



# Are structures practical and economical to maintain?

Paper presented by Mahendra Mistry,  
Department of Transport and Main Roads

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## We ask the question "are structures practical"?

To answer the question we need to understand the current practices



With a focus on 3 Regions in Queensland, they are -

1. **Northern (Cairns) Region** - Kuranda Range Upgrade  
Project: canopy bridges over the Palmerston Highway
2. **North Coast (Gympie) Region** - Caloundra Rd Upgrade  
Project: bridging over creeks / riparian zones
3. **North Coast (Bundaberg) Region** - ledges in culverts and installation of fish baffles

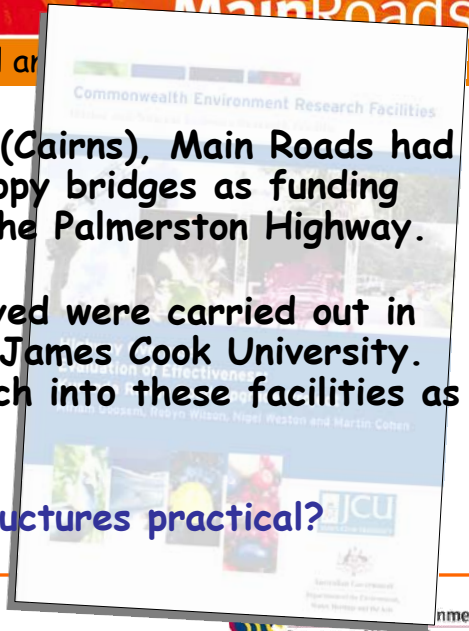


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The Northern Region (Cairns), Main Roads had installed as many canopy bridges as funding would permit across the Palmerston Highway.

The strategies employed were carried out in consultation with the James Cook University. They provided research into these facilities as you will hear later.

Are these structures practical?

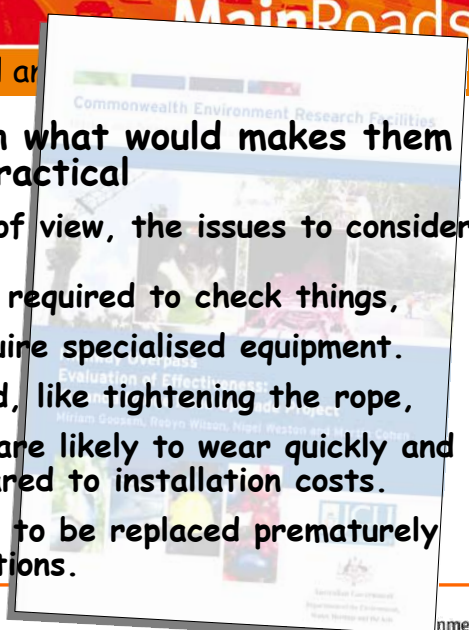


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That would depend on what would makes them impractical

From a maintenance point of view, the issues to consider would be things like:

- Are regular site visits required to check things,
- Is access easy or require specialised equipment.
- Is cyclic work required, like tightening the rope,
- Are there parts that are likely to wear quickly and cost substantial compared to installation costs.
- Is the structure likely to be replaced prematurely due to abnormal conditions.



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## Are structures practical and economical to maintain?

Extracts from "HIGHWAY OVERPASS EVALUATION OF EFFECTIVENESS: KURANDA RANGE ROAD UPGRADE PROJECT"  
Section 2 reported on the 'Erection of Canopy Bridges over the Parlmerton Highway'

During late dry season 2005, arboreal overpasses were sited. 4 rope bridges and 1 tunnel were erected at predetermined distances apart



Figure 2.10 Ergon Energy cherry picker used to thread tunnel into position from electricity pole to tree support. Photos: Birgit Kuehn



Figure 2.11 Tumblers and chains for attachment to pole and wooden supports on trees. Photos: Nigel Weston

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### COSTS

A great deal of personnel time in-kind was donated in the construction and erection of the bridges including Ergon Energy, Main Roads, Environment North Pty, Ltd, James Cook University and other volunteers.

Table 2.1 Costs of Erection and Monitoring of four Canopy Bridges, one Rope Tunnel, and three Rope Ladders

Item	Materials	Labour	Other	Total
Electricity Poles	Slay, screw anchor 3 @ 152.21 Wood pole, 11.0m 1 @ 336.05 Wood pole, 12.5m 2 @ 470.55 50% profit margin 95.32	Free	Free	2,885.10
Labour		Free	Free	
Plant and equipment		Free	Free	
Transport		Free	Free	
Overheads excluding layout		721.57		2,807.27
Ladders using achim silver rope		1,200.00		
12mm steel wire for ladders		2,581.95		
Medium ladder overall length 60m		3,855.00		
Green bow shackles, U shackles, 10mm U		175.20		
Shackles, 10mm, rope, shackles, buckles		1,230.02		14,749.35
Straps, shackles				17,556.62
Total Materials				
Monitoring				
Indicated personnel salary 3/2006 - 3/2007				10,111.04
Indicated personnel travel to site 3/06 - 3/07				17,840.50
CRC personnel monitoring (sponsored by QUMR and CRC)				6,145.44
Total Monitoring				44,157.03

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## WHAT WORKS OR DOESN'T ?

There is a presentation later today on these facilities when you will hear some of the stories that have occurred during the life of this infrastructure.

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Figure 2.15 Three days after Severe Category 4 Cyclone Larry passed almost directly over the Palmerston Highway and the canopy bridges, showing canopy bridges still in place, slight sagging of the rope tunnel, pole shaken in ground and damage next to one of the ladders.  
Photos: S. Goosen

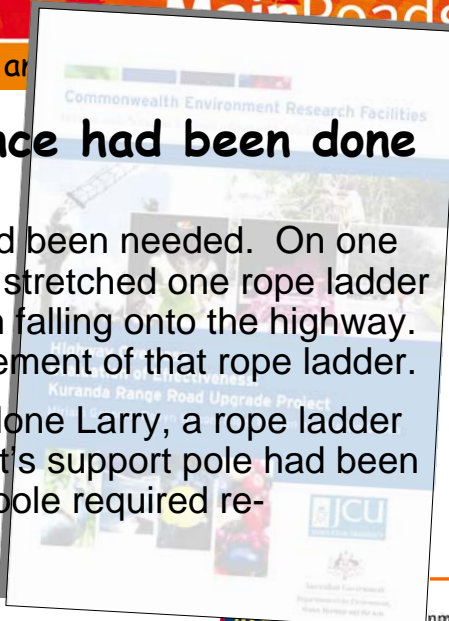
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## What maintenance had been done

- Little maintenance had been needed. On one occasion a fallen tree stretched one rope ladder that held the tree from falling onto the highway. There was the replacement of that rope ladder.
- After the wake of Cyclone Larry, a rope ladder was left sagging and its support pole had been shifted. The support pole required re-establishing.

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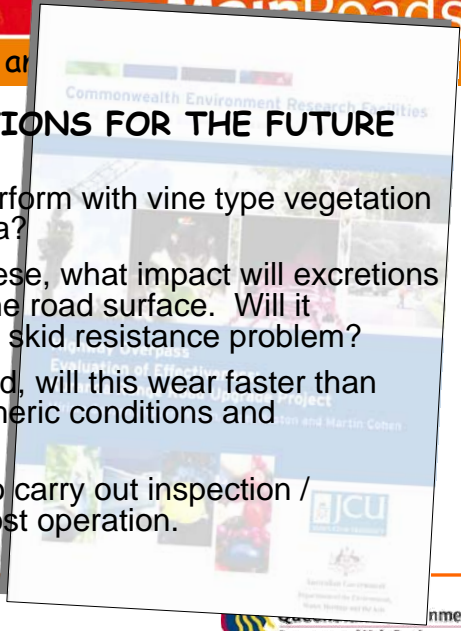
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### OTHER CONSIDERATIONS FOR THE FUTURE

- How will the structure perform with vine type vegetation that may grow in the area?
- Whilst fauna may use these, what impact will excretions have that may drop on the road surface. Will it accumulate and create a skid resistance problem?
- What about the rope used, will this wear faster than expected due to atmospheric conditions and excretions?
- Traffic control required to carry out inspection / maintenance is a high cost operation.



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### Belli Creek Crossing No.3 Flora and Fauna Management Plan

**In the North Coast Region (Gympie), provision for fauna has been introduced over the last few years too.**

**As such, no real information is available on maintenance issues of a long term nature.**

**However, some comments made include:**



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- The period of maintenance after initial construction is vital;
- People involved in such work have often moved on;
- The likelihood of failure is at it's highest, depending on the maintenance needs;
- With riparian zones, these require the most attention;
- A separate contract is used managing the revegetation of riparian areas. This quarantines required funding;
- A specific maintenance management plan is a valuable tool. This can then be incorporated into the maintenance contracts.

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**What are some of the impacts of not maintaining:**

- increased edge effects that may lead to increased weed invasion,
- increased light penetration to aquatic habitats and altered structure of habitats,
- severance of wildlife corridors,
- decline in water quality result of increased erosion,
- changes to the drainage and hydrology characteristics and
- physical disturbance of in-stream habitats – beds, banks and snags;

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**The Wide Bay / Burnett Region (Bundaberg) is similar to those of the other areas already mentioned**

**No real information is available on maintenance issues of a long term nature.**

**Some comments made include:**



- Provisions have been made to existing structure and as such have compromised the hydraulics,
- Where a road has been designated an evacuation route during times of flooding, these provisions have compromised hydraulics of the structure,
- Installed ledges in culverts,
- Installed fish baffles,
- Baffles have become “hiding places” and therefore maintaining them can lead to detrimental effects,
- If a natural creek bed is not maintained, it ‘moves’, therefore is maintenance required in structures?



## What other issues should we be looking at?



- If a natural creek bed is not maintained, it 'moves', therefore is maintenance required in structures?
- If trees are planted in fauna paths, these could fall on them.
- Vandalism is an issue.
- Must take holistic view, that is, design for fauna in area. For example, floppy top fencing is suitable for koalas so do not use for other.



- What would happen if during design, forecasting of maintenance cost was required as part of the whole of costing?
  - They would need to work out what maintenance will be required,
  - How much it would cost,
  - How often maintenance was required,
  - They would need to find out how to carry out the maintenance; that is, what equipment to use and so on,
- Sometimes not maintaining is actually a good thing as it develops a natural habitat,
- Installation of easily maintainable facility is desirable, but how do we achieve this?



Communicate!

Communicate!

Communicate!



### **What changes are recommended -**

Traditionally Main Roads in the rural areas have been more concerned with engineering solutions rather than ecological solutions. Over the last twenty years or so, the awareness is growing and practices changing. We are learning to value the environment more and more.

Society generally is learning more about the natural habitants of the site and therefore the society's expectations are changing.



### **What changes are recommended ...**

As a result Main Roads is having to understand these expectations more. The impact of the infrastructure development is being changed, including site specific requirements for fauna. These include provisions for fauna crossings. With these infrastructure comes the need to maintaining them.

As more facilities are installed, the more we are learning of what works and what does not. There are environmental solutions and engineering solutions. Both need to go hand in hand. Without the other being considered the balances are tipped to one side creating an undesirable solution. Often these are maintenance nightmares, increasing demand on the already scarce funding available.



**What changes are recommended ...**

To improve the provisions, we should be looking at what we are installing and making sure that it will work the way it was intended. Also understand what maintenance will be able to be done with the funding that will be available.

Often getting a designer to do a whole of life costing, including maintenance needs over the design period (annual costs over say 20 years) will often give a better solution. This is because the designer is going to have to think not just about how it will work, but what will go wrong. It is often what is not anticipated that causes a problem.



**What changes are recommended ...**

There comes a point in time that whilst you want to do the right things, the buck stops you. Just like at home.

You have to live within your means. We all know the consequences of this rule being broken, just look at the current world economy.

We should not stop our expectations, because one day we will get the funding to do the things we should be doing. Government's expectations and values do change.



Thank you