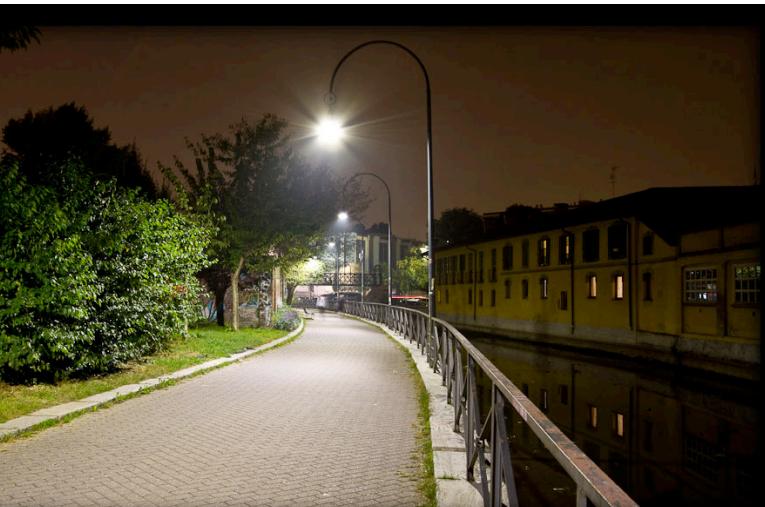


EXAMPLE 2) Benefits/reduced negative externalities impacting society & environment

COUNTRY: **Italy (Milan)**

AGENCY: A2A Illuminazione Pubblica S.r.l.

STRATEGY: renovation of 136 000 public lighting points with energy-efficient LED lamps



New approaches for “smarter”, better targeted, more efficient maintenance

- **Innovations** in engineering, robotics, material science and other technologies enabling cheaper, faster and less invasive repair interventions
- Digitalization and **data-driven approaches** for monitoring and “smarter”, better targeted O&M
- **Nature-based solutions** as a viable option to face some long term resilience challenges and the repercussion on maintenance provisions
- Innovative **contractual agreements** to optimize procurement, reduce O&M costs, tap available revenue sources, etc.
- **Demand management** tools to reduce overuse of, or excessive stress to networks
- A massive **recovery stimulus investment effort**
 - G20 governments have announced infrastructure investment recovery stimulus ~ **USD 3.2 trillion**



Proposed solutions to improve infrastructure maintenance (prioritization, timeliness, efficiency and effectiveness)

Given the complexity of the challenge, the diversity of contextual situations, and multiplicity of stakeholders involved, the **G20 Policy Agenda offers a menu of policy approaches (with case studies)**

Proposed solutions mapped to **3 macro policy areas**:

I. Better planning and institutional coordination across sectors or administrative levels

(e.g. systematic assets inventory, risk modeling frameworks, shared standards of minimum quality/safety, maintenance backlog and spending records)

II. Measures to secure funding and financing

(e.g. Earmarking of tax revenue streams, dedicated funds, performance based contractual settings, risk insurance forms, etc.)

III. Approaches for effective delivery of maintenance

(e.g. new technologies, better asset management strategy, incorporating NbS or different ownership-management contractual configurations)



Key G20 documents on “*Resilience & Maintenance*”

Endorsed by G20 Rome Leaders' Declaration after Summit (October 2021)

- **G20 Policy Agenda on Infrastructure Maintenance** – [Document Link](#)

Accompanying Documents:

- **[IWG Members] Annex of Infrastructure Maintenance Case Studies** – [Document Link](#)
 - Annotated Glossary on Infrastructure Maintenance – [Document Link](#)
- **[OECD] Building Resilience – New Strategies for Strengthening Infrastructure Resilience and Maintenance** – [Document Link](#)
- **[World Bank] Well Maintained: Economic Benefits from more Reliable and Resilient Infrastructure** – [Document Link](#)

