



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

Infrastructure maintenance among G20 top priorities

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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)

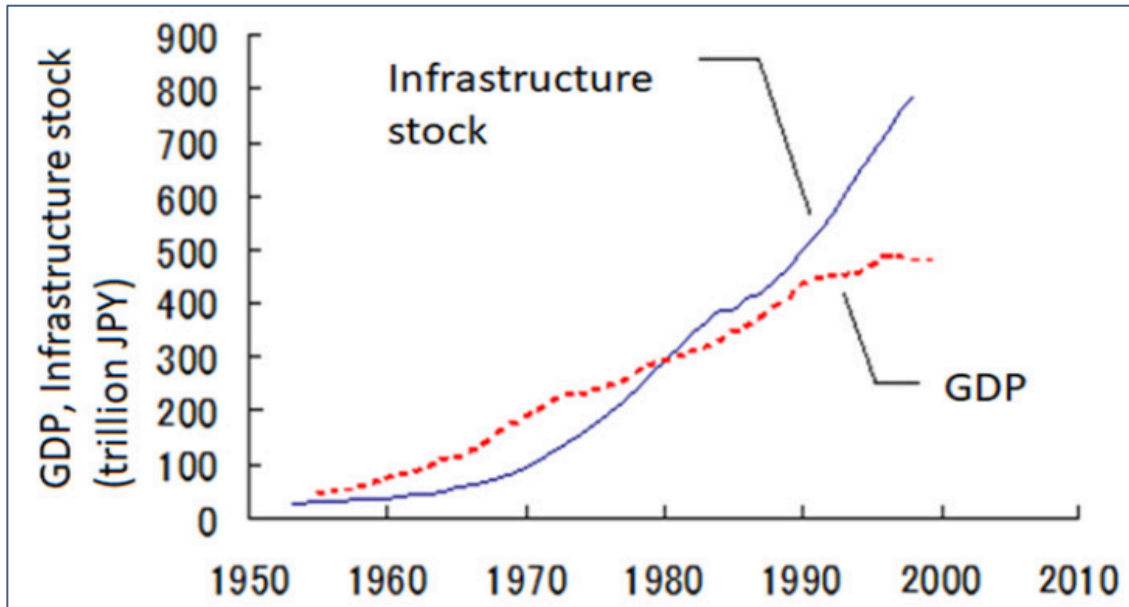


Fig 2 Water & Wastewater O&M expenditures growing faster than capital ones (USA)

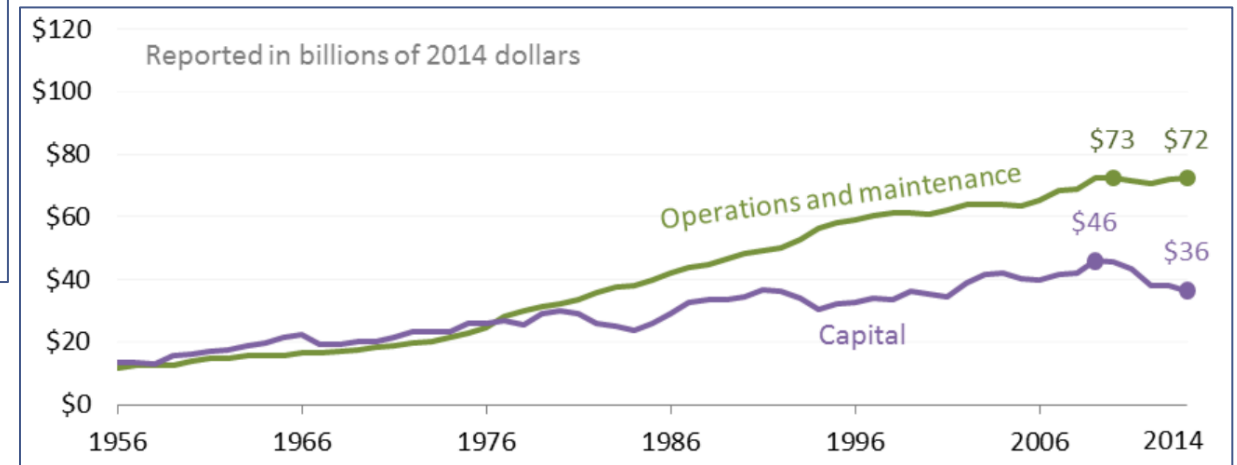


Fig1) Fujino, Yoza, and Dionysius M. Siringoringo. 2020. "[Recent Research and Development Programs for Infrastructures Maintenance, Renovation and Management in Japan.](#)" *Structure and Infrastructure Engineering* 16 (1): 3–25.

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)

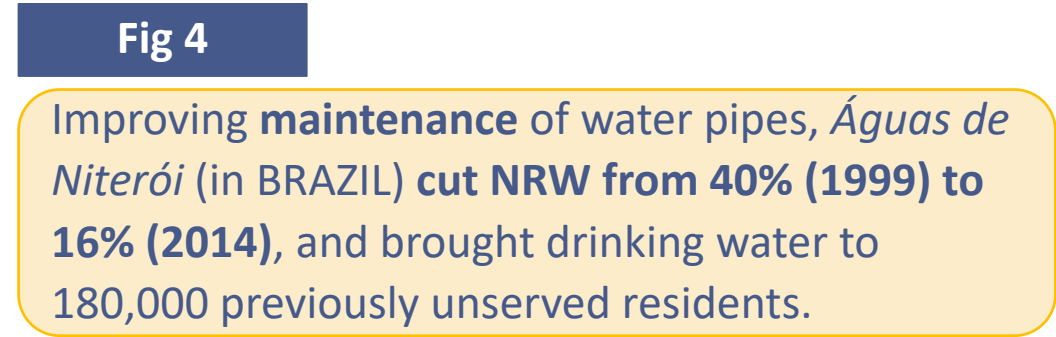
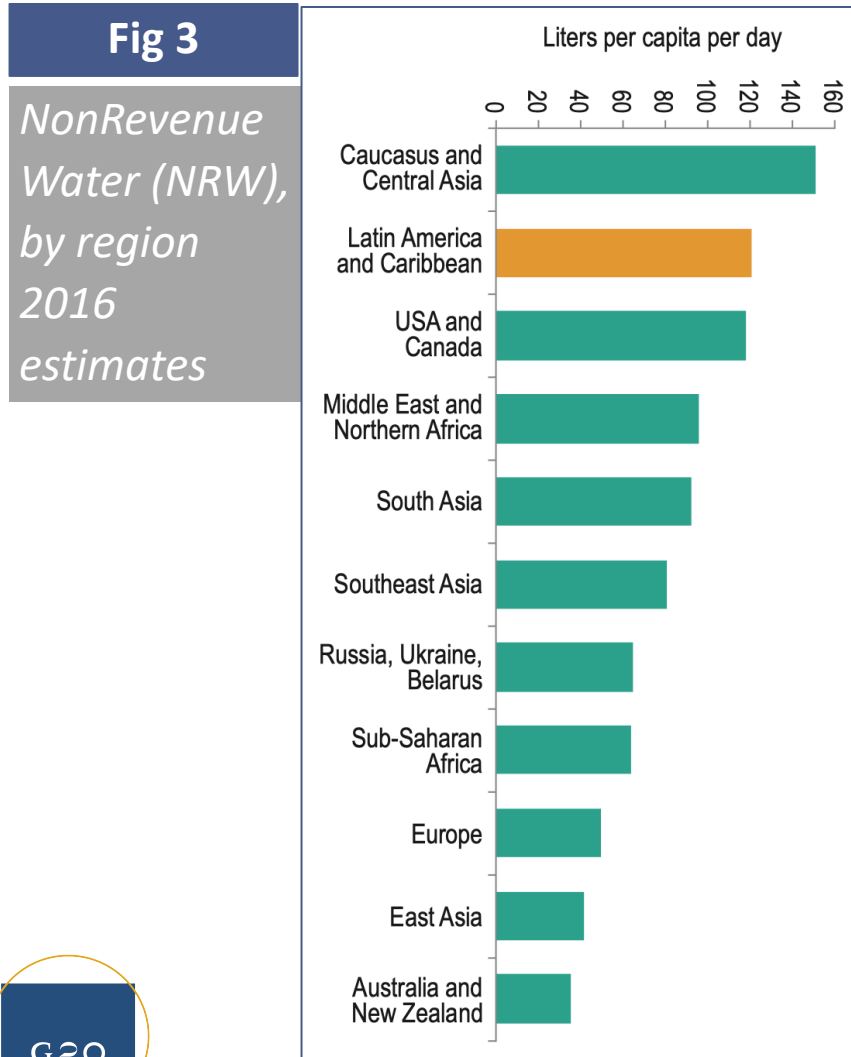


Fig3) Cavallo, Eduardo, Andrew Powell, and Tomás Serebrisky. 2020. “[DIA - From Structures To Services - The Path to Better Infrastructure in Latin America and the Caribbean.](#)” IADB.

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...

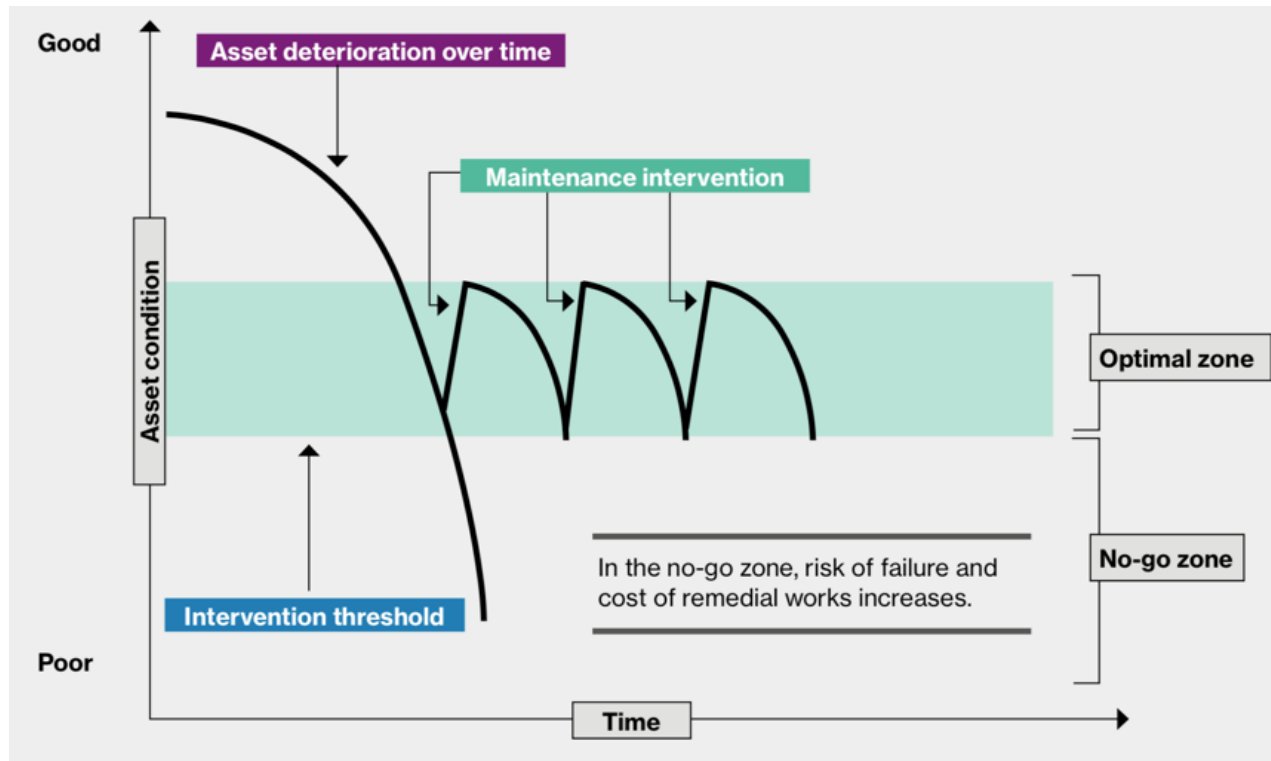
- Inadequate **funding sources** and/or **inefficient public spending**
- **Political bias** in favor of greenfield projects
- **Regulatory/bureaucratic hurdles** to care for existing assets

...& other critical issues

- 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/disaster • Maximization of utilization and efficiency of asset • Extended 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 security • Availability, continuity and quality of service • Avoided coping costs (e.g. electricity generators, alternative drinking water purchases) • Local economy development • Employment 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 efficiency • Higher noise protection • Curbed CO2 emissions • Reduced waste of treated water • Improved 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)

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



Reliability-centered preventive maintenance



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

CO₂
emissions
reduced



50% more
energy efficiency
with LED lamps

Longer lasting
lamps
9 tons/ year
waste avoided

Safety & Value
added for
touristic spots



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](#)