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RISK MANAGEMENT OF URBAN STREET TREES

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1. INTRODUCTION

We live in times of rising expectations. What was a luxury yesterday is taken for granted today; and tomorrow is expected to be better than today. Therefore, in terms of risk, what we could get away with yesterday, we can't get away with now. Tomorrow's failure to manage risk will have greater consequences than today's failure to manage it.

When managing risks, five questions arise;

1 what is risk management?
2 where does risk management fit into an organisation?
3 why is risk management important?
4 what are the risks with street trees?
5 how can those risks be managed?

2. WHAT IS RISK MANAGEMENT?

AS/NZS 4360:1995 defines risk management in 1.2 as

> A logical and systematic method of identifying, analysing, assessing, monitoring and communicating risks associated with any activity, function or process in a way that will enable organisations to minimise losses and maximise opportunities.

Risk is defined as

> "The chance of something happening that will have an impact on objectives. It is measured in terms of consequences and likelihood".

The objectives for street trees are to:

- Perform their intended function;
- Remain safe at all times.

In terms of consequences and likelihood, table 1 provides a qualitative risk analysis matrix, taken from Table D3 in AS/NZS 4360:1995, noting how risks can be categorised.

Table 1 Risk assessment matrix to determine a risk event level

LIKELIHOOD	CONSEQUENCE				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
A (almost certain)	S	S	H	H	H
B (likely)	M	S	S	H	H
C (moderate)	L	M	S	H	H
D (unlikely)	L	L	M	S	H
E (rare)	L	L	M	S	S

H = High risk; S = Significant risk; M = Moderate risk; L = Low risk

According to the Standard, the main elements of risk management are to:

- ESTABLISH CRITERIA against which risk will be assessed;
- IDENTIFY what, why, and how risks can arise for further analysis;
- ANALYSE risks in terms of controls, likelihood, and consequences;
- ASSESS and PRIORITISE risks, compare the level of risk against the risk criteria;
- TREAT RISKS, accept low risk, develop and implement plans for others;
- MONITOR and REVIEW the system, making necessary changes;
- remember the process is ITERATIVE and requires records to be kept.

Conclusion One: If councils are not conducting any of these tasks, or only some of them, can they claim to be managing risk?

According to Helliwell (1990), the combined effect of condition and location determine likely risk from a tree and he cautions assessors

> "not to be unduly swayed by pressure to retain them against his or her better judgement".

In terms of risk likelihood, Helliwell (1990) provided for the British insurance industry a suggestion that a 150-year-old tree has a 1:10 risk of limb loss in one year. He (Helliwell, 1990, pp. 159-161). proposed a risk frequency for falling branches causing serious injury or death as follows:

- **very high risk**, e.g. overhanging a busy road 1:2
- **high risk**, e.g. overhanging a well-used park 1:10
- **moderate risk**, e.g. overhanging a minor road 1:100
- **low risk**, e.g. in a large private garden 1:1 000
- **very low risk**, e.g. in remote woodland 1:10 000.

Conclusion Two: If councils are not setting risk management standards and guidelines, and *publicising* them, can they claim to be managing risk?

3. WHERE DOES RISK MANAGEMENT FIT IN AN ORGANISATION?

Nowadays government agencies and all major organisations are required to manage their assets. For example, an asset may be

- buildings
- roads
- parks or reserves
- adventure play areas
- street trees

In South Australia, Division 4. Management Plans; Section 196 (3) of the Local Government Act 1999, councils are required to

> "prepare and adopt a management plan or plans for its community land that must:
>
> (a) identify the land;
> (b) state the purpose for which council holds the land;
> (c) state the council's objectives;
> (d) state performance targets and how the council proposes to measure its performance against its objectives and performance targets".

Council's may need to state the purpose and objectives for holding its trees; say what performance it expects from them; and measure how they perform against targets set for them. Thus there are risks of non-compliance with this legislation, in not having statements that define the purpose and performance of street trees.

The South Australian Government has also adopted Australian Accounting Standards 27, requiring councils to record, map and value all their Assets. As a consequence, trees need to be treated as assets; be recorded; and be valued and managed.

Conclusion Three: If councils are not complying with the Local Government Act or Australian Accounting Standards 27, where trees are concerned, they have not understood street tree management, nor the concept of tree risk management.

4. WHY IS RISK MANAGEMENT IMPORTANT?

One reason for managing trees and the risks associated with them is to comply with the above requirements. Another is for further legal reasons, for instance the Occupational Health, Safety and Welfare Act (South Australia), 1986, provides for owners, occupiers and designers to ensure that appropriate steps are taken to identify all *reasonably foreseeable* hazards that may affect persons at the workplace. General provisions allow a person to move conveniently and safely about, and to have reasonable access to any workplace or workplace amenity. This legislation covers members of the public against risks to health or safety.

Conclusion Four: If councils are not aware of legislation relating to trees, especially street trees, they are probably not complying with it, and may be at risk.

5. WHAT ARE THE RISKS WITH STREET TREES?

There are many risks or potential risks associated with street trees. In organisational terms, risks may be:

- procedural
- legal
- operational
- situational

Procedural risks include not having a Tree Management Plan, which has:

- policies, strategies and criteria
- definitions
- a database, backed by up-to-date reporting
- a process for review

Without this, a Council may be exposed to a failure to discover how many trees need to be managed, a failure to discover how many Significant trees need to be protected, and a failure to discover how many hazardous trees need to be treated

When a sample of Australian councils were asked if they had a Tree Management Policy, 57% of the 28 responding councils did; 39% (11 councils) did not, and one council did not reply. Of those without a tree policy, only one had no plans to draw one up.

Conclusion Five: Councils without a Tree Management Plan, have no process by which all trees, the good, the average and the bad, can be managed? If they have no database that can highlight matters of risk, the hypothesis is that they cannot manage an unknown quantity.

Legal risks may include consequences of:

- physical damage
- personal injury
- nuisance
- encroachment
- non-compliance with regulations under several acts

Council may be exposed to these risks by a failure to act prudently or exercise a proper duty of care, a failure to keep adequate records, and a failure to deal with risk once pointed out, causing costly litigation.

As an example of tree-related risk, table 3 shows a limited survey of seven countries:

Table 3

COUNTRY	MAIN CAUSE OF PERSONAL INJURY	MAIN CAUSE OF PROPERTY DAMAGE
Australia	Disrupted paving	Storm damage
New Zealand	Storm damage	Limb fall
United States	Disrupted paving	Limb fall
United Kingdom	Limb fall	Disrupted paving
Germany	Disrupted paving	Storm damage
South Africa	Storm damage	Storm damage
France	Disrupted paving	Storm damage

To overcome the risk potentials above, Australia needs to manage disrupted paving and storm damage better.

Operational risks may include:

- failure to conduct tree regular audits
- failure to deal with audit findings
- inappropriate tree management techniques
- failure to respond to ratepayer notification
- failure to make-good physical damage from trees
- inappropriate planting conditions
- inappropriate or inadequate establishment techniques
- inadequate summer irrigation
- failure to appreciate risk
- failure to identify hazardous trees
- failure to remove hazardous trees or tree parts soon enough

In terms of hazardous trees, table 4 asked what councils' percentage of hazardous trees were, in a limited survey of seven countries:

Table 4

Country	Percentage hazardous trees
Australia	Range between 0.1%, 20%, 50% to 75%
New Zealand	**Range between 0.3 % to 10 % but mainly under 1%**
United States	Range between 10% to 90%, with an average around 12%
United Kingdom	Range between 1 and 3%
Germany	Range between 0.4 to 1%
South Africa	Sole figure of 5%
France	Sole figure of 20%

Three observations occur; firstly the range is far too big for risk control; secondly, 20% and 50% returns are extremely and unacceptably high; thirdly, there is probably no definition of the term "hazard" in the policy document. Note that a council with 20 000 trees with 10% of them at risk, has 2 000 dangerous trees. What is a responsible safety goal? Is it 1% (200 trees), is it 0.1% (20 trees) or 0.01% (2 trees)?

Conclusion Six: If councils do not have a policy document defining matters such a "hazardous trees or hazardous conditions" how can they claim to be managing risk, when it has not been identified?

A second risk management query asked for the most favoured pruning technique.
Table 5 shows their replies.

Table 5

MOST FAVOURED TECHNIQUE/COUNTRY	AUS	NZ	USA	UK	GER	SA	FRA
Remove 1 co-dominant stem		**1**					**1**
Cabling and bracing		**2**	**1**				
Crown lifting	**2**		**2**		**2**	**2**	
Whole limb removal	**1**					**1**	**2**
Included bark removal				**2**			
Dead-wooding					**1**		

It is worth asking how far crown-lifting and whole limb removal deal with the highest risks expressed in Australia, namely disrupted paving and storm damage? Do the treatments match the complaints?

Situational risks may include:

- tree canopy amongst power lines (very high risk)
- tree canopy overhanging roads (very high risk)
- trees causing property damage (very high risk)
- trees encroaching someone else's land (high risk)
- fast-growing trees (high risk)
- brittle-limbed trees (high risk)
- trees obscuring sight-lines (high risk)
- trees about to do any of the above (high – moderate)
- trees causing a nuisance (high – moderate)
- trees with nuisance properties or characteristics (moderate risk)

- short-lived trees (moderate risk)
- trees obscuring traffic signs (moderate risk)
- trees obscuring a right of way (moderate risk)

A 1991 survey of 20 United States cities found that the average life of a downtown tree is a mere 13 years (Skiera & Moll, 1992). The survey points to an urban setting that provides more stress factors for trees to cope with than a rural one. Sample findings from the Skiera & Moll survey were:

- increased urban tree mortality;
- average street tree lives for 13 years;
- half of the tree spaces were empty;
- 45% of cities had no maintenance program;
- public concern for trees is at an all-time high;
- people see trees as an indicator of community quality;
- ALL surveyed cities had tree damages claims pending.

However (Bassuk, 1999), claims that, in the United States, urban trees surrounded by pavement live on average for only 7 years. Bassuk found that the same species growing in verges have an average life of 32 years, while the same species growing "in a more hospitable setting" have a *safe useful life expectancy* of 60-200 years.

City trees have a considerable asset value, yet it appears that they are not well managed. British researchers examined tree performances from 11 cities in the north of England in 1983 (Gilbertson & Bradshaw, 1985). Their results found that:

- inner city trees were limited to a few species (lacking species diversity);
- all showed poor growth (having a poor appearance);
- there was a vast range in performance (inconsistent results);
- 10% of all trees were dead (10% of costs wasted);
- tree guards, so often used for protection, caused 12% of tree deaths;
- compaction by machine and bitumen or concrete surfaces impede infiltration and reduce soil moisture and aeration and are prime causes of tree death (Gilbertson & Bradshaw, 1985:pp.132-141). Bracketed comments belong to the study.

These, and other reasons, enabled Gilbertson & Bradshaw to conclude that death rates for urban trees were unacceptably high; and that growth rates were too low. This feedback suggests that managers should upgrade field practices and increase the establishment of healthy trees in order to reduce the likelihood of failures later on.

Condition audits are needed to manage risk in living things and to monitor their progress and decline. This process must be iterative, say 1-5-yearly, so that changes can be recorded and compared with an extending level of risk. Both present and future condition lead to a risk analysis for the tree and for its effect on its surroundings.

Tree performance records provide a good basis for future species selection, because analysis can discriminate between better and poorer performers. Poor performers need not be replanted, while good performers are sought after and may be candidates for genetic improvement.

Conclusion Seven: A wide range of evidence now covers risks to street trees throughout their lifetime. Councils owning street trees with "very high" to "moderate" risks, cannot claim to be managing risk.

6. HOW CAN RISKS BE MANAGED?

Risk is managed by a process that first advises managers to establish the risks to or from a tree, by setting out the criteria against which risk will be assessed.

The next step is to identify what, why, and how risks can arise. A tree owner is expected to foresee likely risks and to forestall them by strategies or actions. Once risks have been identified, they need to be analysed in terms of controls, likelihood and consequences. Likely risk events seem should be assessed and prioritised, then compared, to rate their level of risk against the risk criteria. From this level of risk management preparation, the manager should develop and implement plans for the major and moderate risks, eliminate or reduce their severity, accepting low-level risks, until they become a first priority.

The University of Ulster collected the following data from UK Councils:

No accurate tree records	54%
All trees	4%
Street trees	49%
Park trees	15%
Open space trees	10%
Public housing trees	12%
School trees	4%
Cemetery trees	7%
Council with a computerised tree inventory	50%
Council without a computerised tree inventory	50%
Increased mortality of newly planted trees	24%
Decreased mortality of newly planted trees	27%
About the same	49%

To avoid risk, there are two aspects of trees that need to be managed,

1. their performance
2. their safety

Table 7 shows some risks from trees:

Table 7 State Emergency Service Storm damage data 1995-99

RISK EVENT/YEAR	95/96	96/97	97/98	98/99 APR	TOTAL
Tree down on driveway	23	8	55	19	105
Tree down	63	41	216	57	377
Tree down on road	82	57	223	110	472
Tree down on house	50	10	152	38	250
Tree down on cars	11	6	21	13	51
Tree down on fence	23	7	65	24	119
Tree down on power lines	8	12	110	22	152
Tree down on carport	9	5	42	17	73
Tree down on footpath	3	5	17	15	40
Total	**272**	**151**	**901**	**315**	**1639**

Risk is best avoided by establishing a risk management system containing

- a list of risk sources TO trees
- a list of risk sources FROM trees

Conclusion Eight: If councils do not have a Tree Management Plan, involving record keeping, how will risks be identified, analysed, prioritised and treated? If councils are not doing these things, can they claim to be managing risk?

Summary

There is sufficient evidence from researchers and court proceedings to show that risk management should be taken seriously and be a standard process in corporate affairs.