ANNEX 1 - Maintenance Case Studies

28 May, 2021

Table of Contents

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# 1) BACKGROUND

This Annex presents a collection of case studies, contributed by Infrastructure Working Group members to accompany the **Policy Agenda on Infrastructure Maintenance**, the flagship deliverable completed by the IWG under the “Resilience and Maintenance” priority indicated by the Italian G20 Presidency. Such examples serve to enrich the Policy Agenda by promoting knowledge sharing, as well as illustrating concrete applications of a range of policy tools and levers that can be adopted to enable better planning and prioritization, to secure adequate resources and to implement more efficient and effective maintenance of infrastructure.

# 2) METHODOLOGICAL NOTES

Between March and May of 2021, each IWG member (including some IOs and observer countries) submitted 2 or more cases according to a simple template provided with guidelines *[Appendix I]* which was also accompanied by an Annotated Glossary on Infrastructure Maintenance *[Appendix II]* a tool offered to assist the case studies preparation. In line with the goal of the exercise - to accompany and further illustrate the G20 Policy Agenda - the guidelines suggested to *“briefly describe a recent domestic project/program/institutional reform (either completed or at advanced stage of implementation) that could illustrate a best practice solution to promote infrastructure maintenance.”* In line with the Agenda, the template proposed to categorize the cases into three macro policy areas: 1) improved planning; 2) funding or financing; 3) implementation/delivery (allowing for initiatives to check more than one policy area).

It is important to remark **the voluntary nature** of the decision of individual members to submit cases, as well as their choice in terms of the number of cases submitted, their sector, scope, typology, etc. Furthermore, in preparing the cases, some members kept the case study collection internal to the MoF/Treasury boundaries, while others reached out to other ministries or agencies for collaboration, which explains the richness and diversity of examples gathered in terms of perspective and policy focus. For these reasons, **it would be incorrect and misleading to interpret this collection as a representative sample of member countries’ infrastructure maintenance programs and projects**. Instead, what this Annex can provide is a documentation of what IWG members currently perceive as important, in that the kind of initiatives they describe indicate some of the priorities members are focusing on in the present and forthcoming years. Most importantly, this Annex (also thanks to members active engagement) illustrates how the G20 working groups can promote knowledge exchange, by sharing policy solutions that can serve as mutual inspiration to tackle common issues.

## Selecting two cases per member

As mentioned above, even though members submitted a different number of cases, it was decided to pick two per participant, in order to keep the document within reasonable lenght, as well as securing a balanced country representation.

In cases when members provided more than 2 examples, the Presicdency adopted these selection criteria:

1. Preferring cases with a more accurate focus within the scope boundaries of the collection: i.e. cases with a stricter and more explicit pertinence to infrastructure maintenance (as opposed to other related aspects)
2. Facilitating diversity in terms of sectors covered: given the preponderance of transportation, when available and relevant, examples on other sectors (energy, water, waste, social infrastructure) were picked.

## Some caveats

!DA RISCRIVERE!

* there might have been misunderstandings (aka people did not read the entire thing) so the policy tools categorization is not to be taken as a rigorous and systemantic description but rather as indicative of «perceived importantce»]
* the aggregate info reporting frequency of “x” among the case studies refers to features that were made evident in the overview (not necessary those flagged in the table… whose answers were not always credible nor verifiable)
* how the sums below were taken … (dove esplicito nella overview plus confirmation in table )

# 3) CASES AT A GLANCE

The case studies collection was deliberately left open and flexible to reflect the complexity of the challenge at hand, as well as the myriad of different actors and solutions that are engaged in the endeavour.

In Figure 1 there is a list of the cases selected.

! Confermare (Russia/BRA/FRA+1/MEX+1/ SAU/ ZAF )

| **country** | **flag** | **name** | **policy** | **sector** |
| --- | --- | --- | --- | --- |
| AUS |  | **Roads to Recovery Program** | funding | transportation |
| AUS |  | **Bridges Renewal Program** | funding | transportation |
| BRA |  | **New Basic Sanitation Regulatory Framework** | planning; funding; delivery | Water-Waste |
| BRA |  | **PROSEFER – National Railway Safety Program in Urban Areas** | planning | transportation; social |
| CAN |  | **Canada Core Public Infrastructure Survey** | planning | Water-Waste; transportation; social |
| CAN |  | **Municipal Asset Management Program** | delivery | other |
| CHE |  | **National Roads and Agglomeration Transport Fund** | planning; funding; delivery | transportation |
| CHE |  | **Electricity Grid Usage Tariff** | planning; funding; delivery | energy |
| CHN |  | **Retroftting Ageing Highway Bridges** | planning | transportation; social |
| CHN |  | **Circular of the Ministry of Finance on Issuing the Operation Guideline for Performance Management of PPP Projects** | planning; funding; delivery | energy; Water-Waste; transportation; ICT; social; other |
| EGY (from EIB) |  | **CAIRO METRO REHABILITATION** | planning; delivery | transportation |
| ESP (from EIB) |  | **Metro de Madrid Infrastructure upgrade** | planning; delivery | transportation |
| ETH (from EU) |  | **Road Sector Policy Support Programmes – Ethiopia (Sector Budget Support Modality)** | planning; funding; delivery | transportation |
| FFF (from EU) |  | **Sub-Saharan Africa Transport Policy Program - SSATP** | planning; funding; delivery | transportation |
| FRA |  | **Sud Europe Atlantique High Speed Rail Link** | planning; funding; delivery | transportation |
| GBR |  | **AMP7 – Ofwat Price Review 19** | funding; delivery | Water-Waste |
| GBR |  | **Control Period 6 (2019 – 2024) – Asset Information Services Strategic Plan** | planning; delivery | transportation; ICT |
| GER |  | **A) Bridge Modernization Program, Retrofitting of Older Road Bridges  B) Intelligent Bridge** | planning; delivery | transportation |
| GER |  | **Bundesnetzagentur (BNetzA), the German Federal multisector economic regulator** | delivery | energy |
| IDN |  | **Eastern Sumatera Highway Preservation in Riau Province (Non Toll Road)** | planning; funding; delivery | transportation |
| IDN |  | **Eastern Sumatera Highway Preservation in South Sumatera Province (Non Toll Road)** | planning; funding; delivery | transportation |
| IND |  | **Long term O&M of Infrastructure Assets through Public Private Partnerships** | planning; funding; delivery | transportation |
| ITA |  | **Bridge safety guidelines** | planning | transportation |
| ITA |  | **ANAS - planned road maintenance** | planning; funding; delivery | transportation; ICT |
| JPN |  | **National Strategy for Life Extension of Infrastructure** | planning; delivery | Water-Waste; transportation; social |
| JPN |  | **Fundamental Policy and Guideline for pre-flood emergency reservoir drawdown operational procedure for enhanced flood management** | planning; funding; delivery | energy; Water-Waste |
| KOR |  | **Master Plans for Managing Infrastructure (2020~2025, announced May 11, 2020), established according to Article 8 of the Framework Act on Sustainable Infrastructure Management** | planning; delivery | energy; Water-Waste; transportation; information and communications; other |
| KOR |  | **Seoul Metropolitan City’s Sustainable Infrastructure Management Plan** | planning; funding; delivery | Water-Waste; transportation; other |
| MEX |  | **Mexico Tollroads MRO Model (Maintainer - Rehabilitator – Operator)** | planning; funding; delivery | transportation |
| NLD |  | **Procurement of innovative circular and modular bridges** | planning; funding; delivery | transportation; social; other (sustainability) |
| NLD |  | **Vital Assets (Dutch: “Vitale Assets”)** | planning; funding; delivery | transportation |
| RUS |  | **Rosmor PPP** | planning; funding; delivery | energy; transportation |
| RUS |  | **Optimization of electricity costs for road lightning of federal, regional (inter-municipal) and local importance roads using energy performance contracts** | planning; funding; delivery | energy; transportation |
| SAU |  | **Treated Wastewater Use Scheme in Al Hasa Oasis** | delivery | Water-Waste |
| SAU |  | **Improve the efficiency of sea water desalination plants in the Kingdom of Saudi Arabia- Shuaiba 1 Plant** | planning; delivery | energy; Water-Waste |
| SGP |  | **Singapore Air Traffic Management System Enhancement Project** | planning; delivery | transportation; ICT |
| SGP |  | **Punggol Digital District** | delivery | energy |
| TUR |  | **Istanbul seismic risk mitigation and emergency preparedness project (ISMEP)** | planning; funding; delivery | ICT; social |
| TUR |  | **Eurasia Tunnel: Ventilation Optimization Study** | planning; funding; delivery | energy; transportation; other |
| USA |  | **Pennsylvania Rapid Bridge Replacement** | planning; funding; delivery | transportation |
| USA |  | **The Transform 66 Outside the Beltway** | funding; delivery | transportation |
| ZAF |  | **Expanded Public Works Programme Integrated Grant for Municipalities** | planning; funding; delivery | transportation; social |
| ZAF |  | **Provincial Roads Maintenance Grant** | planning; funding; delivery | transportation |

Figure 1: Selected case studies

## Distribution of cases collection across basic characteristics

#### Key agency/agencies in charge of the intervention

Not surprisingly, the responses of IWG members reflect the great variability of entities described. We can grasp this variability by analyzing the key stakeholders involved

In Figure 2 we can see (in aggregate form) the key agencies involved in the submitted case studies[[1]](#footnote-1).

Out of the 43 examples considered:

* An interesting aspect to remark is that many cases submitted (22) involved **more than one agency**.
* Several cases (17) involved the **Ministry of Infrastructure/Transportation** (with or without other agencies), plus (2) with direct involvement of **Ministry of Finance/Treasury**;
* **Local/regional/city government agencies** had a role, often in combination with other national/federal agencies, in 7 cases;
* **Private corporations** were in charge in 3 cases, along with **government-owned corporation** (4 cases);
* **Regulators** were only involved in 3 cases, while **authority entities** (on roads, aviation, energy) in 6;

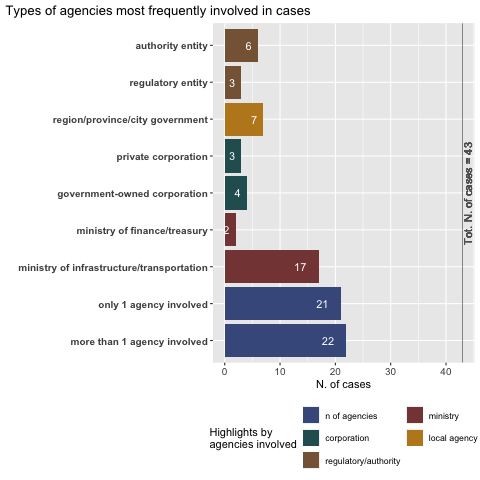


Figure 2: Key agencies involved

#### The administrative level of interventions

In Figure 3 we see the relevant administrative level(s) at which the described initiatives were implemented in the 43 examples considered:

* The first observation worth remarking is how in many examples (16 cases) it appears that **multiple administrative levels** were involved (e.g. national, state and city level jointly engaged). This is often the case of policies or new guidelines endorsed at the national level were implemented at sub-national levels.
* Most cases submitted were at the **federal or national** level: 21, while only 2 involved supranational entities.
* Some case studies, instead, were focused specifically at the **region** (3 cases) or **city level** (3 cases) [[2]](#footnote-2). When considering cases that joined multiple administrative levels, the number of cases implemented at the **sub-national level** rises to a total of 21.

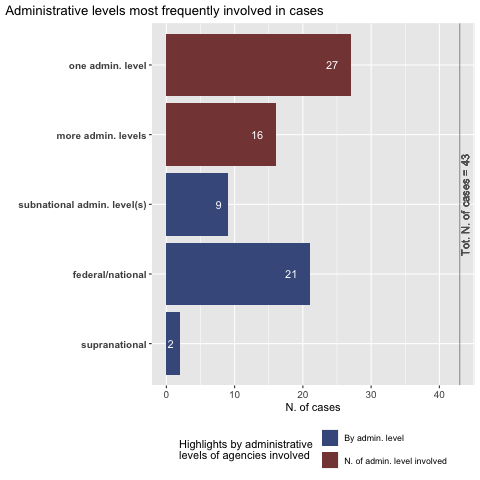


Figure 3: Key agencies involved

#### Year of launch

Figure 4 documents the time in which the submitted cases were launched: 67.4% of the cases were **launched in the last decade**, which is not surprising given the explicit request of the Presidency to submit recent cases.

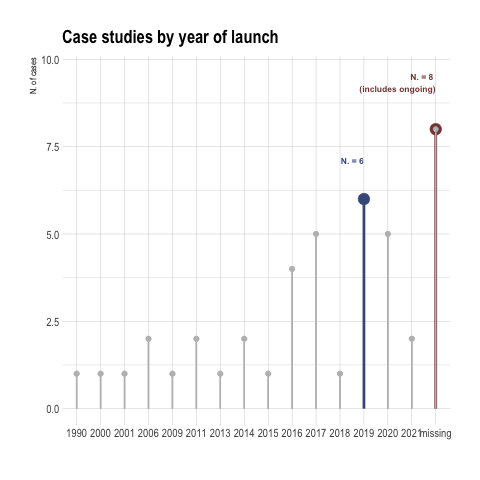


Figure 4: Year of launch of initiatives

#### Distributions by sector

Figure 5 shows that (when counting each sector independently mentioned) transportation is the most frequently covered with 33 mentions.

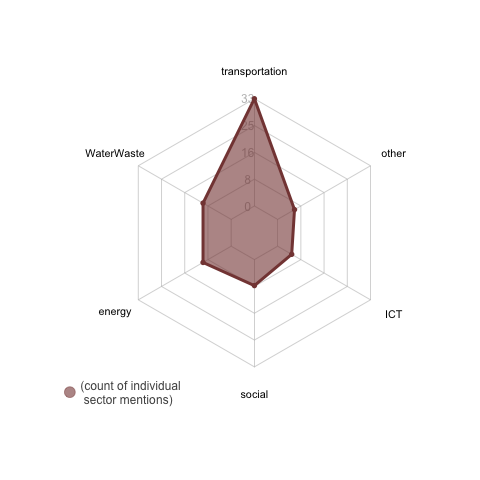


Figure 5: Distribution of cases by (individual) sector

#### Distribution by policy

In Figure 6 is is possible to see the distribution of cases across macro policy area (including when multiple areas were involved)

Notably, most of the cases selected (33) touch all three policy areas related to infrastructure maintenance (planning, funding and delivery) followed by 8 cases combining two policy areas (planning and delivery).



Figure 6: Distribution of cases by policy area

# 4) REVIEW OF CASES IN LIGHT OF POLICY AGENDA KEY INSIGHTS

As mentioned in the beginning, it is important to use caution when observing the cases collection and refrain from generalizing aggregate findings that may be linked to how this specific collection effort was conducted. Nonehteless, it is interesting to notice how many of the core messages in the Policy Agenda seem to be reflected by the recent cases analyzed and the aspects they address.

The aggregated characteristics reported in this section were obtained from the overview that was provided (as free text) by each case.

**1. *(RATIONALE): Maintenance is key to resilience***

Several cases (13) reported among their goals some **improvements in term of sustainability and resilience** (e.g. energy savings, reduced exposure to natural hazard risk etc.) or even, as in a case proposed by the Netherlands, the implementation of a **circular solutions** for procurement and construction of bridges and viaducts.

**2. *(RATIONALE): Maintenance is required because of assets’ age***

Another issue that was raised in the Policy Agenda is the urgent need for maintenance interventions prompted by the **age of the infrastructure stock**. This is reflected in 9 cases that included such considerations in their purpose.

**3. (CHALLENGES): Sectors are increasingly inderdependent**

Figure 7 offers another picture and adds some very intersting insight to what showed above in Figure 5. By showing the actual sectors covered by the cases submitted actually, it indicates how **many initiatives cover multiple sectors**: 18 over 43. As a matter of fact, we see almost every possible combination of the 6 covered sectors represented.

Incidentally, the Policy Agenda invites to consider maintenance an issue that demands to place people at the center (including future generations). A fair number of cases (8) has a focus on social infrastructure.

DA RIVEDERE/RIFARE!

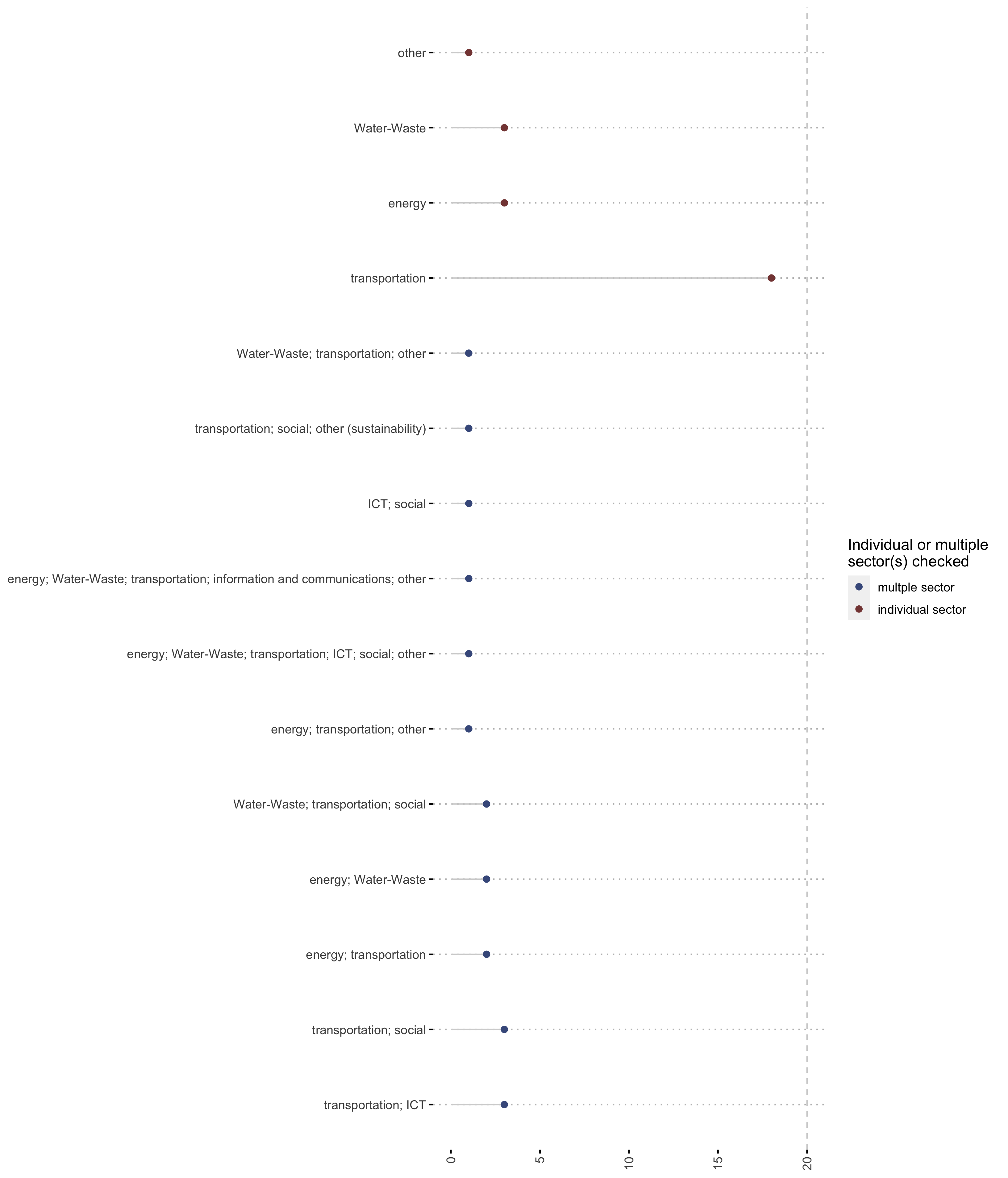


Figure 7: Distribution of cases by sector

**4. *(CHALLENGES): Data as an inescapable prerequisite*** A fair number of the selected cases (8) include some sort of **survey or data collection effort**, often at the onset of the initiative to inform subsequent policy decisions.

**5. *(SOLUTIONS): Macro policy N. 1) Planning & regulation*** In line with what highlighted by the Policy Agenda, many cases (15) included some form of **planning/guidelines revision effort**, while some others (7) documented **regulatory innovations**.

SI PUO’ Approfondire analizzando meglio le sub\_policy indicate: • # cross-agency collaboration? • in # cases we see institutional capacity (creation of committess etc) • in NO cases we see efforts to *improve maintenance expenditure reporting in public accounts*

**6. *(SOLUTIONS): Macro policy N. 2) A role for the private sector in funding***

When looking at the solutions to secure funding and financing, 10 cases illustrate initiatives that involved the private sector in the form of PPP, concessions or other contribution from private operators.

SI PUO’ Approfondire LE sub\_policy SOTTO FUNDING • NAtional funds… • TAX REVENUE …

**7. *(SOLUTIONS): Macro policy N. 3) A role for technology and knowledge sharing in improving delivery*** When looking at the solutions to improve implementation and delivery of maintenance projects, 15 cases illustrate initiatives that involved new technology solutions. Notably, there were also 4 cases with an explicit component dedicated to knowledge sharing efforts.

## — (BENEFITS): HIGHLIGHTS ABOUT BENEFITS BROUGHT (DIRECT AND INDIRECT)

As posited by the Policy Agenda, benefits can be obtained at both the “micro” and “macro” level. Indeed, 11

DA FARE: riempire una tabella che riflette BENEFITS in Pol Agenda ….

# 6) CASE STUDIES IN DETAIL

| **Info** | **Details** |
| --- | --- |
| **Name** | **New Basic Sanitation Regulatory Framework** |
| **Country** | BRA |
| **Sector/s** | Water-Waste |
| **Sub-sector/s** | water supply; drinking water distribution; waste water collection; waste water treatment; solid waste management; other water & waste (drainage and stormwater management); urban infrastructure |
| **Adminstrative level** | national; state; region; city |
| **Key agencies in charge** | Ministry of Regional Development (federal government); National Agency of Water and Basic Sanitation (federal government); Subnational governments (states and municipalities); Subnational regulatory agencies (state, regional and municipal) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Regulation and practices to account for deferred maintenance costs in agencies’ balance sheets;  Tax expenditures allocated to maintenance or rehabilitation purposes;  Innovative funding sources for delivering maintenance of public infrastructure;  Private sector investments, PPP, etc.;  Funding schemes incorporating preparedness to risk;  Mitigation of disincentives to asset maintenance spending;  Coordinated allocation of various available sources of funds, including supranational |
| **Highlights** | The new basic sanitation regulatory framework:  • Determines that the National Water Agency (ANA) is vested with defining reference guidelines for basic sanitation regulation (including quality and efficiency standards in the provision, maintenance and operation of basic sanitation systems).  • Makes it possible to inject more private investments in sanitation services.  • Regionalizes the sanitation service provision, so that small municipalities will also be served.  • Increases competition, facilitating private investments by opening room for concession contracts and biddings and prohibiting new program contracts. The current program contracts may be maintained until their final term, as long as the companies prove their economic and financial capacity and adapt to the goals of universalizing the framework.  • Facilitates the privatization process of a state sanitation company. It eliminates the need of consent from the municipalities if there are no changes in the object and duration of their program contracts.  • Brings more regulatory stability, by strengthening ANA, and provides legal certainty for investors, in addition to contributing to the revitalization of hydrographic basins, the conservation of the hydrographic environment and the reduction of water losses. |
| **Intended/achieved outcome/s** | aimed at boosting productivity growth by providing incentives for incumbent firms to adopt innovative technologies, and encouraging the entry of new and innovative firms in the market place, with evident impacts both in the provision of new infrastructures and in the maintenance of existing ones. |
| **Status & timeline** | launched in 2020 (law) ? |
| **Additional References** | https://www.gov.br/pt-br/noticias/transito-e-transportes/2020/07/novo-marco-de-saneamento-e-sancionado-e-garante-avancos-para-o-pais  https://www.gov.br/ana/pt-br/assuntos/saneamento-basico/novo-marco-legal-do-saneamento  https://agenciabrasil.ebc.com.br/saude/noticia/2020-07/veja-principais-mudancas-no-novo-marco-legal-do-saneamento  http://www.planalto.gov.br/ccivil\_03/\_ato2019-2022/2020/lei/l14026.htm  http://www.planalto.gov.br/ccivil\_03/\_Ato2007-2010/2007/Lei/L11445.htm  https://www.gov.br/ana/pt-br/assuntos/noticias-e-eventos/noticias/ana-define-normas-de-referencia-que-devera-elaborar-para-setor-de-saneamento-ate-2022 |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Bridges Renewal Program** |
| **Country** | AUS |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; bridges and tunnels |
| **Adminstrative level** | federal |
| **Key agencies in charge** | Department of Infrastructure, Transport, Regional Development and Communications |
| **Policy macro area/s** | funding |
| **Policy specific tool/s** | other |
| **Highlights** | Under the program, state, territory and local governments can submit projects proposals to a funding round, to access up to $2.5 million per proposal (up to $2 million for local governments). Funded projects are selected by the Australian Government and must source at least half of total project costs from outside the Bridges Renewal Program. |
| **Intended/achieved outcome/s** | Recognising the productivity benefits of bridge works, the Australian Government’s Bridges Renewal Program funds the upgrade and replacement of bridges to enhance access for local communities and facilitate higher productivity vehicle access. |
| **Status & timeline** | The program is funded to deliver $760 million across Australia between 2015–16 and 2024–25.  To date, the Australian Government has announced funding for five rounds, and plans to open applications for a sixth round in the future. |
| **Additional References** | https://investment.infrastructure.gov.au/infrastructure\_investment/bridges\_renewal.aspx. |

| **Info** | **Details** |
| --- | --- |
| **Name** | **PROSEFER – National Railway Safety Program in Urban Areas** |
| **Country** | BRA |
| **Sector/s** | transportation; social |
| **Sub-sector/s** | rail; urban mobility; civic buildings and structures; other social infrastructure (Public social and affordable housing assets) |
| **Adminstrative level** | federal; national |
| **Key agencies in charge** | Brazilian National Treasury |
| **Policy macro area/s** | planning |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Institutional capacity/ governance |
| **Highlights** | to collect information about the level crossings on Brazilian railways and to rank them according to the priority level, in order to eliminate or reduce the negative effects of these level crossings in the urban areas of municipalities, promoting the safety of the population who lives with railway operations, improving urban mobility and people's quality of life. |
| **Intended/achieved outcome/s** | A management tool for planning improvements to existing Brazilian railways; categorize and rank priority investments; increase the transport capacity of the Brazilian railways; improve urban mobility and quality of life in urban areas of municipalities that live daily with the railway activity. |
| **Status & timeline** | Launched in 2011, the Program was updated in 2020 for the first time, in order to improve the methodology that led to the prioritization of priority investments. As new level crossings emerge every year and as the data that guide the prioritization of investments are variable, such as vehicle counting at level crossings, it was suggested to promote annual updates for PROSEFER. |
| **Additional References** | https://www.gov.br/dnit/pt-br/assuntos/ferrovias/prosefer |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Canada Core Public Infrastructure Survey** |
| **Country** | CAN |
| **Sector/s** | Water-Waste; transportation; social |
| **Sub-sector/s** | waste water collection; waste water treatment; solid waste management; other water & waste (storm water assets); roads; bridges and tunnels; urban mobility (Public Transportation); tourism and arts (culture assets like art galleries and museums); other social infrastructure (Public social and affordable housing assets) |
| **Adminstrative level** | federal |
| **Key agencies in charge** | Statistics Canada; Infrastructure Canada |
| **Policy macro area/s** | planning |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Institutional capacity/ governance; |
| **Highlights** | The purpose of this survey is to collect statistical information on the inventory, condition, performance and asset management strategies of core public infrastructure assets owned or leased by various levels of Canadian government. |
| **Intended/achieved outcome/s** | Assess the condition of infrastructure assets; inform solutions and prioritize investment; monitor and report on progress of infrastructure investments; benchmark communities against similar municipalities nationwide. |
| **Status & timeline** | Launched in 2017. Conducted for reference years 2016 and 2018. Reference year 2020 is in development. |
| **Additional References** | https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5173 |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Municipal Asset Management Program** |
| **Country** | CAN |
| **Sector/s** | other |
| **Sub-sector/s** | other (not sector spefic) |
| **Adminstrative level** | city |
| **Key agencies in charge** | Infrastructure Canada; Federation of Canadian Municipalities |
| **Policy macro area/s** | delivery |
| **Policy specific tool/s** | Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach |
| **Highlights** | Supports municipalities with improving asset management practices through providing funding that enables: asset management assessments; development of asset management plans, policies and strategies; asset-related data collection and reporting; asset management training and organizational development; and knowledge transfer around asset management. |
| **Intended/achieved outcome/s** | Municipal infrastructure investment decisions are being made through stronger asset management practices using reliable data. |
| **Status & timeline** | Launched in 2016. An 8-year, $110M program funded by Infrastructure Canada. |
| **Additional References** | https://www.fcm.ca/en/programs/municipal-asset-management-program |

| **Info** | **Details** |
| --- | --- |
| **Name** | **National Roads and Agglomeration Transport Fund** |
| **Country** | CHE |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; bridges and tunnels; urban mobility |
| **Adminstrative level** | national |
| **Key agencies in charge** | Federal Roads Office (FEDRO) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards;  Institutional capacity/ governance;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Tax expenditures allocated to maintenance or rehabilitation purposes;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance |
| **Highlights** | It creates the basis for the federal government to invest enough funds in the operation, maintenance and expansion of the national roads. |
| **Intended/achieved outcome/s** | A clear prioritization of maintenance and preservation of infrastructure assets in a long term logic; more transparency; simpler credit management. |
| **Status & timeline** | It was launched in 2017. |
| **Additional References** | https://www.astra.admin.ch/astra/it/home/temi/strassenfinanzierung/naf.html |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Electricity Grid Usage Tariff** |
| **Country** | CHE |
| **Sector/s** | energy |
| **Sub-sector/s** | energy transmission; energy distribution |
| **Adminstrative level** | national |
| **Key agencies in charge** | Swissgrid (the national grid company) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Regulation and practices to account for deferred maintenance costs in agencies’ balance sheets;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management |
| **Highlights** | According to the Electricity Supply Act (in German: “Stromversorgungsgesetz”), income from the electricity grid usage tariff (in German: “Netznutzungstarif”) is used to cover grid maintenance costs. |
| **Intended/achieved outcome/s** | This ensures the long-term financing of maintenance. |
| **Status & timeline** |  |
| **Additional References** | Underlying law : https://www.fedlex.admin.ch/eli/cc/2007/418/it#art\_14 and https://www.fedlex.admin.ch/eli/cc/2007/418/it#art\_15  Responsible agency : https://www.swissgrid.ch/en/home.html  (Links are to websites in Italian, as the information is not available in English.) |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Retroftting Ageing Highway Bridges** |
| **Country** | CHN |
| **Sector/s** | transportation; social |
| **Sub-sector/s** | bridges and tunnels; tourism and arts; urban infrastructure |
| **Adminstrative level** | national |
| **Key agencies in charge** | Min Transp; Provincial Transp Depts |
| **Policy macro area/s** | planning |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Data collection/analysis effort |
| **Highlights** | As part of the efforts to modernise the infrastructure networks in China, China launches a nationwide drive to retrofit ageing highway bridges to improve safety and durability, through improving and expanding traffic capacity and flood resistance capacity, improving technical conditions,and addressing insufficient load-capacity. |
| **Intended/achieved outcome/s** | （1) By the end of 2023, the retrofit of national and provincial trunk highway bridges classified into 4 or 5 categories in 2019 will be basically completed.  （2) By the end of 2025, the retrofit of rural highway bridges classified into 4 or 5 categories in 2019 will be basically completed. The retrofit rate of national and provincial trunk highway bridges newly-classified into 4 or 5 categories should be 100%. A part of ageing existing highway bridges will be retrofit to make the ratio of category 1 and 2 in national express highway reach more than 95%, and the ratio of category 1 and 2 in ordinary national and provincial trunk highway reach more than 90%. |
| **Status & timeline** | Work Schedule:  （1) By the end of December 2020, the nationwide comprehensive survey has been completed.  （2) By the end of February 2021,the total retrofit workload,implementation plan and management system have been determined by the provincial transport departments.  （3) Between March 2021 and the end of December 2025,the provincial transport departments will make and implement the retrofit plan of each year, and report the progress to the Ministry of Transport (MOT) on monthly basis. |
| **Additional References** | http://xxgk.mot.gov.cn/2020/jigou/glj/202012/t20201228\_3509089.html  http://xxgk.mot.gov.cn/2020/jigou/glj/202012/P020201229367107959905.doc  http://www.mot.gov.cn/2020zhengcejd/weiqiaogz/index.html |

| **Info** | **Details** |
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| **Name** | **Circular of the Ministry of Finance on Issuing the Operation Guideline for Performance Management of PPP Projects** |
| **Country** | CHN |
| **Sector/s** | energy; Water-Waste; transportation; ICT; social; other |
| **Sub-sector/s** | energy generation; energy storage; energy transmission; energy distribution; energy efficiency; renewable energy; water supply; dams and hydropower ; desalination; drinking water distribution; waste water collection; waste water treatment; solid waste management; irrigation and agri-business ; airports; ports; rail; roads; bridges and tunnels; urban mobility ; telecommunications; information technology; digital connectivity; civic buildings and structures; defence; education; healthcare; justice buildings; sports and recreation; tourism and arts; urban infrastructure; other social (elderly care, social security); other sector (ecological construction and environmental protection, integrated urban development, government infrastructure, affordable housing, forestry, agriculture) |
| **Adminstrative level** | national |
| **Key agencies in charge** | Financial departments at all provincial, municipal and county levels |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Definition/adoption of standards; Private sector investments, PPP, etc.; Other funding; Solutions improving maintenance planning / lifecycle asset management strategy / risk management; Contractual provisions improving maintenance delivery; Solutions improving maintenance delivery; Private sector participation in successful delivery of O&M |
| **Highlights** | The Operation Guideline for Performance Management of PPP Projects was issued by the Ministry of Finance of China in order to regulate the full life cycle performance management of PPP projects, and improve the quality and efficiency of public service delivery. Performance management of PPP projects refers to project management activities including the management of performance targets and indicators, performance monitoring, evaluation and result application carried out throughout the full life cycle of PPP projects. The operation guidelines issued this time are applicable to all PPP projects, including government-pay projects, viability gap funding projects and user-pay projects. The performance evaluation results of PPP projects are an important basis for pay-for-performance. |
| **Intended/achieved outcome/s** | "regulate the full life cycle performance management of Public Private Partnership (PPP) projects, improve the quality and efficiency of public service supply and protect the legitimate rights and interests of all parties" (from ANNEX Circular Art. 1) |
| **Status & timeline** | Issued in 2020 |
| **Additional References** | https://www.cpppc.org/en/czb/999281.jhtml |

| **Info** | **Details** |
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| **Name** | **CAIRO METRO REHABILITATION** |
| **Country** | EGY (from EIB) |
| **Sector/s** | transportation |
| **Sub-sector/s** | urban mobility |
| **Adminstrative level** | national |
| **Key agencies in charge** | The metro operator ECM (Egyptian Co. for Metro Management & Operation); owner of the infrastructure NAT (National Authority for Tunnels), resorting under the Ministry of Transport |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Other STRATEGIC PLANNING;  Adoption/sharing of innovation and new technology for maintenance;  Solutions improving maintenance cost management |
| **Highlights** | Rehabilitate all the systems and tracks of Cairo Metro Line 1 and 2 (in operations for 20 years and in need of rehabilitation, renovation) to rehabilitate to:  • Improve the reliability and long term sustainability of the metro services; and  • Increase the transport capacity of the line by enabling higher speeds and a higher number of trains per hour.  The scope of the rehabilitation includes renewal and upgrading the signalling system, telecommunications systems, electromechanical systems, the centralised control system, the power supply system and renewal of parts of the tracks. |
| **Intended/achieved outcome/s** | • Improve the reliability and long term sustainability of the metro services; and  • Increase the transport capacity of the line by enabling higher speeds and a higher number of trains per hour. |
| **Status & timeline** | - Line 1: Design for the rehabilitation of line 1 is completed and procurement started. This is financed with a loan signed in January 2019 for EUR 350 million.   - Line 2: Design for the rehabilitation of line 2 is ongoing. This is financed with an EIB loan of a total value of EUR 1.1 bn loan, of which a first tranche of EUR 600 million was signed in December 2020 and a second tranche of EUR 528 million would be signed in 2021. The project related to rehabilitation of the Line 2 is of a value of EUR 240 millio that is a part of the EUR 1.1 bn loan. |
| **Additional References** | http://www.nat.org.eg/english/index.html |

| **Info** | **Details** |
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| **Name** | **Metro de Madrid Infrastructure upgrade** |
| **Country** | ESP (from EIB) |
| **Sector/s** | transportation |
| **Sub-sector/s** | urban mobility |
| **Adminstrative level** | region |
| **Key agencies in charge** | Metro de Madrid, owned solely by Madrid Regional Government (Comunidad Autónoma de Madrid). |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solutions improving maintenance delivery |
| **Highlights** | This investment programme is aligned with METRO’s strategic pillars, namely: 1) public service; 2) efficiency; and 3) client experience. These strategic pillars are at the same time in line with EU and EIB objectives with regards to the enhancement of sustainable public transport use.  The project encompasses 6 groups of action plans:  (a) Rehabilitation and upgrade of stations (buildings and equipment) including measures to improve accessibility for people with reduced mobility;  (b) purchase of rolling stock spare parts and rolling stock upgrading;  (c) upgrade and rehabilitation of track and structures;  (d) specialised equipment/tools;  (e) signalling technology to improve supply/demand; and  (f) equipment renewal to improve energy efficiency.  The sub-projects under this Framework loan in support of METRO’s investment programme will be executed in the province of Madrid, mainly in Madrid city. |
| **Intended/achieved outcome/s** | The following positive socio-economic impacts of the project can be highlighted:  • Improvement of energy efficiency: The improvement of ventilation in metro lines will improve environmental conditions and reduce energy consumption. Improvement of energy efficiency will also result from upgrading works in different electrical systems.  • Improvement of the transport quality and comfort for current and future users of the metro network: The metro services will be more reliable and will offer improved comfort levels after the planned renewal of signaling and communications systems, capacity increase of electric substations, improvements of the electrical and transformation systems and upgrading of rolling stock.  • Enhancement of the attractiveness of public transport: The additional service features such as increased accessibility for people with reduced mobility, improved communication infrastructure, increased reliability and safety of escalators, introduction of air conditioning, etc. will help enhance the attractiveness of public transport. In addition, modernisation of metro lines should reduce travel time.  • Reduction of operating costs: Maintenance costs are expected to decrease as a result of the track renewal operation. The improvement of energy efficiency and the optimisation of key processes will also introduce a reduction of operating costs. |
| **Status & timeline** | Project implementation phase was originally planned from 2017 until the end of 2019, while execution of some of the planned investments will eventually be extended until the end of 2021. |
| **Additional References** | Metro de Madrid Accessibility and Inclusion Plan 2016-2020  Renewal plan for stations 2017-2021. Metro de Madrid  Madrid Metro Network Modernisation Plan 2016-2030  (The Modernisation Plan covers metro lines 1,2, 4, 5, 6, 7, 8 and 9, with a total budget of EUR 490 m) |

| **Info** | **Details** |
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| **Name** | **Sud Europe Atlantique High Speed Rail Link** |
| **Country** | FRA |
| **Sector/s** | transportation |
| **Sub-sector/s** | rail |
| **Adminstrative level** | national; region |
| **Key agencies in charge** | Sud Europe Atlantique High Speed Rail Link (France); LISEA S.A.S |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Regulatory innovations;  Socio-economic observatory during the first 10 years of the Project;  Private sector investments, PPP, etc.;  Other funding;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance;  Resilience or maintenance solution relying on nature-based approaches / green infrastructure;  Private sector participation in successful delivery of O&M |
| **Highlights** | The Sud Europe Atlantique High-Speed Line is a 302-km long dual-track railway between Tours and Bordeaux, with 38km of additional links to the main cities in the South-West of France. (€7.7bn of investment).  The project includes 445 structures in total, including 391 standard structures (“ouvrages d’art courants”), and 35 non-standard structures (“ouvrages d’art particuliers”), which had to be tailored to suit the particular site constraints, as well as 19 viaducts (“ouvrages d’art non-courants”). There are no tunnels on the route.  Obligations and risks associated with the construction and operation and maintenance of the line have been transferred to contractors on a "back-to-back" and "if-and-when" basis under an operation and maintenance Contract entered into with MESEA (70% VINCI Concessions, 30% Systra).  MESEA is in charge of the monitoring and routine maintenance of all the components of the line: tracks, catenaries, signalling/IT systems and civil works. MESEA operates with four maintenance bases along the line and almost 200 employees. The maintenance task orders are issued by a computerised maintenance management system. MESEA performs three types of Preventive Maintenance:  • Systematic Preventive Maintenance: undertaken at fixed intervals in accordance with standards or at the completion of a defined number of usage cycles, but without prior checking of the state of the asset concerned;  • Conditional Preventive Maintenance: based on monitoring of an asset’s performance and/or significant performance parameters and includes additional actions required during hot weather or ice etc.; and  • Predictive Maintenance: performed at intervals determined by extrapolation of significant parameters relating to an asset’s degradation characteristics over time.  LISEA remain responsible for major maintenance and renewals activities. |
| **Intended/achieved outcome/s** | The Sud Europe Atlantique HSL carries 20.5 million passengers per year between the South-West regions of France and Paris, and North and East regions of France. HSL SEA offers journey times between Paris and Bordeaux of 2h compared to 3h before construction.  The route has been designed for speeds of up to 350 kph. The commercial speed is 320 kph.  The Concession Agreement defines performance indicators and penalties are imposed in the case of failure to meet annual performance thresholds for regularity, reliability, availability and passenger comfort. |
| **Status & timeline** | The Sud Europe Atlantique HSL has been in service since 2nd July 2017. |
| **Additional References** | https://www.lisea.fr/  https://www.mesea.fr/ |

| **Info** | **Details** |
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| **Name** | **Road Sector Policy Support Programmes – Ethiopia (Sector Budget Support Modality)** |
| **Country** | ETH (from EU) |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; other transportation (Logistics, Road safety, Connectivity – transport corridor performance and services) |
| **Adminstrative level** | national; region; city |
| **Key agencies in charge** | Ethiopian Roads Authority (ERA), Ethiopian Road Fund Office |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Tax expenditures allocated to maintenance or rehabilitation purposes;  Innovative funding sources for delivering maintenance of public infrastructure;  Mitigation of disincentives to asset maintenance spending;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Solutions integrating resilience into infrastructure intervention |
| **Highlights** | The EU’s strategic approach to support Ethiopia’s road transport sector reforms & sustainable sector performance is primarily based on the modality of sector budget support. It is aligned to the provision of the Government’s “Road Sector Development Programme (RSDP)”. |
| **Intended/achieved outcome/s** | • Between 2009 and 2017, the trend of federal roads and regional roads annually maintained has to a great extent steadily increased from some 13.000 km to 18.000 km (federal) and from some 7.300 km to almost 10.000 km (regional);  • The evolution of the rural roads accessibility has been growing from 52% of rural communities with access to all-weather roads in 2011 to 72% in 2016; the area further than 2 km from all-weather roads dropped from 69% in 2013 to 63% in 2018;  • The paved and gravel core road network condition (good and fair) has been constantly improving and remains at a satisfactory level. It has gradually increased from 69% in 2006 to 93% in 2017.  • Reforms to the Road Fund, including lifting a cap previously imposed on direct transfer of fuel levy, a new revenue source (Axle Load Based annual vehicle’s licence renewal fee), and regarding ERA’s asset management tools and maintenance mandate;  • The overall allocation to road maintenance has increased through the years by some 75% (from 2013 to 2018), but further efforts are needed to cover needs and maintenance backlog; |
| **Status & timeline** | launched in 2006, 2009-2017 |
| **Additional References** | Videos:  Health via Healthy Roads | Capacity4dev (europa.eu)  https://vimeo.com/271133772 |

| **Info** | **Details** |
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| **Name** | **Sub-Saharan Africa Transport Policy Program - SSATP** |
| **Country** | FFF (from EU) |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; urban mobility; other transportation (multi-modal transport approaches under aspects of connectivity & regional integration) |
| **Adminstrative level** | supranational; national; region; city |
| **Key agencies in charge** | Operational Set-up: The SSATP is financed by the contributions of development partners to a trust fund administered by the World Bank. Current donors are the European Commission (EC), Swiss State Secretariat for Economic Affairs (SECO), Agence Française de Développement (AFD), and African Development Bank (AfDB).  [governance structure omitted...]Partnerships: The SSATP is fostering partnership with institutions and initiatives with similar objectives such as institutions e.g. Africa Corridor Management Alliance (ACMA), MCLI (Maputo Corridor Logistics Initiative), Central Corridor, and ALCO (Asset-Liability Committee); with WCO (World Customs Organization) and IRU (International Road Union) on the transit regimes; with Mobilize Your City (MYC), IUTP/UATP (International Association of Public Transport/, and Leaders in Urban Transport Planning (LUTP) to promote the urban mobility agenda; and with the International Traffic Safety Data and Analysis Group (IRTAD), FIA (Federation Internationale de l'Automobile), and GRSF (Global Road Safety Fund) in the form of a strategic alliance to tackle issues related to data collection and analysis. |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Innovative funding sources for delivering maintenance of public infrastructure;  Road Fund Maintenance Funding & Management;  Solutions improving maintenance planning / lifecycle road asset management strategy / risk management;  Solutions improving maintenance delivery;  Solutions improving maintenance cost management |
| **Highlights** | The mission of the SSATP is to facilitate policy development and capacity building in the transport sector in Africa. SSATP activities follow the policy development cycle: knowledge creation and dissemination, advocacy, knowledge application etc. In the meantime, the program is proud on the membership of 42 African partner countries. EC is one of its long standing financiers |
| **Intended/achieved outcome/s** | SSATP has made the commercialization of the road sector a thematic priority; the program significantly contributed and made essential achievements by supporting the establishment of a sustainable financing mechanism & legislation for road maintenance (Road Funds) and by improving road management practices (Road Agencies) in African countries; supported the creation of the Africa Road Maintenance Funds Association (ARMFA) with a view (i) to promote a network for exchange of experiences and information on good practices in the financing of road maintenance in Africa and (ii) vis-à-vis the promotion and strengthening of ties between Road Maintenance Funds in Africa.    In 2021, the program’s key focus has shifted in response to evolving transport challenges in Africa towards the key pillars of (i) Regional Integration/Connectivity, (ii) Urban Transport and Mobility, (iii) and Road Safety |
| **Status & timeline** |  |
| **Additional References** | https://www.ssatp.org/  https://www.ssatp.org/publications |

| **Info** | **Details** |
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| **Name** | **AMP7 – Ofwat Price Review 19** |
| **Country** | GBR |
| **Sector/s** | Water-Waste |
| **Sub-sector/s** | water supply; waste water collection; waste water treatment; solid waste management |
| **Adminstrative level** | national; region |
| **Key agencies in charge** | Ofwat |
| **Policy macro area/s** | funding; delivery |
| **Policy specific tool/s** | Private sector investments, PPP, etc.;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solutions improving maintenance delivery;  Resilience or maintenance solution relying on nature-based approaches / green infrastructure |
| **Highlights** | The Ofwat (regulator) Price Review 2019 (PR19) looks to deliver on resilience as a key theme of the review. The document sets out draft determinations which look to assess business plans and integrate into a wider review of companies’ resilience action plans. As such, businesses submit business plans to Ofwat, and these are mapped onto government priorities (including resilience and maintenance). Ofwat then outlines expectations and findings in relation to companies’ plans on long term resilience. This can include the quality of their resilience frameworks or maintaining stable asset health. |
| **Intended/achieved outcome/s** | It looks to deliver on resilience as a key theme of the review |
| **Status & timeline** | The determinations for 2019 has pledged £12bn extra funding to increase resilience and protect the environment. |
| **Additional References** | https://www.ofwat.gov.uk/wp-content/uploads/2020/12/PR24-and-beyond-Our-reflections-on-lessons-learnt-from-PR19.pdf |

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| **Name** | **Control Period 6 (2019 – 2024) – Asset Information Services Strategic Plan** |
| **Country** | GBR |
| **Sector/s** | transportation; ICT |
| **Sub-sector/s** | rail; information technology |
| **Adminstrative level** | national |
| **Key agencies in charge** | Department for Transport; Network rail |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Data collection/analysis effort;  Definition/adoption of standards;  Institutional capacity/ governance;  Solutions integrating resilience into infrastructure intervention |
| **Highlights** | The UK’s Asset Information Services Strategic Plan focuses on providing a managed portfolio of services that are relevant to the users of railways, enabling the optimal and sustainable balancing of investment, safety risk, and performance of the railway. It supports the UK’s Network Rail strategic asset management business plans and is a key foundation for the digital railway. |
| **Intended/achieved outcome/s** | With the broad aim of improving cost efficiency, resiliency and sustainability of rail systems and services, this is a data-driven strategy that will extend and improve the management of data in this area. |
| **Status & timeline** | The AIS is part of the broader CP6 (Control Period 6: 2019-2024) plan, a 5-year timespan that details financial planning for Network Rail. |
| **Additional References** | CP6 (Control Period 6: 2019-2024): https://www.networkrail.co.uk/who-we-are/publications-and-resources/our-delivery-plan-for-2019-2024/  Asset Information Services: https://www.networkrail.co.uk/wp-content/uploads/2019/06/Strategic-Plan-Asset-Information-Services.pdf |

| **Info** | **Details** |
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| **Name** | **A) Bridge Modernization Program, Retrofitting of Older Road Bridges  B) Intelligent Bridge** |
| **Country** | GER |
| **Sector/s** | transportation |
| **Sub-sector/s** | bridges and tunnels |
| **Adminstrative level** | federal |
| **Key agencies in charge** | Ministry of Transport and digital Infrastructure |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Definition/adoption of standards ;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach ;  Solutions improving maintenance delivery;  Data collection/analysis effort;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solutions improving maintenance delivery |
| **Highlights** | A) Growing traffic volume, which is expressed by higher total vehicle weights and higher axle loads as well as by a considerably increased number of transports, together with aging structures and known technical deficits make comprehensive retrofitting and modernization measures necessary. Bridge modernization includes all measures for adapting existing bridge structures to changed boundary conditions regarding load-bearing capacity, traffic safety and durability. To ensure that the modernization measures are carried out as efficiently as possible, a continuous network of particularly heavily loaded routes has been defined as the modernization network. In this network, the required load-bearing capacity of the structures is to be ensured throughout by the year 2030. The network contains about 5200 bridge structures (10000 partial structures) and it largely corresponds to the TEN-T core network.  B) Current challenges such as increasing traffic loads and the aging bridge stock enhance the demands on bridge structures and require new, effective and efficient solutions. The research cluster "Intelligent Bridge" was established at the Federal Highway Research Institute (BASt). |
| **Intended/achieved outcome/s** | A) The possibilities offered by the structural assessment guideline range from more accurate resistance models that consider the structural boundary conditions of the aged structures, through traffic load models that depend on the actual traffic characteristics, to modified partial safety factors and the characteristic values required for the calculation to consider materials that are no longer in use today. As a result, the financial resources can be used in an even more targeted and efficient manner.  B) The aim is to develop a modular system for the continuous recording and analysis of relevant measured parameters with regard to impacts and structural reactions, as well as their evaluation and the visualization of results. Information on changes in condition and forecasts will provide a basis for predictive maintenance management. In this sense, the reserves of the bridges and their components are to be fully utilized and at the same time failures are to be avoided in order to ensure the best possible availability. |
| **Status & timeline** | A) In 2011, the Federal Ministry of Transport and Digital Infrastructure (BMVI) published a guideline for the recalculation of existing road bridges (structural assessment guideline) to ensure that the load-bearing capacity of many of the existing bridge structures, which are already between 40 and 60 years old, is assessed as realistically as possible. Since then, the guideline has been continuously developed and expanded to include new findings from departmental research conducted for this purpose.  B) While initial conceptual projects focused on the feasibility and fundamentals of assessment methods and the development of instrumented components such as expansion joints and bridge bearings, the focus of current work is on testing and evaluating components with regard to their suitability for practical use under real conditions, as well as on their further development. |
| **Additional References** | www.bmvi.de  www.bast.de  www.intelligentebruecke.de |

| **Info** | **Details** |
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| **Name** | **Bundesnetzagentur (BNetzA), the German Federal multisector economic regulator** |
| **Country** | GER |
| **Sector/s** | energy |
| **Sub-sector/s** | energy transmission; energy distribution |
| **Adminstrative level** | federal; national |
| **Key agencies in charge** | Bundesnetzagentur (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway) |
| **Policy macro area/s** | delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solutions improving maintenance delivery |
| **Highlights** | Details about key measures:  1. Quality regulation: Under a regulatory regime that provides incentives to cut costs, there is a risk that operators will neglect maintenance or necessary investments to provide a certain quality of supply. To counter this, the regime includes quality regulation for electricity distribution networks. This takes the form of a quality element in the formula for setting the revenue caps. Operators achieving above-average quality in past years will have a certain amount added to their cap, while operators with comparatively poor quality levels will have amounts deducted (bonus/penalty system). This quality element was implemented in 2014. Each DSO faces a trade-off whether to invest money in order to maintain a high level of quality of supply or to cut those costs and risk a penalty on its allowed revenues  2. CAPEX in period mark-up: The mark-up depends on the network operator‘s investment activity in new assets in years different from the reference year. No distinction is made between replacement and enhancement or expansion expenditures. The mark-up only applies to DSOs and is based on cost forecasts. Operators have to apply for the mark-up six months in advance. The CAPEX mark-up is part of the so-called annual CAPEX true-up. The true-up also includes a yearly CAPEX adjustment,for depreciation which is determined prior to the regulatory period. It reflects the actual reduction of CAPEX due to amortisation in the revenue cap.  3. Investment measures at TSO level: Having investment measures granted means that these costs are treated as “non- controllable” costs for the measures’ duration and directly passed through to the allowed revenues. Non-controllable costs are an element of the formula for setting the revenue caps, too. Thus, TSOs are able to quickly and completely refinance their expansion and restructuring investments through investment measures. Proposed expansion and restructuring investments can be approved provided they are required for the stability of the system as a whole, for incorporation into the national or international interconnected grid, or for expansion of the network to meet energy supply requirements. Thus, if a maintenance measure is structured as an expansion or restructuring investment, it will be passed through directly to the allowed revenues without any deductions.  Last but not least since 2011 BNetzA is also responsible for approving the national network development plan (NDP) for electricity transmission networks (the four German TSOs have to submit a joint national NDP) and for gas transmission networks (again the 16 German TSOs have to submit a joint national NDP). |
| **Intended/achieved outcome/s** | Since 2009 BNetzA implements the incentive regulation for energy transmission and distribution network operators (TSOs and DSOs). Given the high number of operators in Germany and the aim of incentivizing efficient grid operation as well as ensuring efficient grid investment BNetzA introduced in 2009 the incentive regulation as a dynamic and predictable form of regulation. Based on an efficiency benchmark BNetzA calculates with the revenue cap formula for each operator a revenue cap setting the efficiency target (relative to the most efficient operator and factoring in a general productivity factor X-gen) to be reached during the regulatory period (“individual revenue path”). BNetzA carries out the efficiency benchmark for all operators in Germany. The incentive regulation includes all costs, i.e. capital expenditure (CAPEX) and operational expenditure (OPEX), thus following a total expenditure or TOTEX approach and splits the cost shares in the following three categories:  • non-controllable costs (not subject to efficiency requirements);  • temporarily non-controllable costs (subject to efficiency requirements);  • controllable costs (inefficiencies have to be eliminated during the regulatory period). |
| **Status & timeline** | All described regulatory elements are part of the German Incentive Regulation and already implemented:  1. Quality regulation: This quality element was implemented in 2014. Each DSO faces a trade-off whether to invest money in order to maintain a high level of quality of supply or to cut those costs and risk a penalty on its allowed revenues  2. CAPEX mark-up: A CAPEX in period mark-up was introduced into the regulatory formula supplanting the budget approach in 2016 in order to alleviate industry’s concerns about time lags.  3. Investment measures at TSO level: TSOs have the possibility to apply for so-called “investment measures” which have been introduced in 2012.  Last but not least since 2011 BNetzA is also responsible for approving the national network development plan (NDP) for electricity transmission networks (the four German TSOs have to submit a joint national NDP) and for gas transmission networks (again the 16 German TSOs have to submit a joint national NDP). |
| **Additional References** | https://chairgovreg.fondation-dauphine.fr/sites/chairgovreg.fondation-dauphine.fr/files/attachments/180410\_synthese\_0.pdf  OECD Network of Economic Regulators (NER): http://www.oecd.org/gov/regulatory-policy/ner.htm  Bundesnetzagentur: www.bundesnetzagentur.de;  Press release of 5 March 2021:https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/BNetzA/PressSection/PressReleases/2021/20210305\_Netzausbaubericht.pdf?\_\_blob=publicationFile&v=2  Report (German only): https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen\_Institutionen/NetzentwicklungundSmartGrid/Zustand\_VN/ZustandVN\_node.html. |

| **Info** | **Details** |
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| **Name** | **Eastern Sumatera Highway Preservation in Riau Province (Non Toll Road)** |
| **Country** | IDN |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads |
| **Adminstrative level** | national |
| **Key agencies in charge** | Directorate General of Highways, Ministry of Public Work |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Definition/adoption of standards;  Institutional capacity/ go; ernance;  Strengthened institutional framework;  Regulatory inno; ations;  Pri; ate sector in; estments, PPP, etc.;  Solutions impro; ing maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual pro; isions impro; ing maintenance deli; ery;  Solutions impro; ing maintenance deli; ery;  Pri; ate sector participation in successful deli; ery of O&M |
| **Highlights** | Eastern Sumatera Highway Preservation in Riau Province (Non Toll Road)  The project is a concession agreement between the Directorate General of Highways, MoPWH and PT Adhi Jalintim Riau, a private sector company, to design, build, finance, operate and maintain (DBFOM) Eastern Sumatera Highway Preservation in Riau Province. The main scope of the project is to carry out the preservation of the 43 km long Riau National Road for 3 sections non toll road include 4 bridges and 1 unit weighbridge facility. |
| **Intended/achieved outcome/s** | The project is the second PPP project in the non toll road sector in Indonesia. As one of the alternative financing schemes, this PPP project is a form of Government support for the community through infrastructure projects that have a major impact on economic improvement (backbone of national economic growth), namely through increasing connectivity between regions, especially those used as logistics, tourism, access roads to ports and airports, and savings in Vehicle Operating Costs (BOK) and the value of travel time. |
| **Status & timeline** | For the Highway Preservation in Riau the contract was signed in April 2021 and will start the preservation/construction in October 2021. The project, with investment cost of Rp654,7 billion, has a concession periode pf 15 years consisting of 3 years of construction periode and 12 years of delivery service. The project has achieved PPP Signing Agreement stage and currently under preparation financial close stage. The project granted various supports from the Ministry of Finance, namely the Project Development Facility and infrastructure guarantee from IIGF. |
| **Additional References** | https://kpbu.kemenkeu.go.id/proyek/detail/59-preservasi-jalan-nasional-lintas-timur-sumatera-di-provinsi-riau |

| **Info** | **Details** |
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| **Name** | **Eastern Sumatera Highway Preservation in South Sumatera Province (Non Toll Road)** |
| **Country** | IDN |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads |
| **Adminstrative level** | national |
| **Key agencies in charge** | Directorate General of Highways, Ministry of Public Work |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Definition/adoption of standards;  Institutional capacity/ go; ernance;  Strengthened institutional framework;  Regulatory inno; ations;  Pri; ate sector in; estments, PPP, etc.;  Solutions impro; ing maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual pro; isions impro; ing maintenance deli; ery;  Solutions impro; ing maintenance deli; ery;  Pri; ate sector participation in successful deli; ery of O&M |
| **Highlights** | Eastern Sumatera Highway Preservation in South Sumatera Province (Non Toll Road)  The project is a concession agreement between the Directorate General of Highways, MoPWH and PT Jalintim Adhi-Abipraya, a private sector company, to design, build, finance, operate and maintain (DBFOM) Eastern Sumatera Highway Preservation in South Sumatera Province. The main scope oh the project is to carry out the preservation of the 29,87 km long South Sumatera National Road for 6 section non toll road include 14 bridges and 2 unit weighbridges facility. The project, with investment cost of Rp982 billion, has a concession periode pf 15 years consisting of 3 years of construction periode and 12 years of delivery service. The project has achived financial close stage and currently under preparation construction stage. The project granted various supports from the Ministry of Finance, namely the Project Development Facility and infrastructure guarantee from IIGF. |
| **Intended/achieved outcome/s** | As one of the alternative financing schemes, this PPP project is a form of Government support for the community through infrastructure projects that have a major impact on economic improvement (backbone of national economic growth), namely through increasing connectivity between regions, especially those used as logistics, tourism, access roads to ports and airports, and savings in Vehicle Operating Costs (BOK) and the value of travel time. |
| **Status & timeline** | The PPP contract of Highway Preservation in South Sumatra between the government and the private partner was signed in August 2020 and started preservation/construction in February 2021 |
| **Additional References** | https://kpbu.kemenkeu.go.id/proyek/detail/59-preservasi-jalan-nasional-lintas-timur-sumatera-di-provinsi-sumatera-selatan |

| **Info** | **Details** |
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| **Name** | **Long term O&M of Infrastructure Assets through Public Private Partnerships** |
| **Country** | IND |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; bridges and tunnels |
| **Adminstrative level** | national |
| **Key agencies in charge** | Ministry of Road Transport and Highways (MoRTH); Government of India |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Data collection/analysis effort; M&E framework focused on maintenance backlog and budgeting; Institutional capacity/ governance; Regulatory innovations; Innovative funding sources for delivering maintenance of public infrastructure; Private sector investments, PPP, etc.; Funding schemes incorporating preparedness to risk; Mitigation of disincentives to asset maintenance spending; Contractual provisions improving maintenance delivery; Private sector participation in successful delivery of O&M |
| **Highlights** | Ministry of Road Transport & Highways (MoRTH) has encouraged Long term road (development), operations, and maintenance contracts through various innovative PPP modes such as Hybrid Annuity Mode (HAM) and Toll Operate Transfer (TOT) mode.  PPP modes involve drafting of complicated and detailed contract, risk allocation and points of responsibility, etc. MoRTH has developed unique Model Concession Agreements based on market accepted standards to allow private sector efficiencies in road maintenance. |
| **Intended/achieved outcome/s** | the optimal and ideal form of PPP project should be one which starts from the capital works and continues with the maintenance works. This can encourage the contractor to uplift the construction quality so as to save its future maintenance cost. |
| **Status & timeline** | ongoing (MoRTH has successfully awarded more than 170 HAM contracts and 4 TOT contracts) |
| **Additional References** | https://morth.nic.in/sites/default/files/Revisd%20MCA%20for%20HAM-Nov.pdf  https://morth.nic.in/sites/default/files/OM\_Changes%20MCA&RFP\_of%20TOT\_Model.pdf |

| **Info** | **Details** |
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| **Name** | **Bridge safety guidelines** |
| **Country** | ITA |
| **Sector/s** | transportation |
| **Sub-sector/s** | bridges and tunnels |
| **Adminstrative level** | national |
| **Key agencies in charge** | 1) CIAS (Centro Internazionale di Aggiornamento Sperimentale-Scientifico) – nonprofit organization for scientific advancement in civil engineering  2) 4 EMME Service S.p.A. - a company that specialized in structural engineering diagnostic  3) Consiglio Superiore dei Lavori Pubblici - higher technical consultative body for the Ministry of Infrastructure (MIT)  4) RINA S.p.A – a multinational companies specialized in services for various infrastructure sectors (including certification) |
| **Policy macro area/s** | planning |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards |
| **Highlights** |  |
| **Intended/achieved outcome/s** |  |
| **Status & timeline** |  |
| **Additional References** |  |

| **Info** | **Details** |
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| **Name** | **Mexico Tollroads MRO Model (Maintainer - Rehabilitator – Operator)** |
| **Country** | MEX |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads, urban mobility |
| **Adminstrative level** | federal; national |
| **Key agencies in charge** | Fondo Nacional de Infraestructura (FONADIN) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Innovative funding sources for delivering maintenance of public infrastructure;  Private sector investments, PPP, etc.;  Funding schemes incorporating preparedness to risk;  Mitigation of disincentives to asset maintenance spending;  Coordinated allocation of various available sources of funds, including supranational;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance;  Solutions improving maintenance cost management;  Resilience or maintenance solution relying on nature-based approaches / green infrastructure;  Solutions integrating resilience into infrastructure intervention;  Private sector participation in successful delivery of O&M |
| **Highlights** | MRO Tollroads Model  Main agents:  1. FONADIN (National Infrastructure Fund. Public trust in charge of coordinating investment in infrastructure mainly in the areas of communications, transportation, hydraulics, environment and tourism) currently manages the largest concessioned toll roads network in the country composed of 57 toll roads with a total length of neraly 5,000 km.  2. FONADIN in accordance with its legal framework, to operate and maintain their toll raods may use the governmental agency in charge of maintenance of roads in the country or has the possibility, like the private sector does, through a competitive bidding processes hire private firms to operate, maintain, and rehabilitate the toll roads to keep them updated.  3. Through these processes two main figures are the Supervisory Administrator Agent and the Maintainer, Rehabilitator, Operator (MRO): a) AAS - Supervisory Administrator Agent (Manages and supervises compliance with performance standards, supports planning and elaborates Master Development Programs. Supports the hiring of the Maintainer-Rehabilitator-Operator); b)MRO - Maintainer, Rehabilitator, Operator (In charge of operating and maintaining tollroads with levels of service, responsible for Operation, Maintenance and Rehabilitation)  4. Through the competitive bidding processes, the objective is that FONADIN transfer the use of high amount of money to the private sector to maintain the road, the private operate the toll road for a period of time to recover the investment, and the toll roads has to keep a standard grade among the road evaluated by national indicators. |
| **Intended/achieved outcome/s** |  |
| **Status & timeline** |  |
| **Additional References** |  |

| **Info** | **Details** |
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| **Name** | **ANAS - planned road maintenance** |
| **Country** | ITA |
| **Sector/s** | transportation; ICT |
| **Sub-sector/s** | roads; bridges and tunnels; information technology |
| **Adminstrative level** | national |
| **Key agencies in charge** | Anas S.p.A. (Italian government-owned company deputed to the construction and maintenance of Italian motorways and state highways under the control of Italian Ministry of Infrastructure and Transport.) It is owned by Ferrovie dello Stato (100% under MEF) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Data collection/analysis effort; M&E framework focused on maintenance backlog and budgeting; Institutional capacity/ gov; M&E framework focused on maintenance backlog and budgeting; Definition/adoption of standards; Institutional capacity/ governance; Strengthened institutional framework; Regulatory innovations; Earmarking of funding sources for maintenance; Regulation and practices to account for deferred maintenance costs in agencies’ balance sheets; Innovative funding sources for delivering maintenance of public infrastructure; Funding schemes incorporating preparedness to risk; Coordinated allocation of various available sources of funds, including supranational; Solutions improving maintenance planning / lifecycle asset management strategy / risk management; Solution adopting integrated approach; Contractual provisions improving maintenance delivery; Solutions improving maintenance delivery; Adoption/sharing of innovation and new technology for maintenance; Solutions improving maintenance cost management; Resilience or maintenance solution relying on nature-based approaches / green infrastructure; Solutions integrating resilience into infrastructure intervention |
| **Highlights** | With the 2016-2020 planning contract, the biggest change has been achieved in the effectiveness of monitoring, especially of works via information systems, new internal governance processes and better planning. The approach to maintenance have moved from extraordinary spot intervention to a planned approach based on a multi-year horizon. The effort has been reflected also in an increase of dedicated funds over the last few years. |
| **Intended/achieved outcome/s** | Ultimately, ANAS is proceeding to engineering an improved maintenance strategy in which maintenance become a crucial goal. With such re-engineering of the maintenance approach, the performance of the company is improving. |
| **Status & timeline** | With the 2016-2020 planning contract, Anas (which oversees over 30.000 km of roads nationwide plus 2.000 tunnels and 15.000 bridges and viaducts) changed its approach and shifted to a multi-year planning cycle of maintenance - which has taken a central role for the company. The change was prompted also by the transfer under its purview of over 7.000 km of roads previously under regions/provinces /municipalities. The next steps on the agenda are: 1) normative revisions; 2) smart road and digitalization; 3) digital platforms to facilitate where possible predictive maintenance. |
| **Additional References** |  |

| **Info** | **Details** |
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| **Name** | **National Strategy for Life Extension of Infrastructure** |
| **Country** | JPN |
| **Sector/s** | Water-Waste; transportation; social |
| **Sub-sector/s** | dams and hydropower; desalination; waste water collection; waste water treatment; solid waste management; irrigation and agri-business;airports; ports; rail; roads; bridges and tunnels; civic buildings and structures; urban infrastructure |
| **Adminstrative level** | national; city; other |
| **Key agencies in charge** | Ministry of Land, Infrastructures, Transport and Tourism; Cabinet Office |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Definition/adoption of standards;  Regulatory innovations;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance;  Solutions improving maintenance cost management;  Private sector participation in successful delivery of O&M |
| **Highlights** | In 2013, the Inter-Ministerial Coordination Committee for Promotion of Measures Against Aging Infrastructures was established. The committee was chaired by the Cabinet Office and led primarily by MLIT in terms of planning and implementation. Aiming to enhance safety and resilience of infrastructures while controlling long-term public expenditures and fostering business in the maintenance sector, the committee adopted the Basic Plan for Life Extension of Infrastructure, a national level strategy, in 2013. The Basic Plan required every public agency or local government responsible for infrastructure maintenance to review all infrastructure assets under their jurisdiction and create plans for life extension. Line ministries were required to create Action Plans for Life Extension of Infrastructure, and municipalities were required to create Comprehensive Management Plans for Public Facilities, which includes maintenance plans, specification of maintenance measures (i.e. repair, rehabilitation, or reconstruction), investment plans, and implementation schedules. As of October 2020, the majority of eligible entities have created the individual Facility Plans: 1,824 entities (92%) for bridges, 712 entities (100%) for tunnels, and 64 entities (99%) for dams. In 2018, MLIT introduced a new Infrastructure data platform, ‘’National Land and Transport Data Platform." The platform will integrate all the infrastructure inspection data collected throughout the life extension initiative as well as the design data of newly procured infrastructure facilities. The platform is planned to have layers of GIS-based geological database with complete geological core sample data sets at 140,000 locations. Other datasets are linked with the platform, including traffic, climate, and economic activity, to provide a centralized data portal for future maintenance and emergency measures. The platform will offer an Application Programming Interface (API) to allow any user to utilize the database or platform to build their customized applications and services. To encourage private participation in the maintenance business, MLIT supports corporate R&D for new maintenance technologies that enhance life-cycle efficiency of infrastructures. MLIT also encourages a tender system to solicit technical proposals to improve the efficiency and effectiveness of infrastructure maintenance. Successfully implemented technologies are introduced online on the ‘New Technology Information System.’ |
| **Intended/achieved outcome/s** | A survey by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) predicts that about half of all roads, tunnels, river management facilities, and port quays in Japan will be over 50 years old by 2033. Being a disaster-prone country, the Japanese government conducted a nationwide reappraisal of existing infrastructure stock to develop a national strategy for the infrastructure's life extension. |
| **Status & timeline** | All eligible entities are now in the second phase of the five-year inspection cycle from this year. In the first phase, out of 722,942 bridges and 11,215 tunnels, 99.9% and 99.5% was inspected, respectively. The establishment of long-term investment plans for individual facilities is now in progress. MLIT provides technical guidance for rehabilitations to augment the technical capacities of small-scale entities and local governments. MLIT has adopted new inspection manuals for 14 subsectors, including roads, railways, dams, river protections, and housings. It also provides a 50% grant to local governments for large-scale maintenance projects identified in the Facility Plans. |
| **Additional References** | 1. Cabinet Office, Inter-Ministerial Coordination Committee for Promotion of Measures Against Aging Infrastructures, http://www.cas.go.jp/jp/seisaku/infra\_roukyuuka/index.html  2. MLIT, Basic Plan for Life Extension of Infrastructure, https://www.mlit.go.jp/sogoseisaku/sosei\_point\_mn\_000010.html  3. MLIT, Action Plan for Life Extension of Infrastructure, https://www.mlit.go.jp/sogoseisaku/maintenance/03activity/03\_01\_03.html  4. MLIT, Monitoring of the Action Plans for Life Extension of Infrastructure, https://www.mlit.go.jp/sogoseisaku/maintenance/03activity/pdf/202010koudoufu.pdf  5. National Land and Transport Data Platform, https://www5.cao.go.jp/keizai-shimon/kaigi/special/reform/wg6/20191105/pdf/shiryou2.pdf, https://www.mlit-data.jp/platform/ |

| **Info** | **Details** |
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| **Name** | **Fundamental Policy and Guideline for pre-flood emergency reservoir drawdown operational procedure for enhanced flood management** |
| **Country** | JPN |
| **Sector/s** | energy; Water-Waste |
| **Sub-sector/s** | energy generation, dams and hydropower |
| **Adminstrative level** | national; region; city |
| **Key agencies in charge** | Ministry of Land, Infrastructure, Transport and Tourism (MLIT); Japan and Cabinet Secretary of Gov of Japan; Other ministries and agencies related to water uses / hydropower generation through dams reservoirs |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  Institutional capacity/ governance;  Funding schemes incorporating preparedness to risk;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Adoption/sharing of innovation and new technology for maintenance;  Solutions integrating resilience into infrastructure intervention |
| **Highlights** | The reservoir operation including emergency drawdown is conducted in the following manner: i) rainfall forecasting in the catchment, ii) dam inflow simulation using rainfall forecasts, iii) dam operation simulation with targeted reservoir drawdown and inflow forecasts, and iv) determination of emergency drawdown operation and preliminary discharge before floods. For this emergency reservoir operation, the advanced hydrological/meteorological data monitoring and acquisition system and rainfall forecasting capacity is most critical. The numerical weather prediction provided by the JMA includes the Global Spectral Model (GSM), Meso Scale Model (MSM) and ensemble prediction system. The ensemble forecasting uses simulation results based on several initial or boundary conditions and can provide a quantitative range of rainfall forecasts in real time reflecting ongoing meteorological conditions. This allows dam operators for optimal reservoir operation by quantitatively evaluating two risks: i) inadequate drawdown resulting in insufficient control of subsequent high peak flood and ii) excessive drawdown resulting in insufficient recovery of water storage by flood. Moreover, the International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM) has developed a dam inflow prediction system by integrating precipitation forecasting data estimated by an ensemble numerical weather forecasting model and the Water and Energy Budget-based Distributed Hydrological Model with Snow, which can estimate snowfall, snow cover and snowmelt in order to increase the efficiency of water use and the effectiveness of flood control. This system has been applied to two hydropower dams in which the dam inflow was estimated for several flood events in those basins and used to optimize the dam operations in order to reduce ineffective water discharges, increase the efficiency of power generation, and recover the reservoir water volume after floods. |
| **Intended/achieved outcome/s** | This guideline capitalizes on advanced rainfall/flood forecasting systems to inform decision-making processes associated with the management of dam reservoirs and to ensure water draw-down processes reduce flood risks on downstream communities. These guidelines are being applied to all major dams in Japan and across sectors under an integrated river management system guided by the MLIT. The processes are coordinated for each river basin by its river managers under the guidance of the MLIT in coordination with dam owners for water uses and hydropower generation under the guidance of aforementioned sectoral ministries as well as prefectural and municipal governments in charge of disaster management. |
| **Status & timeline** | The Cabinet Secretary of GOJ issued a fundamental policy for enhancing flood control functions of existing dams based on a working group including the Ministry of Land, Infrastructure, Transportation and Tourism (MLIT), Ministry of Economy, Trade and Industry (METI), Ministry of Health, Labor and Welfare (MHLW), Ministry of Agriculture, Forestry and Fisheries (MAFF), Japan Meteorological Agency (JMA), and Agency for Natural Resources and Energy (ANRE) in December 2019. Subsequently, the MLIT issued a guideline for pre-flood emergency reservoir drawdown operational procedures for enhanced flood disaster management applied for single and multipurpose dams including hydropower generation, urban, industrial and irrigation water supply in addition to flood control in April 2020. |
| **Additional References** | https://www.kantei.go.jp/jp/singi/kisondam\_kouzuichousetsu/  https://www.mlit.go.jp/report/press/content/001341537.pdf |

| **Info** | **Details** |
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| **Name** | **Master Plans for Managing Infrastructure (2020~2025, announced May 11, 2020), established according to Article 8 of the Framework Act on Sustainable Infrastructure Management** |
| **Country** | KOR |
| **Sector/s** | energy; Water-Waste; transportation; information and communications; other |
| **Sub-sector/s** | energy transmission; water supply; drinking water distribution; waste water collection; waste water treatment; airports; ports; rail; roads; bridges and tunnels; telecommunications; other sector (damage prevention facilities, e.g. river, reservoir, dam; underground pipelines, e.g. gas, heat transport, oil; underground pipe utilities) |
| **Adminstrative level** | national; region |
| **Key agencies in charge** | Ministry of Land, Infrastructure and Transport (for policy generation); Korea Authority of Land and Infrastructure Safety (to support the MLIT on infrastructure management policy direction and execution) |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Strengthened institutional framework; Coordinated allocation of various available sources of funds, including supranational |
| **Highlights** | This Master Plans for Managing Infrastructure, formulated and implemented by the Ministry of Land, Infrastructure and Transport is established as per Article 8 of the Framework Act on Sustainable Infrastructure Management (Enacted Dec. 2018). The Master Plan functions as a basis of Infrastructure Management Plans, which the supervisory agency formulates and implements for managing infrastructure within its jurisdiction. The Master Plan is a nation-wide policy planning on systematic maintenance and management of infrastructure and improvement of infrastructure performance. Bearing in mind the rapid increase in maintenance cost of aged infrastructure facilities, construction of which were concentrated in the 1970s, through the Master Plan the government expects to provide comprehensive policy direction to infrastructure management.  Main tasks of the 2020~2025 Master Plan consist of four pillars:  (1) establish comprehensive and preemptive maintenance and management governance system  (2) increase level of infrastructure maintenance overseeing and decrease blind spots  (3) establish foundation for ‘smart maintenance and management of infrastructure’ and promote related industries  (4) invest in preventive safety measures for aged infrastructure and diversify investment sources |
| **Intended/achieved outcome/s** | First of all, the Master Plan seeks to establish long term vision for management of infrastructure. The mission of 2020~2025 Master Plan is “establising smart foundation for operation and management of sustainable infrastructure.” As the 2020~2025 Plan is the first formulated master plan since the enactment of the Framework Act on Sustainable Infrastructure Management, it primarily focuses on setting the foundation of infrastructure management governance in order for the system to safely settle down. Meanwhile, an increased investment amount is required to be able to secure the golden time for sustainable infrastructure management. The central government should not only focus on large-scale public facilities, but also render support to building operation and management capacity of local governments and the private sector. Finally, smart maintenance system needs to be introduced to promote related industries. |
| **Status & timeline** | Government of Korea announced the Master Plans for Managing Infrastructure in May 2020 with the purpose of providing new policy vision to manage aging infrastructure assets. Time scope of the Master Plan is from 2020 to 2025. |
| **Additional References** | http://www.molit.go.kr/USR/NEWS/m\_71/dtl.jsp?id=95083872 (Korean) |

| **Info** | **Details** |
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| **Name** | **Seoul Metropolitan City’s Sustainable Infrastructure Management Plan** |
| **Country** | KOR |
| **Sector/s** | Water-Waste; transportation; other |
| **Sub-sector/s** | water supply; other water & waste (Environmental basic infrastructure (sewerage)); rail; roads; other sector (Distribution and supply facilities - heat supply- and Disaster prevention facilities -river maintenance) |
| **Adminstrative level** | city |
| **Key agencies in charge** | Supervision agency: Seoul City (Safety Management Division)  Management agencies: Seoul City (15 departments including Road Management Division), 25 districts of Seoul city (50 departments related to roads and sewerage), affiliated agencies (Seoul Facilities Corporation, Seoul Metro, Seoul Energy) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Tax expenditures allocated to maintenance or rehabilitation purposes;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management |
| **Highlights** | Main tasks of the project are as follows;  (1) Update a ‘Condition Report’ for facilities (bridges, tunnels, water supply and drainage systems) that are 30 year or older and update the information every five years.  (2) Technology advancement is pursued through the use of the latest ICT technology such as big data analysis.  (3) The government will establish a mid to long-term investment plan and invest accordingly to reduce overall life-cycle maintenance costs.  (4) Establish a system of cooperation between the central government, citizens and experts and related organizations to maximize the effects of urban infrastructure maintenance. |
| **Intended/achieved outcome/s** | The purpose of the project is changing the current facility management technique which has focused on ‘short-term maintenance and post management’ to ‘preemptive mid- to long-term response in preparation for the future’.  Specifically, the facility maintenance system, which has been operated independently for each facility will be integrated. Also, a big data database of management details will be established and it will predict the best time for maintenance and reinforcement for each facility based on this data.  This future-predicting model is expected;  (1) to save KRW 193.9 billion every year (KRW 5.8 trillion during 30 years).  (2) to increase an average life span of infrastructure facilities up to 15 years.  (3) to increase an anverage safety performance by 5.6% |
| **Status & timeline** | In 2017 the Seoul Metropolitan Government announced the Sustainable Infrastructure Management Plan ‘the Seoul Infrastructure Next 100-Year Project’ to prepare for the next century in the era of threatened safety and financial difficulties due to the rapid increase of aged city infrastructure.  The milestones since 2017 are as follows;  - The Seoul Metropolitan City Ordinance to promote performance improvement for aged facilities (Enacted Jul. 14, 2016 and abolished May 19, 2020).   - Conducted the research for improvement strategies of a maintenance system (Feb. 2017)   - Establishment of the implementation plan for Seoul Infrastructure Next 100-Year Project (Jul. 11, 2017.)   - Establishment of the implementation plan for the development of an integrated management system for infrastructure big data (Aug. 16, 2016)   - Developed the condition evaluation and the big data analysis system for each facility (Sept. 2018 ~ Dec. 2020)   - Composition of the Seoul Infrastructure Management Committee (Apr. 2019)   - Enforcement of the Framework Act on Sustainable Infrastructure Management (Jan. 1, 2020)   - Enactment of the Framework Ordinance for Seoul Metropolitan City’s Sustainable Infrastructure Management (May 19, 2020)  - Establishment of the Seoul Metropolitan City’s fisrt Infrastructure Management Plan (Jan. 6, 2021)  - Announcement of the standards for minimum maintenance and performance management of the infrastructure (Mar. 25, 2021) |
| **Additional References** | http://opengov.seoul.go.kr/sanction/21985497 (In Korean) |

| **Info** | **Details** |
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| **Name** | **Procurement of innovative circular and modular bridges** |
| **Country** | NLD |
| **Sector/s** | transportation; social; other (sustainability) |
| **Sub-sector/s** | bridges and tunnels; urban mobility; civic buildings and structures; other social infrastructure (specify: Circular infrastructure); other sector (specify Durability, Circular economy) |
| **Adminstrative level** | supranational; national |
| **Key agencies in charge** | Rijkswaterstaat (part of the Dutch Ministry of Infrastructure and Water Management and responsible for the design, construction, management and maintenance of the main infrastructure facilities in the Netherlands) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Definition/adoption of standards; Regulatory innovations; Private sector investments, PPP, etc.; Solution adopting integrated approach; Contractual provisions improving maintenance delivery; Adoption/sharing of innovation and new technology for maintenance; Solutions improving maintenance cost management; Resilience or maintenance solution relying on nature-based approaches / green infrastructure  Solutions integrating resilience into infrastructure intervention |
| **Highlights** | Rijkswaterstaat first needs to co-create and procure innovations full scale and subsequently provide companies the opportunity to market these concepts and solutions further (inter)nationally. This is done by means of an SBIR (Small business innovation request). With this SBIR call, Rijkswaterstaat intends to increase the supply of validated circular solutions and the number of parties that can offer those. Within the object group of bridges and viaducts, Rijkswaterstaat initially focuses on solutions for the object type 'Viaducts' where road traffic of all weight classes is able to pass without hindrance. Rijkswaterstaat intends to start other SBIR calls at a later date aimed at other object groups and object types. Especially relevant in relation to the SBIR call is the fact that Rijkswaterstaat, together with the national Bouwcampus network, initiated an Open Learning Environment Circular Viaducts and Bridges (www. openleeromgeving.nl). In it, 60 participants from the private sector, government bodies and knowledge institutions exchanged knowledge and best practices on the circular (de)construction of viaducts and bridges. The participants looked for depth on different themes:  - Business and Value Case  - Procurement and tendering  - Chain cooperation  - Materials  - Design  - Technology and data  By progressing this way a common picture of what can already be procured in a circular manner was developed, together with innovation/procurement issues that will need to be developed further. In addition, in equal cooperation with two market parties, Rijkswaterstaat realized a prototype of a circular viaduct as a physical structure. Government, the contractor and other stakeholders openly shared their insights on design philosophy, performance, cooperation and the D&C process. |
| **Intended/achieved outcome/s** | The Directorate-General for Public Works and Water Management of the Netherlands (Rijkswaterstaat's) ambition is to be a Launching Customer for sustainability transitions in order to make a maximum contribution to reducing CO2 emissions and material use within its own sphere of influence. Rijkswaterstaat’s aim is to become fully circular and climate neutral by 2030. The aim of this SBIR call is to develop validated solutions for circular viaducts for roads and motorways that can be repeatedly procured and applied in other projects (replacement as well as new construction) by Rijkswaterstaat, as well as in projects by other public and semi-public organizations and/or private parties (inter)nationally. |
| **Status & timeline** | Launched in 2019, Rijkswaterstaat’s aim is to become fully circular and climate neutral by 2030. |
| **Additional References** |  |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Vital Assets (Dutch: “Vitale Assets”)** |
| **Country** | NLD |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; bridges and tunnels; other (locks) |
| **Adminstrative level** | national |
| **Key agencies in charge** | Rijkswaterstaat (part of the Dutch Ministry of Infrastructure and Water Management and responsible for the design, construction, management and maintenance of the main infrastructure facilities in the Netherlands) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Data collection/analysis effort;  Regulatory innovations;  Facilitating “just in time” predictive and cost-conscious maintenance, avoiding network availability breakdown;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance |
| **Highlights** | The “Vital Assets” program was set up to optimize timing of maintenance. By using simple energy sensors, deviations from normal electricity consumption can be detected. Combining this data with other types of data (e.g. temperature, wind or usage) allows Rijkswaterstaat to investigate whether the deviations are normal or not. Abnormal deviations are reported to the asset manager and contractor, who check what kind of maintenance is required. The combination of sensors and big data analysis allows for more precise monitoring of the condition of installations, so that the maintenance interval can be more tailored and even stretched. |
| **Intended/achieved outcome/s** | It allows RWS to keep the installation vital for a longer period of time with small interventions. This not only makes maintenance cheaper, but can also extends the lifespan of the asset. In addition, the reliability of the assets increases. Unexpected malfunctions are limited by intervening early. Objective, real-time data ensures that the technicians are present at the right time to resolve annoying malfunctions. |
| **Status & timeline** | Launched in 2019, it is ongoing. |
| **Additional References** |  |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Singapore Air Traffic Management System Enhancement Project** |
| **Country** | SGP |
| **Sector/s** | transportation; ICT |
| **Sub-sector/s** | airports; information technology |
| **Adminstrative level** | state |
| **Key agencies in charge** | Civil Aviation Authority of Singapore |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Data collection/analysis effort;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery |
| **Highlights** | LORADS III (“Long Range Radar and Display System”) air traffic management system: The high system availability is enforced by maintenance contracts with service level agreements as well as effective spares management and after-sale support services to ensure prompt responses to incidents as well as uninterrupted supply and replacement of equipment. Due to the safety-critical nature of the system, there are continual reviews of the maintenance procedures on configuration and change management, release and deployment management, and business continuity management to ensure high service and process effectiveness. |
| **Intended/achieved outcome/s** | Tapping on past experiences, the project was awarded as a single contract, with combined software development, integration, testing and acceptance, to achieve manpower and cost savings, as well as reduction in software delivery complexity. Improved integrated operational testing was also introduced to increase the effectiveness of the verification and validation of the system. |
| **Status & timeline** | In anticipation of growing air traffic demands, CAAS adopted LORADS III, the third generation air traffic control system, in 2014.  In 2020, Singapore completed the enhancement of our Air Traffic Management System (known as LORADS III) with new capabilities to support new runway operations as well as to provide higher level of safety nets and operational efficiency. |
| **Additional References** | na |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Punggol Digital District** |
| **Country** | SGP |
| **Sector/s** | energy |
| **Sub-sector/s** | energy generation; energy storage; energy distribution; energy efficiency; renewable energy |
| **Adminstrative level** | national |
| **Key agencies in charge** | JTC Corporation; Urban Redevelopment Authority; Economic Development Board; National Environment Agency; Land Transport Authority; Energy Market Authority; etc |
| **Policy macro area/s** | delivery |
| **Policy specific tool/s** | Solution adopting integrated approach |
| **Highlights** | In the search of effective energy and urban solutions for Singapore, the government has increasingly recognised the need for an integrated, system-level approach. Additionally, as part of Singapore’s Smart Nation vision launched in 2014, the use of data analytics, networks, and information and communication technologies can provide opportunities to improve services by utility providers, support energy efficiency, facilitate the adoption of renewable sources, and enable people to lead more sustainable lives.  Under the Singapore Green Plan 2030 (SGP30), which is a national sustainability movement, we aim to establish sustainable towns and districts, push for the adoption of cleaner energy vehicles, and green our infrastructure and buildings. To this end, various Singapore government agencies have worked together to implement several system-level solutions, including the Punggol Digital District, Solar Nova, and Marina Bay’s underground District Cooling System. Punggol Digital District, a residential district located at the northeast of Singapore, is leading the next phase of urban development for Singapore. Punggol is slated to become Singapore’s first smart town, featuring homes with built-in smart sockets and smart distribution boards that enable better monitoring of household energy consumption. This supports Singapore’s target to reduce energy consumption in Housing Development Board towns by 15% by 2030 under the SGP30. |
| **Intended/achieved outcome/s** | Punggol is slated to become Singapore’s first smart town, featuring homes with built-in smart sockets and smart distribution boards that enable better monitoring of household energy consumption. This supports Singapore’s target to reduce energy consumption in Housing Development Board towns by 15% by 2030 under the SGP30.  The Punggol Digital District (PDD) within will feature (i) smart energy grid solutions to integrate energy generation and storage systems, and optimise energy consumption; (ii) a comprehensive network of infrastructure and facilities to support greener mobility options, (iii) an Open Digital Platform that would collect real-time data from the district to roll out solutions such as optimising temperatures in buildings, and (iv) a disrict cooling system that centralises cooling needs, which could lead to lower capital investment and maintenance costs. The PDD is also designed to let industry and academia intermingle through sharing of work spaces and facilities. This physical integration facilitates the cross-fertilisation of ideas and nurtures collaboration in key emerging technologies. |
| **Status & timeline** | The Punggol Digital District is developed by JTC Corporation, in partnership with various government agencies including the Urban Redevelopment Authority, Economic Development Board, National Environment Agency, Land Transport Authority, and in consultation with other agencies such as the Energy Market Authority. On the project timeline, foundation and infrastructure works of the PDD commenced in 2H 2018. The district is expected to be ready from 2023. |
| **Additional References** | https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Urban-Transformations/Punggol-Digital-District |

| **Info** | **Details** |
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| **Name** | **Istanbul seismic risk mitigation and emergency preparedness project (ISMEP)** |
| **Country** | TUR |
| **Sector/s** | ICT; social |
| **Sub-sector/s** | telecommunications; information technology; digital connectivity; other ICT (sremote automation monitoring & control); education; healthcare; tourism and arts; other social infrastructure (public buildings:dormitory, police station, nursing home, children care facility etc.) |
| **Adminstrative level** | city |
| **Key agencies in charge** | MoF; Min Youth Sports; Min. environment; Minister of interior…; Presidency of Strategy and Budget; many Istanbul agencies; IBRD |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Definition/adoption of standards;  Other planning [Strategic Planning via ISMEP Project Appraisal Study];  Innovative funding sources for delivering maintenance of public infrastructure;  Mitigation of disincentives to asset maintenance spending;  Other funding [IFI Loans];  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance; Resilience or maintenance solution relying on nature-based approaches / green infrastructure; |
| **Highlights** | In order to improve the city of Istanbul’s preparedness for a potential earthquake through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans, Istanbul Seismic Risk Mitigation and Emergency Preparedness (ISMEP) Project had been prepared by the Turkish Government. The International Bank for Reconstruction and Development (IBRD) and the Republic of Turkey signed a Loan Agreement in the amount of Euro 310.00 million (US$400.00 million equivalent) on October 18, 2005 for the funding of ISMEP. The agreement became effective on February 3, 2006.  ISMEP Project consists of: (A) Enhancement the effectiveness and capacity of the provincial and municipal public safety organizations in İstanbul to prepare for, respond to and recover from significant emergencies, those arising from earthquakes; (B) Seismic risk mitigation for priority public facilities to ensure their function and to reduce casualties in the event of earthquake through retrofitting of hospitals, schools and other priority public facilities; (C) Enforcement of building codes made in implementation of land use plans to strengthen the institutional and technical capacity of the Metropolitan Municipality and selected district municipalities. |
| **Intended/achieved outcome/s** | The project was found “highly satisfactory” by the World Bank and the financial return of the project with consideration of the financial damage impact in case of a disaster is estimated between 7 to 12 times higher than the project investment cost according to the Economic Impact Analysis Report prepared by Deloitte in 2016. |
| **Status & timeline** | The [IBRD loan] agreement became effective on February 3, 2006. The project is still on progress and to date, through 7 IFIs, the project budget has reached to 2,3 billion EUR and more than 1400 public buildings (inc. healthcare facilities, educational buildings, public buildings etc.) have been retrofitted or reconstructed and became resilient to the disasters. Additionally, the project beneficiary has reached to 3.1 million people in Istanbul. |
| **Additional References** | https://ieg.worldbankgroup.org/news/reducing-risk-disaster-strikes-seven-lessons-turkey  http://testweb.ipkb.gov.tr/downloads/NF.rar |

| **Info** | **Details** |
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| **Name** | **Rosmor PPP** |
| **Country** | RUS |
| **Sector/s** | energy; transportation |
| **Sub-sector/s** | energy storage; ports |
| **Adminstrative level** | federal; region |
| **Key agencies in charge** | Ministry of Transport of the Russian Federation; The Federal Agency for Sea and Inland Water Transport (Rosmorrechflot); Federal State Unitary Enterprise “Rosmorport” |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Institutional capacity/ governance; Tax expenditures allocated to maintenance or rehabilitation purposes; Innovative funding sources for delivering maintenance of public infrastructure; Private sector investments, PPP, etc.; Coordinated allocation of various available sources of funds, including supranational; Contractual provisions improving maintenance delivery; Solutions improving maintenance delivery; Solutions integrating resilience into infrastructure intervention |
| **Highlights** |  |
| **Intended/achieved outcome/s** |  |
| **Status & timeline** |  |
| **Additional References** |  |

| **Info** | **Details** |
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| **Name** | **Eurasia Tunnel: Ventilation Optimization Study** |
| **Country** | TUR |
| **Sector/s** | energy; transportation; other |
| **Sub-sector/s** | energy efficiency; bridges and tunnels; other sector [Environmental Good Practice about Air Quality] |
| **Adminstrative level** | national; city |
| **Key agencies in charge** | Ministry of Environment and Urbanisation, Istanbul Metropolitan Municipality - The Environment Protection Directorate |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Data collection/analysis effort;  Definition/adoption of standards;  Strengthened institutional framework;  Regulatory innovations;  Private sector investments, PPP, etc.;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Private sector participation in successful delivery of O&M |
| **Highlights** | Eurasia Tunnel is two deck, 5 km long road tunnel under İstanbul Strait (Bosphorus). Longitudinal Ventilation is applied in Eurasia Tunnel with jet-fans located through the tunnel and the system is supported with axial fans located in two ventilation stacks at the end of each deck.  - As the 1st stage of the project, Air Quality Monitoring Sensors are implemented in the tunnel before, after and inside of the ventilation stacks to monitor the interior air quality. Sensors are selected to monitor CO, NO, NO2 and Visibility (Particulated Matter) concentration in the air. According to the analysis on gathered data and observations air quality values are determined in correlation with the traffic data. Concentration levels are determined below both PIARC regulations and the design criteria which determines the trigger points for working schedules of the ventilation system. Also exterior air quality monitoring stations are established at the nearest location to the ventilation stacks according to the air quality studies to understand and control possible effect of tunnel on ambient air quality.  - At the 2nd phase, air quality measurements are done in the tunnel to model the air quality and traffic volume relations inside the tunnel with both installed sensors, hand tools and laboratory sample analysis results. According to the monitoring results new trigger points are determined in both air quality and traffic density.  - In the 3rd phase, the effect of different working conditions of the ventilation system (axial fan number and capacity, and jet fan number) on air quality is determined with various tests. Also energy consumption and the efficiency of the fans are determined in different numbers and capacities.  According to the evaluation results of the phases new working schedules are determined which creates an energy consumption saving up to 80% in daily basis compared to the initial design criteria.  - In the 4th phase recently an additional study is held. This study aims to create adaptive working conditions for the ventilation system (especially axial fans) according to the predetermined trigger points. System monitors and checks the air quality monitoring sensor values continuously and determines both working capacity and number of the axial fans according to the measured concentrations. Thanks to this study up to 15% energy consumption saving is done when compared to the fixed operating scenarios in hourly basis. |
| **Intended/achieved outcome/s** | With these improvement studies significant energy efficiency is achieved. Both axial-fans and jet-fans working durations are reduced. Thus lifecycle costs related with heavy maintenance/replacement requirements for the fans and bearings are also reduced significantly. |
| **Status & timeline** | Eurasia Tunnel is commenced to the operation in December 2016. |
| **Additional References** | Hataysal, Ertan & Tabarra, Mohammad & Gun, Badel & Gucuyener, Murat. (2019). Assessment of Tunnel Ventilation Operation in Eurasia Road Tunnel. |

| **Info** | **Details** |
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| **Name** | **Pennsylvania Rapid Bridge Replacement** |
| **Country** | USA |
| **Sector/s** | transportation |
| **Sub-sector/s** | bridges and tunnels |
| **Adminstrative level** | state; region; city |
| **Key agencies in charge** | Pennsylvania Department of Transportation (PennDOT) |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Data collection/analysis effort;  M&E framework focused on maintenance backlog and budgeting;  Definition/adoption of standards;  Institutional capacity/ governance;  Strengthened institutional framework;  Regulatory innovations;  Earmarking of funding sources for maintenance;  Regulation and practices to account for deferred maintenance costs in agencies’ balance sheets;  Innovative funding sources for delivering maintenance of public infrastructure;  Private sector investments, PPP, etc.;  Funding schemes incorporating preparedness to risk;  Mitigation of disincentives to asset maintenance spending;  Private sector equity and debt financing through issuance of Private Activity Bonds;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance;  Solutions improving maintenance cost management;  Resilience or maintenance solution relying on nature-based approaches / green infrastructure;  Solutions integrating resilience into infrastructure intervention;  Private sector participation in successful delivery of O&M |
| **Highlights** | The Pennsylvania Rapid Bridge Replacement Project is replacing 558 structurally deficient bridges in 3 years under a single contract through an availability payment-based public–private=partnership (P3). The bridges are primarily stateowned, smaller spans that are on roads with low traffic volumes in rural areas across the state. |
| **Intended/achieved outcome/s** | The project accelerated the replacement of the bridges with robust, high-quality new structures that will be well maintained and have longer lifespans. By bundling the replacementof over 500 bridges in a single P3 procurement and by applying asset management best practices throughout the 25-year concession period, PennDOT created efficiencies through economies of scale. The bridges have also been designed to minimize environmental impacts and public inconvenience during construction. |
| **Status & timeline** | The consortium was awarded the contract in October 2014. |
| **Additional References** | https://www.penndot.gov/ProjectAndPrograms/p3forpa/pages/rapid-bridge-replacement-project.aspx |

| **Info** | **Details** |
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| **Name** | **The Transform 66 Outside the Beltway** |
| **Country** | USA |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads; urban mobility |
| **Adminstrative level** | national; state; region |
| **Key agencies in charge** | Virginia Department of Transportation (VDOT) |
| **Policy macro area/s** | funding; delivery |
| **Policy specific tool/s** | Innovative funding sources for delivering maintenance of public infrastructure;  Private sector investments, PPP, etc.;  Funding schemes incorporating preparedness to risk;  Mitigation of disincentives to asset maintenance spending;  Coordinated allocation of various available sources of funds, including supranational;  Other;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Contractual provisions improving maintenance delivery;  Solutions improving maintenance delivery;  Adoption/sharing of innovation and new technology for maintenance;  Solutions improving maintenance cost management; |
| **Highlights** | Transform 66 Outside the Beltway: The project is a concession agreement between the Virginia Department of Transportation (VDOT) and Cintra led consortium known as Express Mobility Partners (EMP), a private sector company, to design, build, finance, operate and maintain tolled express lane facility for 50 year period.  “The project requires zero public investment and Virginia’s private partner will provide an upfront payment of approximately $500 million that will be used to fund additional transportation improvements in the corridor. Additionally, the comprehensive agreement requires EMP to pay a net present value of $800 million for transit service in the corridor and $350 million for other projects to improve the I-66 corridor over the next 50 years.” |
| **Intended/achieved outcome/s** | According to VDOT’s public statement, “the project will modify nearly 23 miles of I-66 providing two express lanes alongside three regular lanes from I-495 to Route 29 in Gainesville in each direction, with dedicated express lane access points, and space in the median reserved for future transit. In addition, the project consists of 4,000 park-n-ride spaces, new and expanded bus service throughout the corridor, safety and operational improvements at key interchanges, auxiliary lanes between interchanges, and bicycle and pedestrian upgrades.” |
| **Status & timeline** | In December 2016 VDOT awarded a 50 year concession contract to I-66 Express Mobility Partners to design, build, operate and maintain I-66 from I-495 to Gainesville. |
| **Additional References** | http://outside.transform66.org/about\_the\_project/default.asp |

| **Info** | **Details** |
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| **Name** | **Provincial Roads Maintenance Grant** |
| **Country** | ZAF |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads |
| **Adminstrative level** | region |
| **Key agencies in charge** | National Department of Transport and Provincial Departments of Transport. |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Earmarking of funding sources for maintenance ;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management;  Solution adopting integrated approach;  Contractual provisions improving maintenance delivery |
| **Highlights** | Provincial Roads Maintenance Grant: This supplementary grant that supports the cost of maintaining provincial roads. Provinces are expected to fund the construction of new roads from their own budgets and supplement the cost of maintaining and upgrading existing roads. Grant allocations are determined using a formula based on provincial road networks, road traffic and weather conditions. These factors reflect the varying costs of maintaining road networks in each province. The grant requires provinces to follow best practices for planning, and to use and regularly update road asset management systems. |
| **Intended/achieved outcome/s** | To supplement provincial investments for road infrastructure maintenance (routine, periodic and special maintenance); to ensure that all roads are classified as per the Road Infrastructure Strategic Framework for South Africa and the technical recommendations for highways, and the Road Classification and Access Management guidelines; to implement and maintain road asset management systems; to supplement provincial projects for the repair of roads and bridges damaged by unforeseen incidents including natural disasters; to improve road safety with a special focus on pedestrian safety in rural areas. |
| **Status & timeline** | The Department of Transport and the National Treasury agree that the grant should be used to incentivise improved performance in provincial roads departments and will work together in 2021 to revise the incentive component in time to determine allocations from the R1.7 billion unallocated incentive pool in 2022/23. The total allocation for the Medium-Term Expenditure Framework (MTEF) period is R37.5 billion. |
| **Additional References** | http://www.treasury.gov.za/legislation/bills/2021/[B3%20-%202021]%20(Division%20of%20Revenue).pdf - Division of Revenue. 2021. Explanatory Memorandum. |

| **Info** | **Details** |
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| **Name** | **Optimization of electricity costs for road lightning of federal, regional (inter-municipal) and local importance roads using energy performance contracts** |
| **Country** | RUS |
| **Sector/s** | energy; transportation |
| **Sub-sector/s** | energy efficiency; roads |
| **Adminstrative level** | federal; region; city |
| **Key agencies in charge** | Ministry of Economic Development of the Russian Federation; Ministry of Energy of the Russian Federation; Ministry of Transport of the Russian Federation; Other relevant authorities including regional bodies |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Other pertaining to FUNDING & FINANCING; Solutions improving maintenance planning / lifecycle asset management strategy / risk management; Solutions integrating resilience into infrastructure intervention |
| **Highlights** |  |
| **Intended/achieved outcome/s** |  |
| **Status & timeline** |  |
| **Additional References** |  |

| **Info** | **Details** |
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| **Name** | **Treated Wastewater Use Scheme in Al Hasa Oasis** |
| **Country** | SAU |
| **Sector/s** | Water-Waste |
| **Sub-sector/s** | water supply; waste water collection; solid waste management; irrigation and agri-business |
| **Adminstrative level** | state; region |
| **Key agencies in charge** | Ministry of Environment, Water and Agriculture  Saudi Irrigation Organization |
| **Policy macro area/s** | delivery |
| **Policy specific tool/s** | Solutions improving maintenance planning / lifecycle asset management strategy / risk management; Solutions integrating resilience into infrastructure intervention |
| **Highlights** | The Saud Irrigation Organization (SIO) is a public governmental institution with a mandate to carry out the management, operation and maintenance of irrigation and drainage in the Kingdom. The SIO headquarter is located in AL Hasa Oases which is one of the largest and most famous natural palm oases in the world. The SIO has developed substantial treated wastewater use scheme in Al Hasa Oasis through investing about 2 billion Saudi riyals in treated wastewater use infrastructure and operation system. This cost included the development of pipe water transmission and distribution system and pipeline to transport of treated wastewater from Al Khobar City (160 km pipeline) to Al Hasa with a design capacity of 200,000 m3 per day.  The SIO conducts a daily monitoring of the treated wastewater quality in in-house laboratories. Real-time analyzes are conducted before pumping the water in the irrigation system for levels of free chlorine, turbidity and total sediments as indicators of their quality and extent of their conformity with the specifications,  To encourage farmers to adapt modern irrigation methods and to use the treated wastewater for irrigation, the SIO has taken the following steps:  • Awareness programs for farmers to enlighten them about the importance of modern irrigation and its contribution to delivering actual water needs with minimal losses, thus reducing water consumption and improving productivity  • Providing technical and material support through the institution’s participation in the costs of introducing the modern irrigation system (network, pond and pump) with varying rates according to the area. In addition to providing technical advice regarding network design, implementation and operation method.  • Continuous follow-up and encouragement through workshops and flyers, and allocating a prize to the ideal farmer.  • Buying dates from farmers who apply modern irrigation methods at a higher price (5 riyals / kg instead of 3 riyals / kg for non-applicants).  • Shortening the irrigation period for farmers who switch to modern irrigation methods. |
| **Intended/achieved outcome/s** | The SIO introduced the Supervisory Control and Data Collection System (SCADA) to operate the irrigation system automatically to control the scheduling and distribution of treated wastewater to farms throughout AL Hasa Oases. It became possible to control the distribution of irrigation water through valves (farm exits) distributed in exchange for each farm that opens and closes automatically to provide each farm with its actual need of water at the appropriate time. The length of the irrigation pipeline network is about 1042881 meters spread over an area of about 8,000 hectares, the SCADA system contains more than 1,368 terminal units (RTUs) to collect data and control the exits of 25,470 farms. Control of 528 exit (farm) areas of up to 200 hectares. The SIO provides farmers with treated wastewater for free based on specific irrigation programs and scheduling. The quantities of water used by each farm are monitored and recorded by SCADA control system. the size and magnitude of the treated wastewater use scheme in AL Hasa Oases are unique in size and performance. The integration of effective SCADA control system coupled with in-house water quality monitoring and control system have enhanced the performance and efficiency of treated wastewater use scheme significantly. |
| **Status & timeline** |  |
| **Additional References** | The Saudi Irrigation Organization website : https://www.sio.gov.sa/en |

| **Info** | **Details** |
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| **Name** | **Improve the efficiency of sea water desalination plants in the Kingdom of Saudi Arabia- Shuaiba 1 Plant** |
| **Country** | SAU |
| **Sector/s** | energy; Water-Waste |
| **Sub-sector/s** | energy efficiency; water supply; desalination |
| **Adminstrative level** | national |
| **Key agencies in charge** | Ministry of Environment, Water, and Agriculture (MEWA); Saline Water Conversion Corporation (SWCC) |
| **Policy macro area/s** | planning; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing;  Solutions improving maintenance planning / lifecycle asset management strategy / risk management |
| **Highlights** | The KSA is largest desalinated water producer in the World. Currently desalinated water supplied about 60% of total domestic and industrial water demands in the Kingdom. The Saline Water Conversion Corporation (SWCC) owns the majority of desalination plants in the Kingdom, accounting for 73% of total installed desalination capacity. Furthermore, at present, MSF is the prevalent technology amongst Saudi Arabia’s desalination plants, accounting for 62% of total installed capacity. SWCC and inlight with the country vision 2030 has developed a comprehensive initative to improve the efficiency of assests used in the desalinatin plants. The intiative objectives are:  • Increase energy efficiency;  • Ensure the security and continuous supply of water by providing additional water capacity in accordance with the supply and demand document;  • Optimal use of the assets and resources of the Saline Water Conversion Corporation (SWCC) and;  • Increased environmental commitment.  Shuaiba 1 desalination plant is one of the targeted plant for operation enhancement as part of SECC initiative. The plant is located south of Jeddah in the Western Province of Saudi Arabia in the Red sea. It consists of 5 boilers, 5 turbines, 5 generators and 10 thermal desalination unit MSF. The plant produce 0.263 GW of electricity, and 223,000 m³ of fresh water every day, Currently Shuaiba 1 plant consume 15 MBDOE of liquid fuel oil. SWCC developed a project to convert Shuaiba 1 plant from thermal desalination MSF to SWRO Technology SWRO liquid displacement Technology. |
| **Intended/achieved outcome/s** | The project started in 2021 and is expected to be completed in 2023. The project will:  • Increase water capacity from 223,000 m3/day to 600,000 m3/day that is about 169% increase in capcity;  • Reduce Specific Electrical Consumption from 15.9kwh/m3 to 2.75 kwh/m3;  • Reduce CO2 Emission by 2.30million ton/year that is 100% removal of all CO2 emissions.  • Reduce crude oil fuel consumption from 15 to 3 MBDoe; and  • Reduce OPEX Cost by 55%    This case study proves the significant of the technological advancement in desalination technology and it is potential cost saving and environmental protection values. |
| **Status & timeline** | The project started in 2021 and is expected to be completed in 2023. |
| **Additional References** | Saudi Water Partnership Company website at https://www.swcc.gov.sa |

| **Info** | **Details** |
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| **Name** | **Expanded Public Works Programme Integrated Grant for Municipalities** |
| **Country** | ZAF |
| **Sector/s** | transportation; social |
| **Sub-sector/s** | roads; civic buildings; urban infrastructure |
| **Adminstrative level** | region; city |
| **Key agencies in charge** | Department of Public Works and Infrastructure |
| **Policy macro area/s** | planning; funding; delivery |
| **Policy specific tool/s** | Strategic plan addressing infrastructure assets management / maintenance / repairing; Earmarking of funding sources for maintenance; Solutions improving maintenance planning / lifecycle asset management strategy / risk management; Solution adopting integrated approach; Contractual provisions improving maintenance delivery |
| **Highlights** | This grant promotes the use of labour-intensive methods in delivering municipal infrastructure and services. To determine eligibility for funding, municipalities must have reported performance on the EPWP, including performance in the infrastructure, social and environment and culture sectors and on the full-time equivalent jobs created in these sectors in the last 18 months. A formula then determines allocations on the basis of this performance as well as the labour intensity of the work opportunities created. The number of bands in which labour intensity are recorded in the formula have been expanded from seven to eight, providing an incentive for labour-intense projects to further increase their intensity. The formula is weighted to give larger allocations to rural municipalities. |
| **Intended/achieved outcome/s** | To incentivise municipalities to expand work creation efforts through the use of labour intensive delivery methods in the following identified focus areas, in compliance with the Expanded Public Works Programme (EPWP) guidelines: road maintenance and the maintenance of buildings; low traffic volume roads and rural roads basic services infrastructure, including water and sanitation reticulation (excluding bulk infrastructure); other economic and social infrastructure tourism and cultural industries; waste management; parks and beautification; sustainable land-based livelihoods; social services programmes; community safety programmes. |
| **Status & timeline** | ? |
| **Additional References** | http://www.treasury.gov.za/legislation/bills/2021/[B3%20-%202021]%20(Division%20of%20Revenue).pdf - Division of Revenue. 2021. Explanatory Memorandum. |

| **Info** | **Details** |
| --- | --- |
| **Name** | **Roads to Recovery Program** |
| **Country** | AUS |
| **Sector/s** | transportation |
| **Sub-sector/s** | roads |
| **Adminstrative level** | federal |
| **Key agencies in charge** | Department of Infrastructure, Transport, Regional Development and Communications |
| **Policy macro area/s** | funding |
| **Policy specific tool/s** | other |
| **Highlights** | The Australian Government’s Roads to Recovery Program provides funds to local governments for maintenance of the nation's local road infrastructure asset. Funds can be spent according to local council priorities, empowering local government to undertake road maintenance relevant to their communities. |
| **Intended/achieved outcome/s** | - The Roads to Recovery program improves local roads by funding construction and maintenance projects identified at the local level. These projects facilitate greater access for Australians and improve safety and economic and social outcomes.   - The program operates uniformly across Australia. Under current arrangements, each council is guaranteed a share of the total available funding.   - Councils choose the road projects on which to spend their Roads to Recovery funding based on their own priorities. |
| **Status & timeline** | Roads to Recovery began on 1 January 2001, with funding to 2004-05, and has subsequently been extended several times. |
| **Additional References** | https://investment.infrastructure.gov.au/infrastructure\_investment/roads\_to\_recovery/ |

# Appendix I - Template

# Appendix II - Annotated Glossary

1. The names of agencies have been streamlined to make them comparable [↑](#footnote-ref-1)
2. Namely: CAN-2 - Municipal Asset Management Program, EIB-2 - Metro de Madrid Infrastructure upgrade, KOR-3 - Seoul Metropolitan City’s Sustainable Infrastructure Management Plan, TUR-1 - Istanbul seismic risk mitigation and emergency preparedness project (ISMEP), ZAF-3 - Provincial Roads Maintenance Grant. [↑](#footnote-ref-2)