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# MANAGEMENT OF BRIDGE STOCK

## Børre Stensvold

- Norwegian Public Roads Administration
- Bridge Director
- [borre.stensvold@vegvesen.no](mailto:borre.stensvold@vegvesen.no)



**Statens vegvesen**

# Introduction

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- Bridges are valuable, expensive and vulnerable elements of a country's inventory of transportation infrastructure.
- In addition to inventory data, a Bridge Management System (BMS) provides support for:
  - inspection,
  - maintenance,
  - rehabilitation, and
  - sometimes design.
- BMS is also used to prioritize maintenance and rehabilitation projects and basis for risk-analyzes



# Introduction

- ✓ The purpose of a Bridge Management System is:
  - To ensure that all bridges in a road network remain in service for intended purpose over design life with minimum life cycle cost within limited budgets.
- ✓ Bridge Management System ensures that:
  - Critically defective bridges are discovered and repaired in a timely manner to prevent further deterioration.
- ✓ The topic Management of bridge stock is:
  - An important issue that appears to be continuously adopted in the PIARC committee of road bridges.



# Scope of study

- The working Group gathered information regarding:
  - Quantity and type of bridges being managed
  - Funding of maintenance program and inspection
  - Implementation of Bridge Management System
  - Use of BMS for prioritization.
- The study was performed by an Questionnaire disseminate to PIARC member countries.

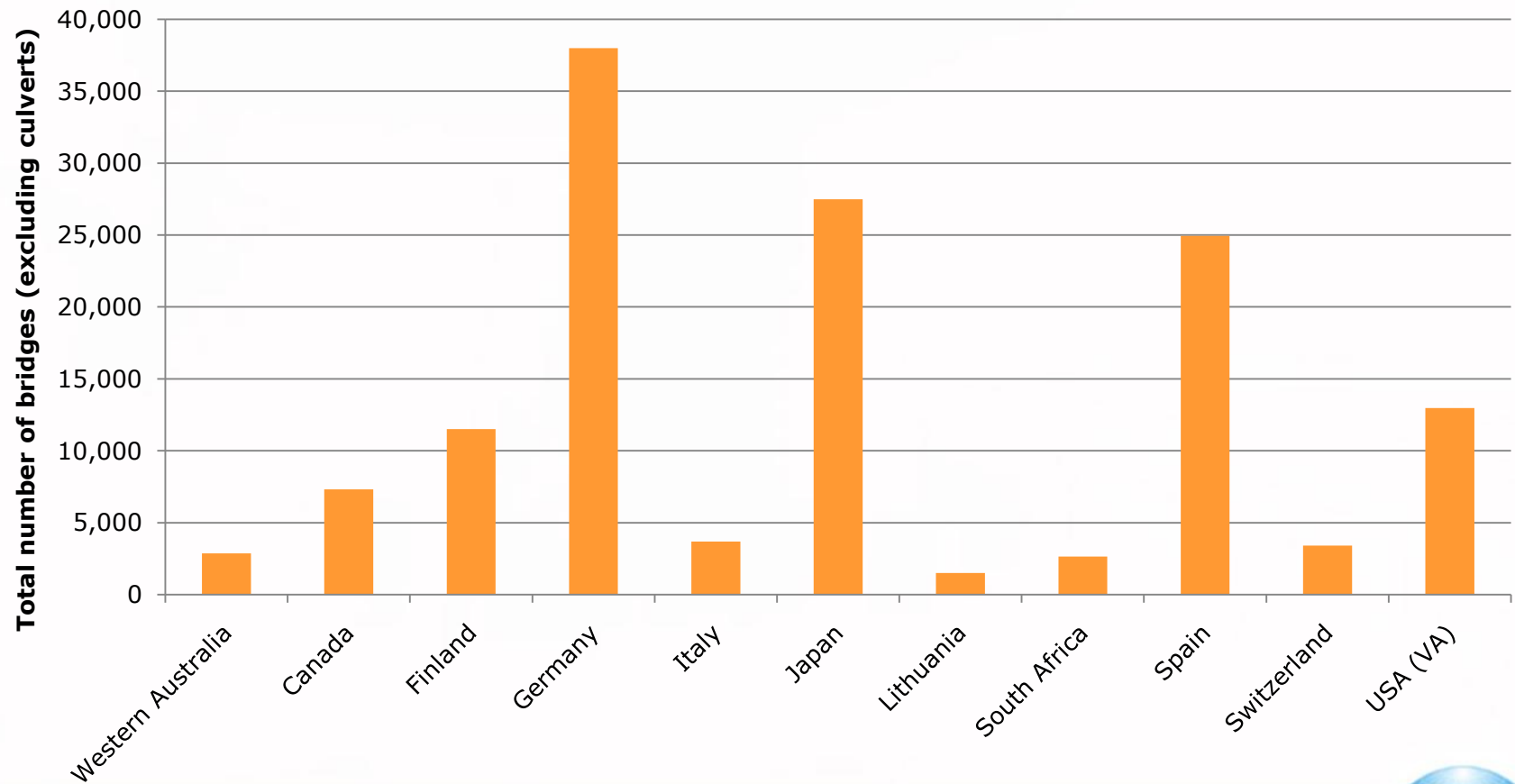


# Quantity and type of bridges being managed

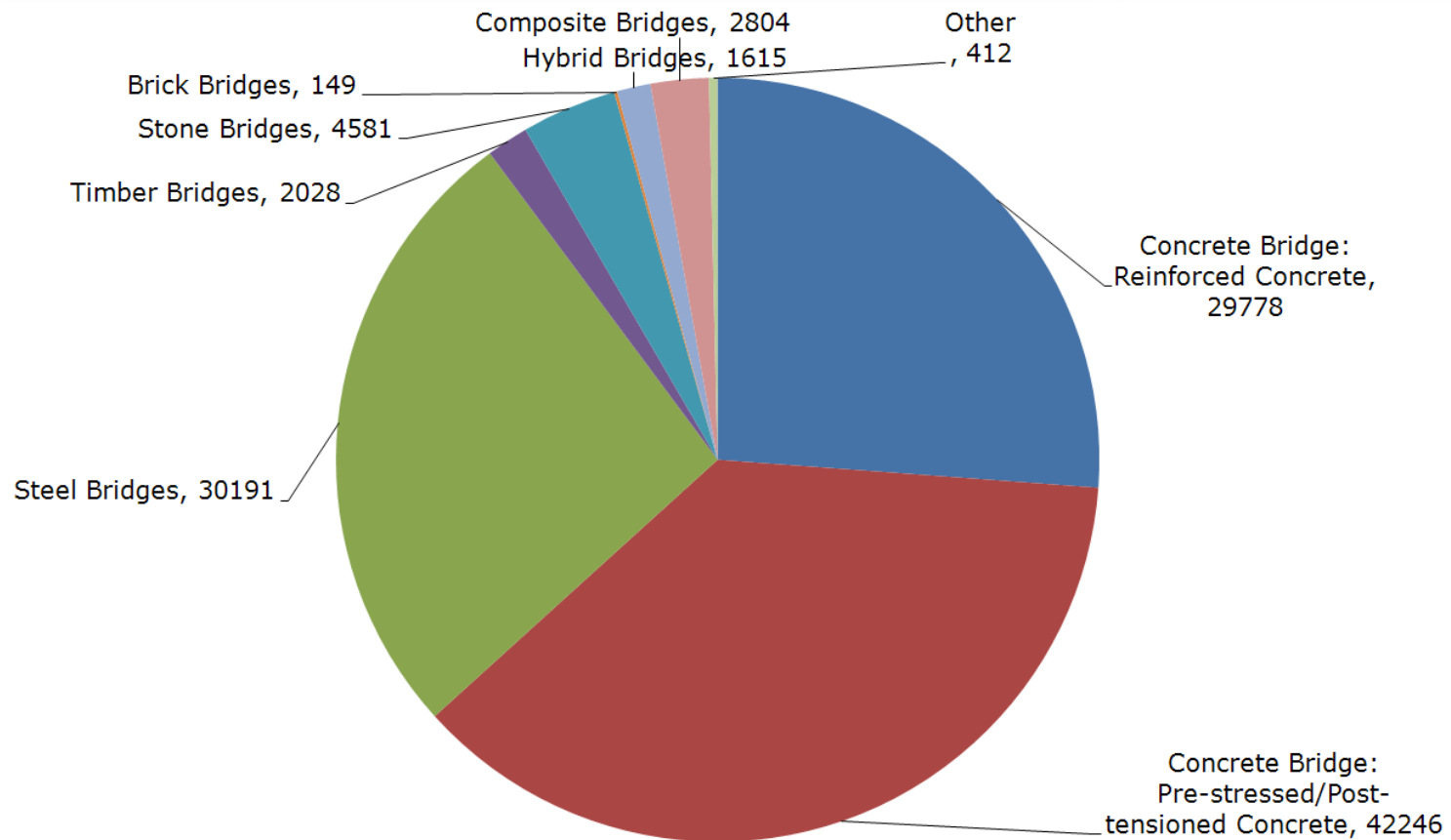
- Signification variations of quantities and types of bridges among respondents.
- Significant geographic differences.
- Different type of concrete bridges most common, followed by steel bridges.
- Average respondent responsible for 8,500 bridges, and a number of approx. 40 % more if culverts are included.



# How many bridges are you responsible for?



# How many bridge types regarding to main material are you responsible for?



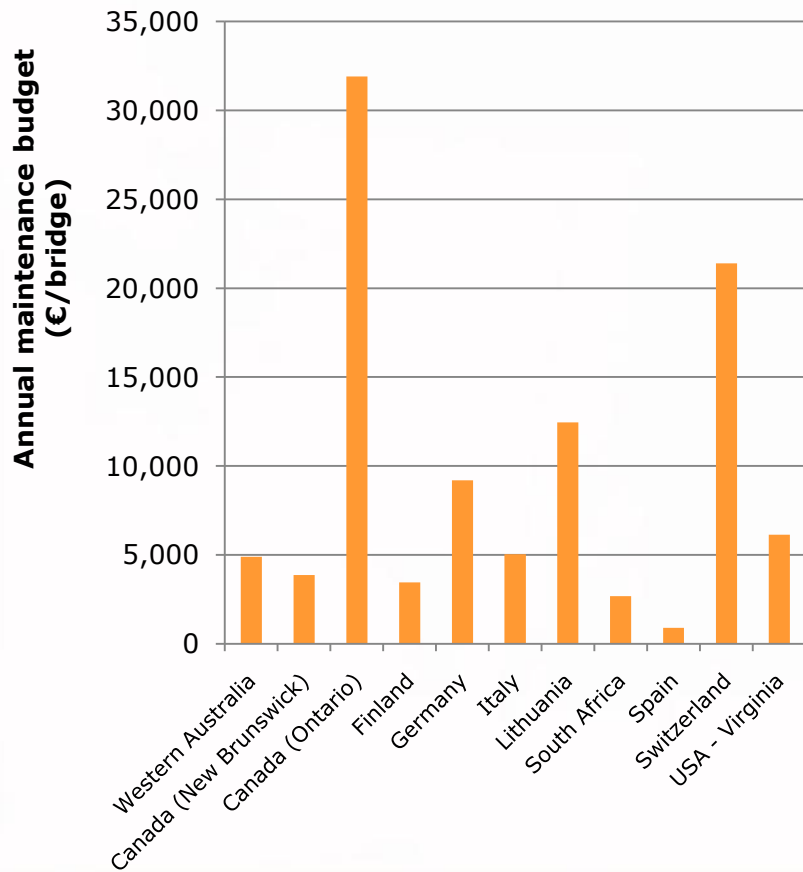
# Funding

- Response bridge stock varied substantially:
  - National highway bridges vs province area bridge.
- Difficult to obtain good overview of funding from survey due to variations within data set.
  - Including routine maintenance, major repair, rehabilitation or perhaps an new construction/replacement.
- Local conditions, bridge types and average bridge size influence the numbers as well as relative cost of inspections and inspection cycles.





# Annual maintenance budget (€ per bridge)



Continental/country median value	Annual Maintenance budget (€ per bridge)
Europe	7,115
North America	6,140
Western Australia	4,895
South Africa	2,674
Japan	NA
<b>Overall median</b>	<b>5,030</b>



# Implementation of BMS

- Of the twelve countries that responded:
  - Nine have implemented a BMS system.
  - Germany and Japan are currently developing a BMS to implement in the near future.
  - Inventory and condition system of Western Australia is complete and working but without fully integrated prioritization.
- For data collecting and updating:
  - Almost equal split between use of internal staff and external use of consultants.



# Implementation:

## How is BMS data captured and updated?

Country	Maintenance		Comment
	Internal	External	
Australia – Western Australia	✱		Data capture is done internally
Canada – New Brunswick	✱		---
Canada – Ontario	✱		Generally consultants are appointed to collect inspection data only
Finland		✱	All regions are responsible to check the data that is collected by consultants
Germany	✱		Data is maintained by the various states and reported to the operation agency of the country
Italy		✱	Two consultants are used to maintain the data
Japan/TMG	✱	✱	Mainly undertaken internally, but on occasions, consultants are used
Japan (Ministry of Land, Infrastructure, Transport and Tourism, MLIT)	✱	✱	Mainly undertaken internally, but on occasions, consultants are used
Japan/NEXCO (concessions)		✱	Various companies
Lithuania	✱		All data is input internally as well as maintenance
South Africa	✱		All data are electronically captured by the consultants appointed, but maintained internally. On privately operated portions of national roads, the concessionaires maintain the data.
Switzerland		✱	Data input is done externally using consultants, but maintained internally
Spain		✱	All data is captured using consultants and also maintained externally
USA – Virginia	✱		Both data capture as well as maintenance is done internally



# Use of BMS for prioritization

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- All of the respondents reported using BMS for assistance in prioritization.
- Respondents also emphasized that engineering judgement cannot be replaced by BMS.



# Conclusions

- ✓ Bridge stock type regarding material:
  - 63% concrete bridges:
    - Reinforced concrete: 26%
    - Prestressed/Post-tensioned concrete: 37%
  - 27% steel bridges
  - 10% other types (Stone, timber, brick, hybrid)
  
- ✓ Bridge stock quantity:
  - Average respondent is responsible for approx. 8,500 bridges
  - Max: Germany (38,000)
  - Min: Lithuania (1,502)



# Conclusions (Cont.)

## ✓ Funding:

- Difficult to get overview due to variations in data set.
- Median annual maintenance budget:
  - 5,030 € per bridge

## ✓ Implementation:

- All countries report either having or developing a BMS.
- Data maintenance, retrieval and update are performed both internally by road administration and externally.

## ✓ Prioritization:

- BMS can be used for assistance in prioritization.
- BMS is not a replacement for engineering judgement.



# Recommendations

- ✓ Bridge Management System (BMS):
  - Each country/ jurisdiction should implement a BMS.
  
- ✓ Effective maintenance of bridge stock:
  - Basic data needs to be captured in an inventory module.
  - System can then be further enhanced to provide:
    - inspection module,
    - maintenance module,
    - priority module, and
    - budget module.



# Recommendations (Cont.)

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- It is always a question about data quality:
  - Quality of the data is paramount to achieving a reasonable output from the system.
  - Data should be supported by regular bridge inspections and continuously updated.
- Developing existing systems:
  - Implementation of a *Risk-Based Management System* can develop and enhance existing methods.





**THANK YOU!**

