



## PIARC – TC 4.4, Task 3

# Approaches to Cost Effective Bridge Management Prioritisation of Bridge Rehabilitation Works

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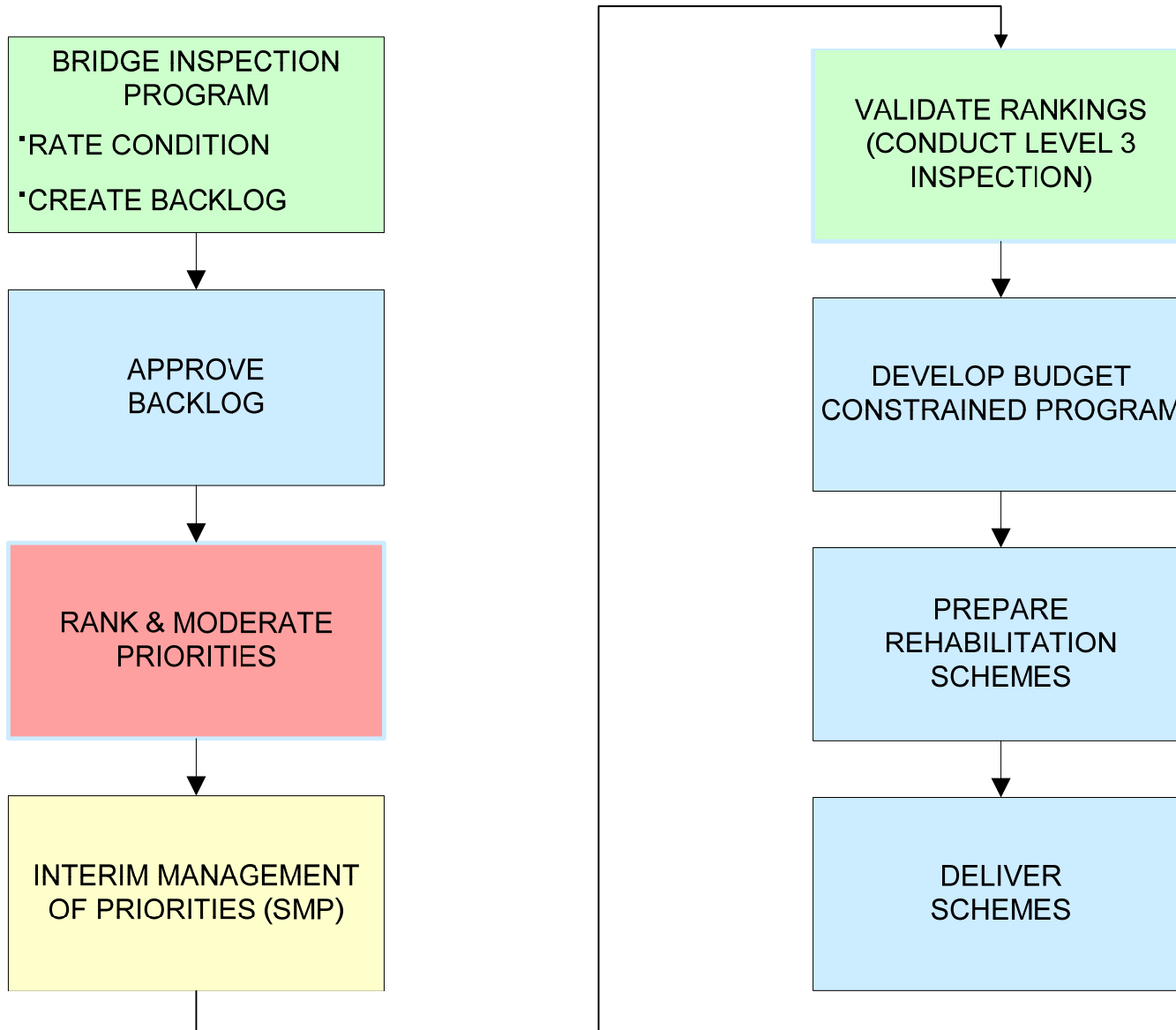


Statens vegvesen

## Task 3 Group Members

- Peter Graham (Chairman) Queensland, Australia
- Susanne Troive Sweden
- Edwin Kruger South Africa
- Malcolm Kerley Virginia US
- Karel Dahinter Czech republic
- Gyula Kolozsi Hungary
- Börre Stensvold Norway
- Nick Malakatas Greece
- Dany Taloc France
- Andrés Torres-Acosta Mexico
- Božo Peraica Croatia

# Project frame of reference





## Task Description

### **Objective:**

To survey the **current practices** in network level **prioritisation** of bridge rehabilitation interventions

### **Focusing on:**

- Bridge performance parameters
- Relative importance of those parameters
- Algorithms that quantify overall structure ratings
- Required minimum data set in a BMS

## Task approach

Initially two questionnaires completed by 12 Task Group members and 10 other TC4.4 members.

### Bridge Management Systems:

- **Background and Overview**
- **Components**
- **Benefits**
- **Required Minimum Data Set in a BMS**

### Prioritisation:

- **Performance Parameters and Weightings**
- **Rating Indices / Algorithms**
- **Rating Methodology**
- **Strategic & Operational Overrides**

# Responses

Questionnaires completed by

→ 12 Task Team members

→ 10 other TC4.4 members.

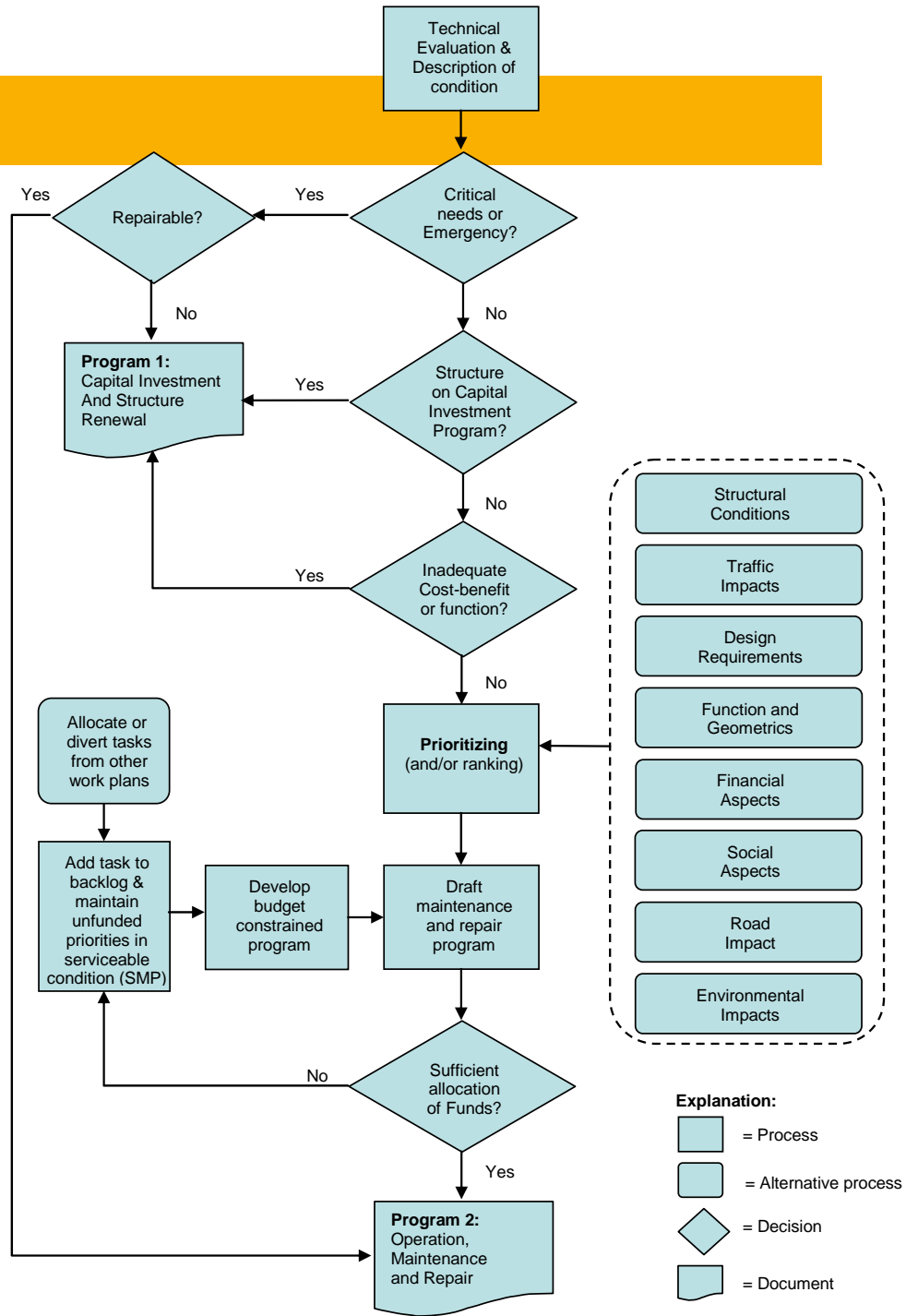
Task Team	Others
Virginia, USA	Denmark
Sweden	Ontario, Canada
France	Autostrade, Italy
Hungary	Poland
Norway	Japan
South Africa	Switzerland
Croatia	Finland
Czech Republic	United Kingdom
Mexico	Spain
NT Australia	Vienna, Austria
WA Australia	
QLD Australia	



## Primary Reporting Objectives

- Prioritisation work flow process
- Common prioritisation factors and relative weightings
- Modification of system derived priorities
- Management processes for unfunded priorities
- Bridge Management System framework required for effective prioritisation

# Prioritisation Process





# Prioritisation Factor Survey

PARAMETER	High	Medium	Low	Score
Structural Conditions	40	15	3	153
Traffic Impacts	7	10	6	47
Design Requirements	12	13	5	43
Bridge Function/Geometrics	4	7	13	39
Financial Aspects	8	3	7	37
Social Aspects	1	5	6	19
Road Impacts	2	4	4	18
Environmental Impacts	0	3	4	10
Sum	70	60	48	366



## Modification of System Derived Priorities

- Initial survey results concerning modification of priorities were insufficient for reporting.
- A supplementary questionnaire was developed and completed by 11 members of the task team.

# Modification of Priorities Survey

Modification Driver	Frequency Rating					
	1	2	3	4	5	Factor
Competing maintenance or operational priorities or strategies	0	3	0	4	2	32
Budget Limitations	0	0	3	2	4	37
Supplementary Funding	1	4	3	1	0	22
Conflicting Local & National strategies Supplementary Funding	2	5	1	1	0	19
Political	1	4	3	1	0	22

## Management of Unfunded Priorities

- Professional & Legal obligation to maintain structures in serviceable condition pending maintenance or replacement.
- May require operational restrictions, detours, increased surveillance or load test.
- Some authorities develop Structure Management Plans for this purpose.

## Survey results

- Bridge Management Systems tend to be developed in-house and vary considerably.
- Commercialised versions tend to be customised by purchasers.
- A generic prioritisation process was identified.
- Condition/defect ratings are the primary means of prioritising works while financial aspects attract only low to moderate ratings.
- Moderation of system derived priorities occurs and is primarily driven by funding limits and project bulking within or across assets.
- Few established mechanisms for the management of unfunded priorities

## Conclusions (1)

- Network analysis essential to identify cost-effective priorities.
- A Bridge Management System will be required for all but smallest networks with modules for inventory, inspection, maintenance management, optimisation and prioritisation.
- The BMS should preferably be integrated with the Road Information Management System (for non-bridge factors).
- The prioritisation process should be underpinned by policies, strategies, accountabilities, methodologies, training programmes and accreditation schemes for data management, inspection and maintenance.

## Conclusions (2)

- Different prioritisation philosophies but condition/defects are most heavily weighted.
- Manual review of automated output conducted that is largely predicated on available funding.
- The relatively low weighting of financial aspects in the prioritisation factors is probably related to the subsequent moderation process.
- Unfunded priorities must be proactively & transparently managed.



## Task status

- Draft report substantially complete.
- One key submission is outstanding and final report cannot be completed until this is received.
- Indicative completion date is November 2007



## Future Work

- Bridge performance measures and relative influence on prioritisation.
- Non-bridge factor influence on prioritisation with particular reference to financial factors.
- Methodology for evaluating bridge needs relative to other infrastructure elements.
- Mappings of condition/defect and treatment options and the relative efficacy of options.
- Deterioration model investigation covering the various deterministic, stochastic and artificial intelligence approaches or combinations thereof.