Accident Compensation Corporation

Review of the Economic and Social Costs of Drowning Fatalities and Water-related Injuries Compared to Prevention

October 2009

PricewaterhouseCoopers

PRICEWATERHOUSECOOPERS

PricewaterhouseCoopers
113-119 The Terrace
PO Box 243
Wellington, New Zealand
Telephone +64 4 462 7000
Facsimile +64 4 462 7001

Richard Greenwood
Manager – Drowning Prevention Strategy
Accident Compensation Corporation
81-83 Molesworth Street
PO Box 242
WELLINGTON

23 October 2009

Suzanne Snively
Partner
E mail: Suzanne.snively@nz.pwc.com
Telephone: +64 4 462 7451
Mobile: +64 21 925 689
Fax: +64 4 462 0245

Margaret Roberts
Director
E mail: Margaret.p.roberts@nz.pwc.com
Telephone: +64 4 462 7004
Mobile: +64 27 476 4148
Fax: +64 4 462 0245

Dear Richard

Review of the Economic and Social Costs of Drowning and Water-related Injuries Compared to Prevention

We are pleased to present our final report setting out our findings and conclusions in relation to the economic and social costs of drowning and water-related injuries compared to prevention.

Consistent with our agreement dated August 2008 governing our work in relation to the review, we draw your attention to the key terms of business and restrictions at Appendix C.

We have really enjoyed working within the sector and wish to thank all those that have supported this review and provided information to us, particularly the members of the Drowning Prevention Council.

Yours sincerely
PricewaterhouseCoopers

Suzanne Snively
Partner
Advisory

Margaret Roberts
Director
Advisory

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Glossary

ACC	Accident Compensation Corporation
BC Ratio	Benefit Cost Ratio – a way of relating costs to benefits
CBA	Cost Benefit Analysis – a systematic process for identifying or assessing all (direct and indirect) costs and benefits of an activity. Given the current data, a starting point for an economic impact study relates to identified services where the cost and benefits can be most easily measured.
Deprivation Index	The average level of deprivation of people living in an area at a particular point in time. Levels of deprivation are ranked into 10 groups. Dep 1 is least deprived, Dep 10 is most deprived.
Direct impacts	The changes in economic activity through the first round of funding. This involves the impacts on the water safety entities themselves.
DPC	The New Zealand Drowning Prevention Council
DPS	The New Zealand Drowning Prevention Strategy
Economic Impact	Economic impact relates to how the existence of an activity (in this case, drowning prevention) influences changes in the wider economy.
Existence Value	Existence value is the value the people place on the existence of a resource, even when they have no intention of directly accessing the resource themselves.
HC	Human Capital
Indirect impacts	The changes in sales, income, or employment in backward-linked industries supplying goods and services to the water safety sector. For example, the increased sales in fuel resulting from more rescue activity are an indirect effect.
Induced economic impact	The increased sales from household spending of the income earned in the water safety sector and supporting the water safety sector. Employees in water safety and supporting industries spend the income they earn on housing, utilities, groceries and other consumer goods and services. This generates sales, income and employment through the economy.

Input/output table	Input/output tables represent the flows of economic activity between sectors over a given year and are calibrated nationally and regionally. An input/output table is calibrated based on the purchase value of what each business or sector uses from every other sector in order to produce a dollar's worth of goods or services. Flows of economic activity are associated with any change in spending and may be traced either forward (e.g., spending generates employee wages, which induces further spending) or backward (e.g., increased use leads to the purchase additional inputs -- utilities, additions to the collection etc.).
IPRU	Injury Prevention Research Unit
MNZ	Maritime New Zealand
Multipliers	Multipliers for the water safety sector may be derived from an input-output model that includes its net economic contribution. Multipliers measure the monetary contribution of an industry or sector above and beyond its direct value add.
NFP	Not-For-Profit – refers to an organisation set up for purposes other than earning a profit.
NGO	Non-government organisation that provides services to the public on a not-for-profit bases.
Non-Monetized Impact	Aspects of drowning prevention that either make no contribution to economic activity or where it is impossible to derive a monetized value.
NPV	Net Present Value. A calculation to provide comparison of future values with current values.
NZASPM	New Zealand Association Swimming Pool Managers
NZIPRA	New Zealand Institute of Park and Recreation Administration
NZIPS	New Zealand Injury Prevention Strategy
NZRA	New Zealand Recreation Association
NZSAR	New Zealand Search and Rescue
PRE	Public Reserve Equipment
RANZ	Recreation Association of New Zealand

SAR	Search and Rescue
SLSNZ	Surf Life Saving New Zealand
SPARC	Sport and Recreation New Zealand. A government Crown Entity that funds programmes that generate participation in physical activity and high performance sport.
System of National Accounts (SNA)	This is the framework applied internationally to measure a country's output, its gross national product (GNP) and its gross domestic product (GDP). The framework includes the input/output matrix that identifies the value of the resources used by each industry and the resources each industry contributes to others. Everything measured by the SNA is converted to annual dollar amounts.
Value chain	The inter-linkages between the different steps/resources employed in the creation of a product from raw materials to the customer.
VOSL	Value of a statistical life
WAI	WaterSafe Auckland Incorporated
WSNZ	Water Safety New Zealand
WTP	Willingness to pay – a measure of an activity, good or service.

Executive Summary

- The Government developed the Drowning Prevention Strategy (DPS) in August 2005 with the aim of a 'water safe New Zealand free from drowning'.

- This report analyses the potential impact of a selection of specific initiatives for drowning prevention (DPS initiatives) estimating the rate of return on investment.

- This report was commissioned by ACC to provide a review of the economic and social costs of drowning and water-related injuries compared with the cost of prevention.

- The review provides a cost benefit analysis of proposed water safety sector initiatives as part of the implementation of the DPS.

- The success of the DPS initiatives is premised on the assumption that the current levels of service provision by the water safety sector are maintained through sustainable base funding.

Context

- Extending over ten degrees of latitude New Zealand is an island nation with more than 11,000 kilometres of coastline, lakes and numerous fast flowing rivers.

- With 1.6 million visitors in 2008, the Ministry of Tourism has identified; beaches, scenic boat cruise and lakes as three of our top four most popular nature-based actives to be undertaken by international tourists.

- With over 3 million domestic visitors going to our beaches and 1.5 million fishing in our waters, the aquatic environment is also one of the most important sites for leisure and recreation for Kiwis (Ministry of Tourism, 2008).

  Studies by Sport and Recreation New Zealand (SPARC) show that over a third of New Zealand's population identifying swimming as an activity in which they participated in 2008; whilst a quarter identified fishing.

- Claiming 537 lives over the last five years, this diverse environment is as deadly as it is dramatic (WSNZ, 2009). Preventing this toll from being any higher is largely thanks 33 non-government organisations, 17,000 volunteers and at least 100 paid staff who contribute to the water safety sector.

- The ability of the water safety sector to continue its present level of activity is contingent on a sustainable funding base which the economic downturn has threatened.

Findings and Conclusions

- It is estimated, by the water safety sector, that over 1,200 fatalities are avoided each year through their rescue activities alone.

- Over 1,500 people are rescued from the sea each year. A further 1,400 people receive first aid from lifeguards on the nation's beaches.

- The groups more at risk of drowning include males, children under 5 years, and Māori and Pacific people.

- Water-related injuries have more than doubled over the last six years, a trend in contrast to drowning fatalities. Males, 0-4 year olds and Europeans are the most at-risk demographics.

- The economic value of the water safety sector's current work in preventing drowning fatalities is estimated to be $4.28 billion per year.

- In addition, the water safety sector is found to generate around 460 jobs through the sector's impact on the economy. These jobs have

an estimated value-add to the economy of $35 million and contribute $18 million to household incomes.

- The water safety sector estimates that 17,000 volunteers and 35,000 members contribute to water safety services [Beath 2007]. Informed sources say the number of hours contributed by volunteers to the water safety sector averages between one hour and ten hours per week. Depending on assumptions about the average number of hours volunteers work, their contribution is estimated to be equal to between 425 and 4,250 full-time employees.

- The value of the contribution of volunteers is estimated to range between $0.28 and $3.65 for every dollar the sector is currently funded. In total, this equates to a contribution from volunteers equal to between $11 million and $146 million per annum.

- The annual costs per annum that are associated with the water safety sector are in the order of $40 million.

- Current funding from government sources, including the Lottery Fund and other Crown funding, is $8.2 million.

- On a five year rolling average, the number of drowning fatalities that occur in New Zealand is currently 106 (2004-2009). This represents 2.6 drowning fatalities per 100,000 people.

- New Zealand has around double the rate of drowning fatalities per person years than America, Australia and the United Kingdom.

- A realistic estimate of further lives that could be saved by implementing sector initiatives proposed as part of the DPS over the next seven years is 85. By 2015, it is estimated these initiatives will save 20 lives per annum. This equates to a reduction of around 20 percent on present numbers of drowning fatalities.

- The annual costs of these DPS initiatives are estimated to range between $1.2 million and $3.25 million, over the seven year period (2009 – 2015), with the greatest cost in the first year of implementation.

- Benefits relating to drowning prevention are significantly greater than those expected to accrue from injury prevention. Drowning prevention attributes approximately 92 percent of the discounted total value of benefits.

- The reduction in water-related fatalities and injuries, arising from these DPS initiatives, is estimated to provide net benefits to New Zealand of between $9.0 million in the first year of implementation to $72.7 million in 2015.

- The initiatives themselves will create additional jobs and add an estimated $12 million in benefits, on their own account, to the New Zealand economy over the implementation period.

- The estimate of the net present value of the DPS initiatives is $213 million, with a benefit cost ratio estimated to be 23. This means that for every dollar invested, there is a return of $23.

- More conservative expectations of benefits resulting from the DPS initiatives renders a benefit cost ratio of 9, a return of $9 for every dollar invested.

- Funding of the water safety sector is provided on a year to year basis, predominantly from sources that provide one-off funding, rather than guaranteed or committed on-going funding. This limits the implementation of longer term strategic initiatives.

- The water safety sector requires additional investment to enable the effective implementation of the DPS. This study confirms and values the benefits of the strategy to be realised.

1 Introduction

Key Points

- The purpose of this report is to provide a review of the economic and social costs of drowning and water-related injuries compared with the cost of prevention.
- The review provides a cost benefit analysis of proposed water safety sector initiatives as part of the implementation of the Drowning Prevention Strategy.
- The cost of injuries to the New Zealand economy was estimated to be between $6 and $7 billion in 2001 [ACC, 2003]. This knowledge motivated the implementation of a nationwide injury prevention strategy, the New Zealand Injury Prevention Strategy (NZIPS).
- The Drowning Prevention Strategy (DPS) addresses one of the six areas that are targeted by the NZIPS.
- It is essential to provide adequate funding to the water safety sector to enable achievement of the reduction is drowning fatalities per annum.

Purpose of the Review

The purpose of this review is to provide an assessment of the economic and social costs of drowning and water-related injuries and compare these with the costs of prevention. The review also examines the economic value created by the water safety sector.

The current activities of the water safety sector are essential to underpinning the reduction in drowning fatalities per annum, and it is important to ensure that funding is available for these and planned activities.

Scope of the Review

The review addresses the demand for water safety in New Zealand and overseas, the nature of water safety incidents and the resultant issues facing the industry. The demand for water safety is defined by the numbers of drowning fatalities and water-related injuries, and the need to respond to this.

The supply of water safety services in New Zealand to meet this demand is described, including the key organisations, sector funding characteristics and the costs and benefits associated with injury and prevention. The review discusses the DPS's key sector initiatives and the associated costs and benefits.

Review Approach

The approach to the review involved:

- examining the literature available in New Zealand and overseas on the economic and social costs of drowning and water-related injury;
- interviewing key players in the water safety sector in New Zealand and overseas;
- undertaking research of available data in regard to water safety and funding models in New Zealand and overseas; and
- investigating documented models that estimated the value of a life and/or willingness to pay.

The review approach did not include a separate process to estimate the value of a life saved specifically from drowning. For this purpose, the review has used the already published estimate developed by the Ministry of Transport and recognised by Treasury.

Context

Extending over ten degrees of latitude, New Zealand is an island nation with more than 11,000 kilometres of coastline, lakes and numerous fast flowing rivers.

Natural attractions are widely regarded as New Zealand's key drawcard for international visitors. With 1.6 million visitors in 2008, the Ministry of Tourism has identified; beaches, scenic boat cruise and lakes as three of our top four most popular nature-based actives to be undertaken by international tourists.

With over 3 million domestic visitors going to our beaches and 1.5 million fishing in our waters (Ministry of Tourism, 2008), the aquatic environment is also one of the most important sites for leisure and recreation for Kiwis. Studies by Sport and Recreation New Zealand (SPARC) show that over a third of New Zealand's population identifying swimming as an activity they participated in 2008; whilst a quarter identified fishing.

Claiming 537 lives over the last five years, this diverse environment is as deadly as it is dramatic (WSNZ, 2009). Preventing this toll from being any higher is largely thanks to 33 non-government organisations, 17,000 volunteers and 100 paid staff who contribute to the water safety sector.

The assessment of economic and social costs of drowning and their prevention is conducted in the context of two key initiatives:

- the New Zealand Injury Prevention Strategy (NZIPS); and
- the Drowning Prevention Strategy (DPS).

The New Zealand Injury Prevention Strategy (NZIPS)

The New Zealand Injury Prevention Strategy (NZIPS) was established in 2003 in consultation with individuals and non-government organisations. The impetus for NZIPS was the significant rates of injuries and fatalities that occurred in New Zealand at the time. Injuries in New Zealand accounted for about 1600 deaths and 42,000 hospitalisations per year.

A series of cabinet papers published the results of analysis that estimated the cost of injury at between $6-7 billion per annum [ACC, 2003].

The NZIPS outlines a commitment to working with organisations to improve the country's injury prevention performance. It focuses on actions to improve the infrastructure that supports injury prevention activity in New Zealand, as well as the development of national strategies to address specific national injury prevention priority areas.

The broad structure of NZIPS includes a set of principles, vision, goals, objectives and actions. The ultimate vision is a 'safe New Zealand, becoming injury free.'

NZIPS acknowledges some important benefits through death and injury prevention:

- continued quality of life, ongoing participation in work, leisure and education, preservation of income and assets for individuals;
- reduced disruption to operations, increased productivity, retention of valued staff and reduced levies for businesses; and
- less demand on the healthcare system for the wider community.

NZIPS identifies deficiencies in the current injury prevention efforts which include:

- fragmentation of effort;
- gaps in injury prevention activity;
- workforce capability issues; and
- quality and access to information.

NZIPS looks to address these deficiencies by providing a framework for policy development and service delivery activities to support government agencies and other non-government organisations with an involvement in injury prevention.

Six national injury prevention priority areas were identified. These are:

- motor vehicle traffic crashes;
- suicide and deliberate self-harm;
- falls;
- workplace injuries (including occupational diseases);
- assault; and
- drowning and water-related injury.

Together, these areas account for at least 80 percent of deaths caused by injury and serious injuries in New Zealand. Of the $412 million of government funding that was allocated to the NZIPS, a substantive proportion was allocated to road safety initiatives. Motor vehicle accidents made up over 28 percent of the total number of deaths caused by injury in New Zealand.

The Drowning Prevention Strategy (DPS)

Drowning accounted for over 8 percent of deaths caused by injury in New Zealand with a five year rolling average of around 130 drowning fatalities per annum. New Zealand's rate of drowning per capita was, and still is, more than double that of the United States, Australia and the United Kingdom.

In order to address drowning and water-related injury, the Drowning Prevention Strategy (DPS) was developed.

This initiative involved key organisations in the water safety sector and was part of the wider NZIPS, and was led by ACC. ACC collaborated closely with the water safety sector and released the DPS in 2005.

The DPS has the aim of making New Zealand a place 'free from drowning' through:

- effective leadership by both the government and the water safety sector; and
- the provision of exceptional water safety services.

In order to achieve these goals, the strategy provides a framework to guide the work of the people and organisations that have an interest in, or are responsible for, drowning prevention and water safety.

It should be noted that the DPS is not designed to cover drowning within the workplace, drowning from suicides or drowning from motor vehicle accidents. These are considered to be more effectively covered under the other injury prevention strategies.

Three broad phases were planned to ensure the DPS's successful implementation:

- Phase One: Establishment of the DPS support framework (2005-2006);
- Phase Two: Full implementation of the DPS (2007-2011);
- Phase Three: Consolidation and looking to the future (2011-2015).

This review assesses the potential impact of the implementation of initiatives that support the goals of the DPS.

This review is based on the assumption that the current level of activity of the water safety sector will be maintained through a sustained funding base.

Overview of the Report

This Introduction (Chapter One) outlines the purpose, approach, context and background to the review.

Chapter Two describes the demand for water safety in New Zealand and overseas where relevant. The Chapter discusses the incidence of drowning by age, ethnicity, location and gender.

Chapter Three describes the supply of water safety services in New Zealand and gives an overview of the key players in the sector and the funding of the sector.

Chapter Four discusses the issues facing the water safety sector.

Chapter Five discusses the sector's current business and the associated forecasts.

Chapter Six discusses the cost of drowning and water-related injury over the past five years, 2004 – 2008.

Chapter Seven describes the quantitative and qualitative economic benefits the sector currently provides to New Zealand. This is a contextual basis for putting the baseline calculation in context.

Chapters Eight and Nine outline the proposed sector initiatives to progress the DPS and the associated cost benefit analysis.

Finally, Chapter Ten summarises the report findings and our conclusions.

2 Demand for Water Safety

Key Points

- Initiatives to prevent drowning in the past have been shown to be effective and sustainable.
- New Zealand drowning rates demonstrate a statistically significant decline for the past 20 years. The lowest number of drowning fatalities was recorded in 2006.
- The implementation of the drowning prevention strategy has the potential to further reduce drowning fatalities.
- There are certain groups which are more at risk of drowning. These groups include:
  - males;
  - children under five; and
  - Māori and Pacific peoples.

Introduction

The assessment of the social and economic costs of drowning and water-related injuries, with the costs of preventative activities, are usefully informed through understanding the demand for water safety. The demand for water safety is defined by the numbers of drowning fatalities and water-related injuries, and the need to respond to this.

The challenges facing the water safety sector in meeting this demand are discussed.

This section of the report analyses drowning fatalities and water-related injuries in New Zealand from the perspectives of location, age, gender, ethnicity and activity.

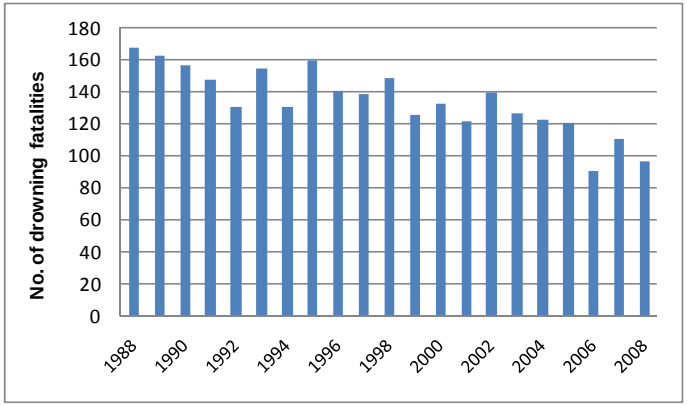
Numbers of Drowning Fatalities in New Zealand

The level of drowning has continued a statistically significant decline in New Zealand over the last 20 years[1]. The low point over this time period was reached in 2006, when there were 91 drowning fatalities (see Figure 1).

The recent upward movement is consistent with concerns that have been expressed in recent years by water safety organisations. The water safety sector has expected an increase in drowning fatalities, given current levels of funding and initiatives.

The New Zealand incidence of drowning is 2.6 per 100,000 people, based on the five year rolling average to 2008. New Zealand has double the rate found in the United States, Australia and the United Kingdom.

Figure 1: Total drowning fatalities in New Zealand, 1998 - 2008



Source: Drownbase 2008, Water Safety New Zealand

[1] rejecting a test for a flat slope with a p–value of .00003

The need for a drowning focussed strategy

The levels of drowning and water-related injuries in New Zealand are of concern. Despite the efforts of the water safety sector to reduce drowning, New Zealand still has significant room to improve, both in comparative and absolute terms. This situation has been met with the response of the Drowning Prevention Strategy.

The DPS addresses approximately 77 percent of drowning fatalities associated with recreational activities, immersion incidents and other non work-related activities[2].

Along with the DPS, four other NZIPS priority areas may also have preventative effects for drowning and water-related injury. These are strategies related to motor vehicle accidents, suicide, work related injuries and falls.

Similarly, Ministry of Health campaigns targeting alcohol and drug abuse may also have a positive impact on reducing the incidence of drowning.

These strategies cover the remaining 23 percent of drowning fatalities per annum.

Understanding the Problem

Drowning Fatalities

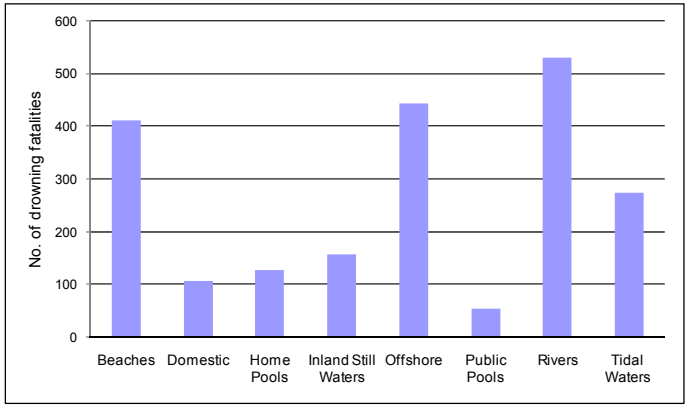
A key source of information on drowning fatalities in New Zealand is Water Safety New Zealand's (WSNZ) 'DrownbaseTM'. WSNZ's data can be broken down by location, age, gender and ethnicity. Recreational drowning fatalities can be further divided by activity type. This information is summarised on the following pages.

Accident Scene

Drowning fatalities in New Zealand occur at a number of accident scenes. The majority of drowning fatalities over the last 20 years have occurred at rivers (25 percent), off shore (21 percent) and beaches (20 percent), as shown in Figure 2.

The lowest numbers of drowning fatalities have occurred at public pools (3 percent) and in domestic areas (5 percent).

Figure 2: New Zealand drowning fatalities by location 1998-2003

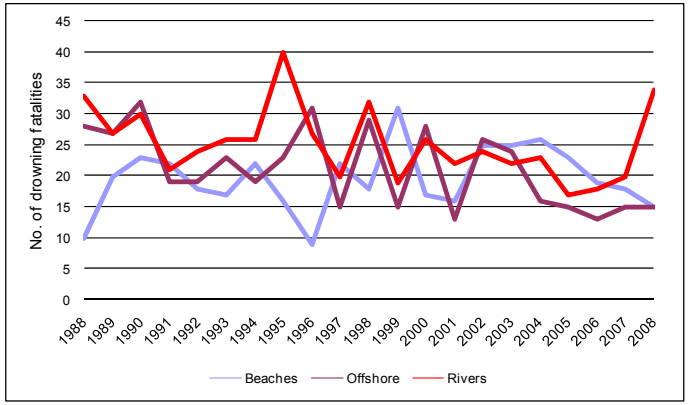


Source: Drownbase 2008, Water Safety New Zealand

The variation in the incidence of drowning fatalities in different locations makes it difficult to forecast where people drown, as shown in Figure 3.

[2] 5 year rolling average 2004 - 2008

Figure 3: New Zealand trend in drowning fatalities by the three main accident scenes



Source: Drownbase 2008, Water Safety New Zealand

Gender

Over the last 20 years, 82 percent of drowning fatalities have been male (Figure 4). This over-representation has been consistent over each of the years and is also statistically significant, as shown by Figure 5. This is also consistent with results from overseas [McDonald et al., 2002].

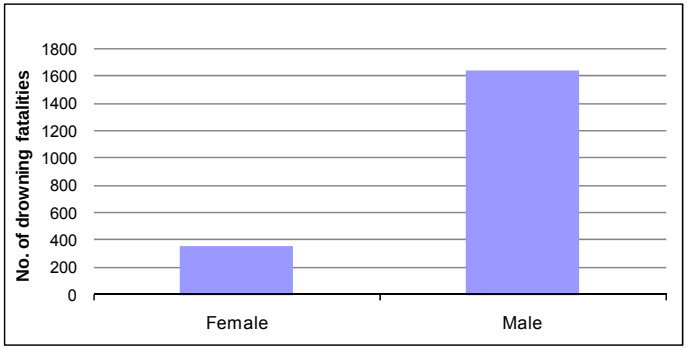
A 2006 New Zealand study, based on survey findings, examined the factors contributing to the higher proportion of male than female drowning fatalities [McCool, J., Moran, K. & Ameratunga, S., 2006].

When compared with females:

- men have greater exposure to aquatic environments;
- young men, in particular, are more apt to take risks in aquatic settings;
- men are less likely to perceive a dangerous situation around swimming;
- men are more likely to overestimate their swimming ability; and
- men are more likely to drink alcohol before swimming.

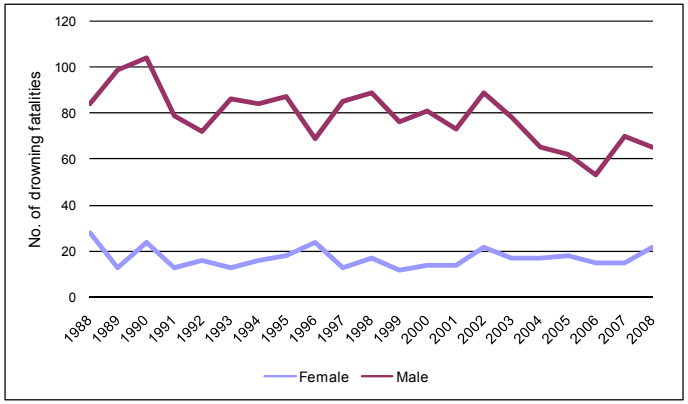
In essence, it is the susceptibility of males to risky behaviour that explains the considerable difference between genders in drowning rates seen in Figure 4.

Figure 4: New Zealand drowning fatalities by gender 1988-2008



Source: Drownbase 2008, Water Safety New Zealand

Figure 5: New Zealand trend in drowning fatalities by gender



Source: Drownbase 2008, Water Safety New Zealand

Age

Historically, the greatest numbers of drowning fatalities are aged between 15 and 24 (18 percent, Figure 6).

This can be linked directly to the explanations given above for gender, with respect to risk taking. Not only are males more susceptible to risk taking, but it is males in this age group which are particularly risk loving.

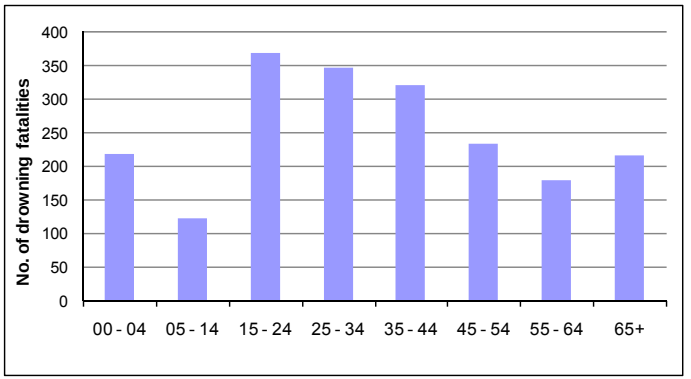
Howland et al [1996] go on to state that "testosterone may…contribute to the peak male drowning rates during the late teen and early adult years" [p96]. It is also known that during these years there are significant changes occurring in different parts of the brain. These changes do not occur at the same rate resulting in a decreased ability to inhibit impulsive and risk taking behaviour [Bandura, 2001; Geidd, 2008, McAnarney, 2008].

Turning to other age groups, 25-34 year olds (17 percent) and 35-44 year olds (16 percent) are the next most at-risk age groups.

The fewest number of drowning fatalities are aged between 5-14 years old, accounting for only 6 percent of all drowning fatalities.

This pattern has been consistent over the past 20 years in New Zealand and is similar to international patterns of those that drown.

Figure 6: The number of New Zealand drowning fatalities by age group 1988-2008

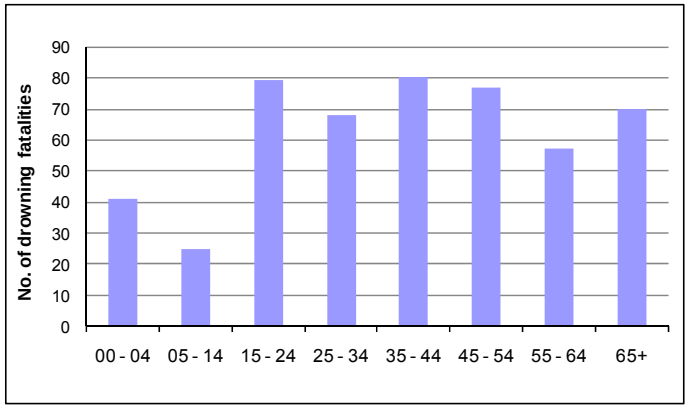


Source: Drownbase 2008, Water Safety New Zealand

Over the period 2003 to 2008, the number of drowning fatalities per age group has appeared to even out, with over 65 year olds becoming more prominent (Figure 7).

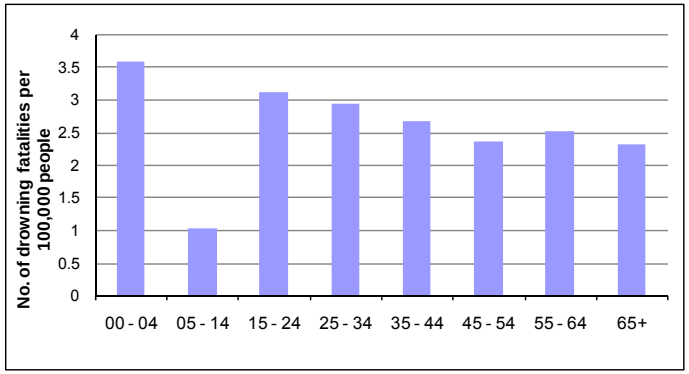
Part of this is due to a demographic shift in the population. Another possible factor could be the increasing popularity of moving to a beach or lake side property to retire and increased participation of over 65 year olds in aquatic recreational activities [Claridge, 2008].

Figure 7: The number of New Zealand drowning fatalities by age 2003-2008



Source: Drownbase 2008, Water Safety New Zealand

Figure 8: New Zealand drowning fatalities per 100,000 people by age 1988-2008



Source: Drownbase 2008, Water Safety New Zealand

When the proportion of the population is taken into account, it is under 5 year olds (18 percent) who are the most at-risk age group, followed by 15-24 year olds (15 percent) as seen in Figure 8.

There has been a considerable amount of literature on infant deaths through drowning. The most common site of drowning for children less than five years old is in the bath [McDonald et al., 2002].

In addition to baths, children under five have also drowned in buckets and at other domestic sites, such as garden ponds and home pools.

Domestic areas are one of the least at-risk locations for drowning in New Zealand. Those who do drown at home are almost exclusively under 5 year olds.

This is attributed to the inquisitive nature of a young child, as well as the lack of ability to attract attention when help is required [McDonald et al., 2002].

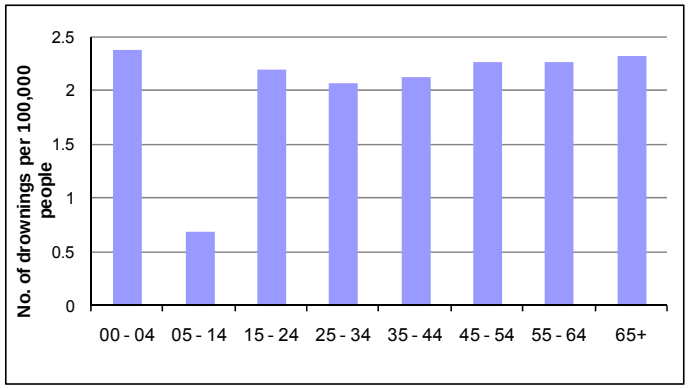
The susceptibility of children to drowning in the home environment was recognised in the development of the Fencing of Swimming Pools Act 1987 (“the Act”). The Act appears to have had some effect as the incidence of drowning of children under six years of age has declined by almost two thirds to an average of 4 per annum since 1988. This decline has happened during a period of an estimated 28% growth in home pools [Department of Building and Housing, 2008]. The biggest reduction has occurred in the past six years with an average incidence of drowning of less than three children per annum. This suggests that there have been other contributing factors to this declining trend.

For children aged between five and 14 years old, the incidence of drowning is less. Using age as a proportion of the population, this group remains under represented in the drowning data when compared with other age groups.

Similarly this under representation of five to 14 year olds persists when measuring incidence per 100,000 people over the past six years. This difference from the other age groups is statistically significant.

The risk profiles of the other age groups per 100,000 people have balanced out with an average of between 2 and 2.5 deaths per 100,000 people (Figure 9).

Figure 9: New Zealand drowning fatalities per 100,000 people by age 2003-2008



Source: Drownbase 2008, Water Safety New Zealand

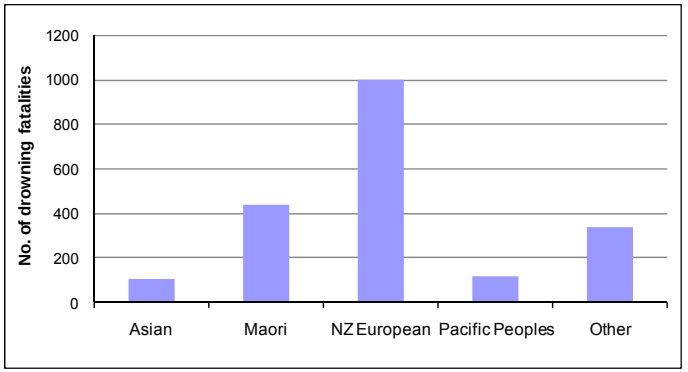
Ethnicity

Historically, New Zealand Europeans have made up 50 percent of all drowning fatalities, followed by Māori, making up 22 percent (Figure 10).

When the proportion of the population is taken into account, however, it is Māori who are over represented, followed by Pacific and Asian people (Figure 11).

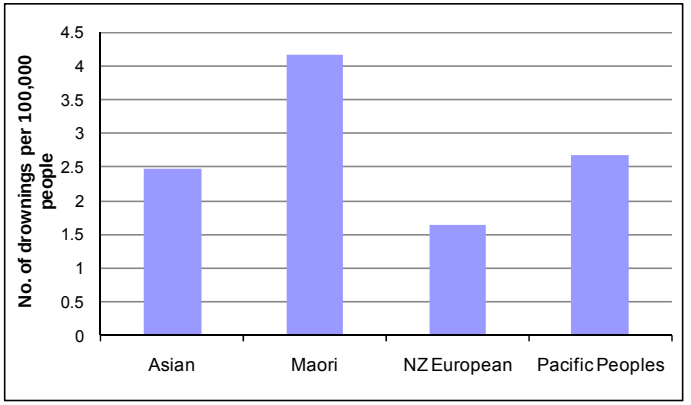
In all but five of the past 20 years, Māori are the most over represented ethnic group and New Zealand Europeans are the least. This difference is statistically significant.

Figure 10: Number of drowning fatalities by ethnicity 1988-2008



Source: Drownbase 2008, Water Safety New Zealand

Figure 11: New Zealand drowning fatalities per 100,000 people by ethnicity 1988-2008



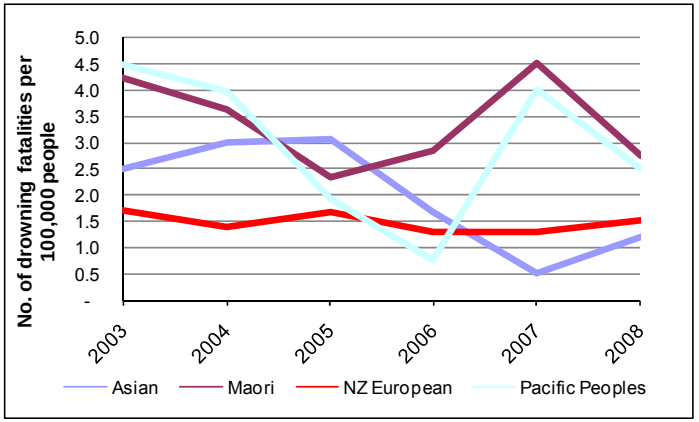
Source: Drownbase 2008, Water Safety New Zealand

The reason for this over representation is unclear. This may reflect greater exposure to aquatic environments as Māori have strong cultural links with lakes, rivers and seas[3], particularly as revered sources of food.

This correlation between ethnicity and drowning risk has been identified in other places. For example, black adolescent males are the most at-risk group in the United States [Brenner et al., 2001]. Despite this acknowledgement risk, though, "the factors that place black males at increased risk of drowning are not well understood" [Brenner et al., 2001, pp.85].

As seen in Figure 12, in more recent years, Māori and Pacific drowning fatalities had taken a downward turn. Over the 2006 to 2007 period they rose again to be the most over represented ethnic groups. Asians have followed an inverse trend, increasing and then markedly declining over the 2006 to 2007 period. The trend for New Zealand Europeans has remained fairly constant at around the 1.5 drowning fatalities per 100,000 people.

Figure 12: New Zealand trend in drowning fatalities per 100,000 people by ethnicity 2003-2008



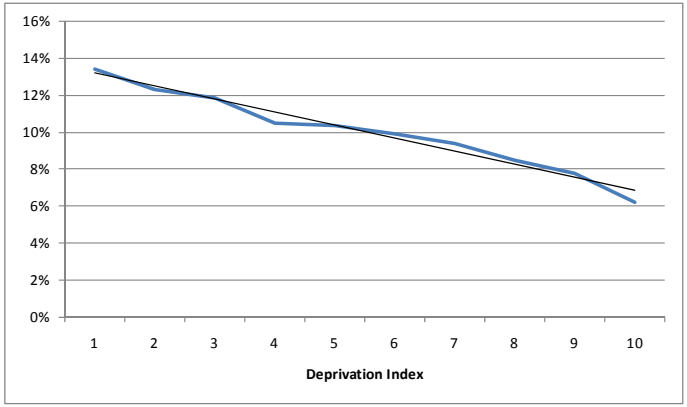
Source: Drownbase 2008, Water Safety New Zealand

[3] Māori have a recognised god of the sea, rivers, lakes - Tangaroa

Socio-economic Status

Using the deprivation index[4] to measure socio-economic status, water-related injuries are more than twice as likely to occur to people from higher socio-economic areas as people from lower socio economic areas (Figure 13). This trend has been consistent over the past ten years.

Figure 13: New Zealand water-related injuries by deprivation index



Source: Drownbase 2008, Water Safety New Zealand. Note: Dep 1 is high income group and Dep 10 is the lowest

A similar trend is also reflected in claims for serious injury where people from the highest socio-economic area have almost twice the number of claims than people from the lowest socio-economic area. This trend is only seen in the two lowest and highest categories (Dep1, Dep 2 and Dep 9, Dep 10 respectively) of deprivation.

[4] The deprivation index is the average level of deprivation of people living in an area at a particular point in time, relative to the whole of New Zealand. Deprivation refers to areas (based on New Zealand Census meshblocks) rather than individuals (Ministry of Health, 2008, www.moh.govt.nz/moh.nsf/**index**mh/immunisation-coverage-questions).

For deprivation levels three to seven, there is no evident distinction between the groups and incidence of water-related injury as reflected in claims data.

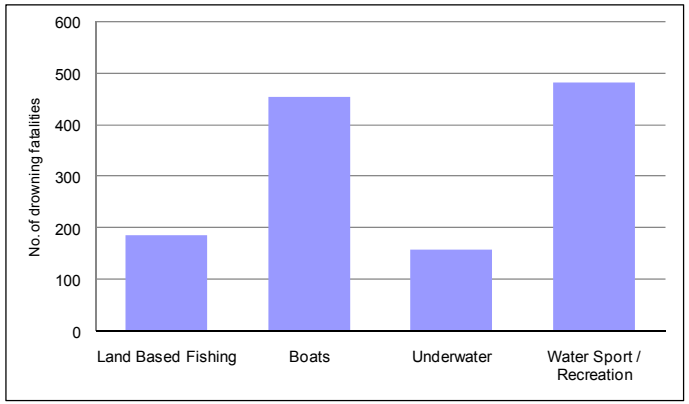
Similarly, it is only the two lowest and highest categories of deprivation that show differences in relation to fatalities from water-related injury.

Fatalities from water-related activity show a reverse trend. People who die from water-related injury are almost twice as likely to come from the lowest socio-economic areas (Dep 9 and Dep 10) than from the highest socio-economic areas (Dep 1 and Dep 2).

Activity Type

Of recreational drowning fatalities over the last 20 years, 37 percent of these have been water sports, which include swimming. Water sports have consistently experienced the highest level of drowning, with the exception of 1993, where activity associated with power boats led to the highest level of drowning (Figure 14). There is no significant change over the 20 year period.

Figure 14: New Zealand drowning fatalities by activity 1988-2008



Source: Drownbase 2008, Water Safety New Zealand
The boats category consists of: 162 non-powered boats, 237 powered boats and 54 sailing boats.

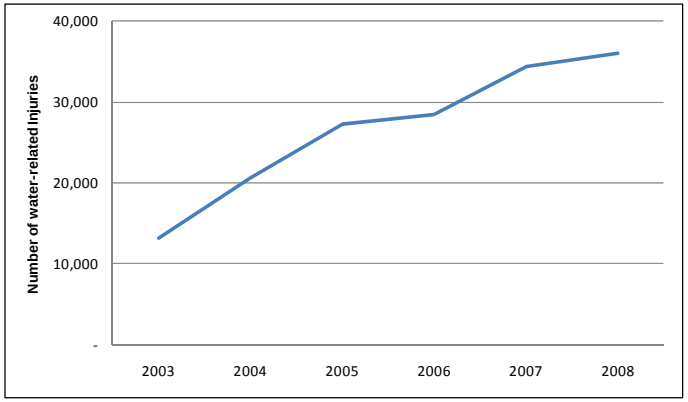
Water-Related Injuries

It is difficult to measure the amount of water-related injuries per year. Although there are a number of sources for injury data, such as Surf Life Saving NZ, ACC and hospital records, it is difficult to aggregate data from these sources without the risk of double counting.

The analysis in this section examines the number of claims to ACC as a proxy for the number of water-related injuries in New Zealand. ACC provides the most extensive and reliable data set of all available sources. Using a single data set also reduces the potential for double counting.

This is understood to be an underestimate of the total number, since these figures only include those who have received medical attention for injuries and have proceeded to lodge a claim with ACC. Furthermore, water-related injuries are of such a nature that many will not require treatment, and, therefore, are not recorded.

Figure 15: Trend in water-related injuries in New Zealand, 2003-2008



Source: ACC 2008
Please note that the data collection prior to 2005 used a different methodology

The ACC data suggests that there is a large upward trend in water-related injuries. From 2005 to 2008, the number of injuries increased 32 percent.

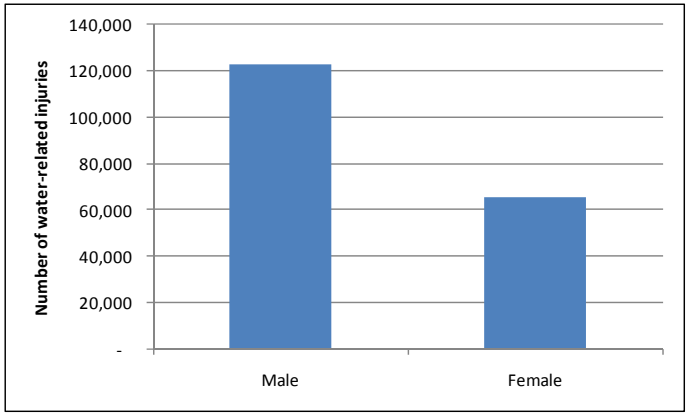
There appears to be no association between the trend in water-related injuries and the trend in drowning fatalities. While injuries have been on the increase, fatalities have been following a downward trend. The injury trend also does not exhibit as much fluctuation as the trend in drowning, even over the last four years.

It should be noted that the increase in injuries could be due to an increase in the proportion of people claiming injuries. Also, it is possible that changes to the ACC reporting over this period, may have led to clearer descriptions of the injuries reported. However, this is unlikely to fully explain the increase.

Gender

Like drowning fatalities, males are far more at-risk of injury from water based activities than females, who represent just 35 percent of water-related injuries since 1998. However, this imbalance is less severe than drowning fatalities. Since 1998, 65 percent of water-related injuries have been male compared to 82 percent of drowning fatalities.

Figure 16: Water-related injuries by gender in New Zealand, 1998-2008

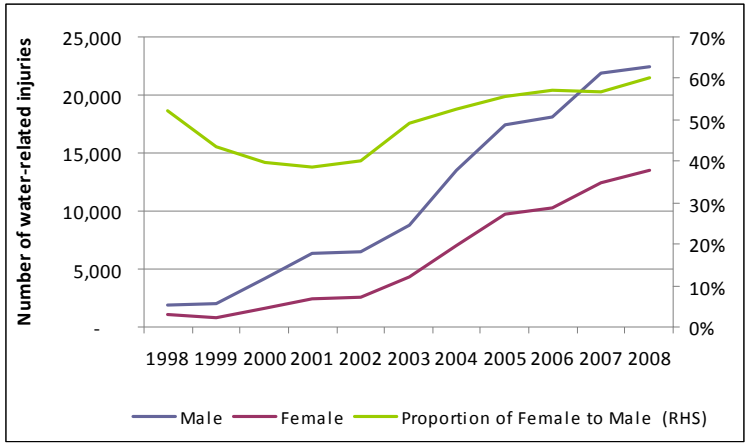


Source: ACC 2008

This overrepresentation has been consistent over time, and it is reasonable to suspect the same reasons for the discrepancy as in the fatalities section.

Since 2002, however, female injuries as a proportion of total injuries has risen, showing a convergence between male and female water-related injuries.

Figure 17: New Zealand trend in water-related injuries by gender



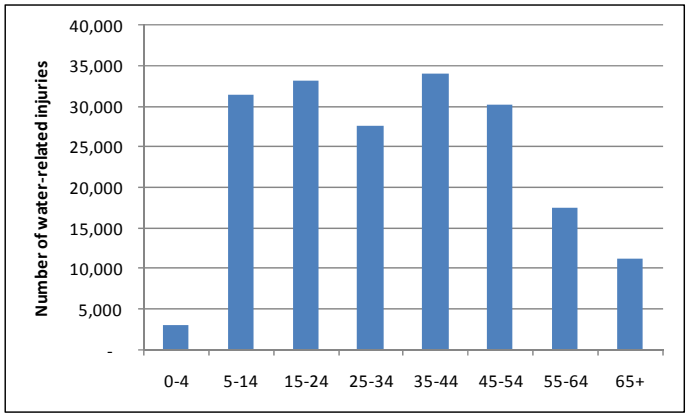
Source: ACC 2008
Please note that the data collection prior to 2005 used a different methodology

Age

Historically, the age group with the least amount of water-related injuries are the 0-4 year olds (2%). All other age groups up to 55 are approximately evenly represented (ranging from 15% to 18%).

This distribution of water-related injuries over age groups has been consistent over time.

Figure 18: New Zealand water-related injuries by age group, 1998-2008



Source: ACC 2008

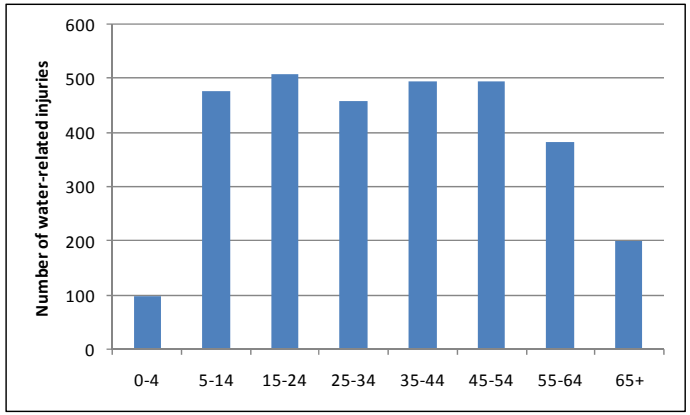
Interestingly, this pattern is not highly affected when population proportion is accounted for. Again, the 0-4 year old age group is the least affected by water-related injuries. This is in stark contrast to drowning fatalities, where this age group is the most at-risk.

A possible explanation is that while infants are less likely to engage in water-based activities, and, therefore, less likely to sustain injury, they are more susceptible to dying once exposed to a water hazard.

As outlined earlier, the majority of infant drowning fatalities occur domestically, in areas such as baths and swimming pools when left unattended. In these situations, the likely outcome is death, rather than injury.

The age groups between 5 and 55 are again the most highly represented. The majority of drowning fatalities for the older age groups occur when undertaking a sporting activity

Figure 19: Average number of water-related injuries in New Zealand by age group per 100,000 people, 1998-2008



Source: ACC 2008

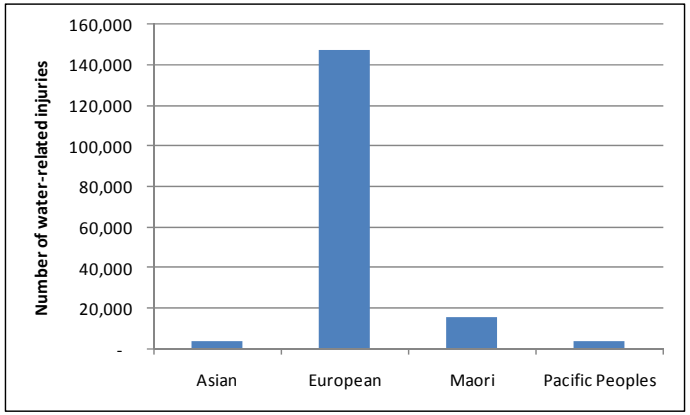
Ethnicity

Historically, Europeans have had by far the most water-related injuries at 78%. The next is Maori, who make up just 9% of water-related injury claims.

Further, this overrepresentation still remains once population proportions are taken into account. This is in contrast to the drowning fatality data, where Europeans are the most under-represented ethnicity. This discrepancy seems inconsistent.

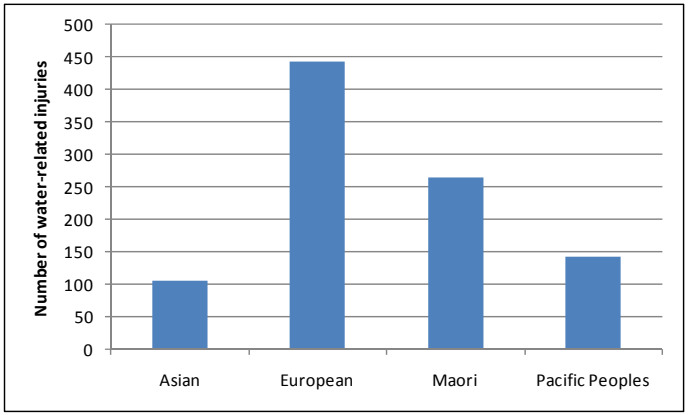
A probable explanation for this lies in the nature of the data. As outlined earlier, the injury data is sourced from ACC claims. This overrepresentation of Europeans probably lies in the injury reporting behaviour of Europeans.

Figure 20: Water-related injuries by ethnicity in New Zealand, 1998-2008



Source: ACC 2008

Figure 21: Average number of water-related injuries in New Zealand by ethnicity per 100,000 people, 1998-2008



Source: ACC 2008

Water-related injuries have more than doubled over the last six years, a trend in contrast to drowning fatalities. Males, 0-4 year olds and Europeans are the most at-risk demographics.

3 Supply of Water Safety Services

Key Points

- There are many organisations that take an active role in promoting water safety in New Zealand. These include both non- government organisations and public sector entities. These entities provide a range of water safety services.
- ACC is the lead government agency responsible for Drowning Prevention and has worked with other water safety organisations in the development of the Drowning Prevention Strategy and its Implementation Plan. The Drowning Prevention Council (DPC) is responsible for actioning the Implementation Plan.

Introduction

The demand for water safety is met by the supply for a range of water safety services provided by a variety of key organisations. These organisations take an active role in promoting water safety in New Zealand.

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Key Organisations within the Water Safety Framework

This section describes the activities of the major organisations within the water safety sector.

Water Safety NZ

Water Safety New Zealand Inc (WSNZ), formed in 1949, is a national charitable organisation responsible for ensuring all New Zealanders play safe in the water.

Its emphasis is on drowning prevention, with the fundamental task of providing New Zealanders with quality public water safety education. WSNZ believes a mix of educational initiatives is the most effective and efficient way to promote and improve water safety and ultimately reduce drowning fatalities.

WSNZ delivers its initiatives through its own activities, as well as distributing funding for nationally recognised educational programmes carried out by other water safety organisations.

WSNZ's biggest project is "Swim for Life". The purpose of the project is to increase the awareness of the importance of swimming and to motivate participation in learning to swim. Its goal is to ensure that every New Zealand child by the age of 12 can swim 200 metres confidently [WSNZ, 2008]. There is a concern that for the past twenty years learning to swim has not been a prescribed component of the school curriculum.

Other notable projects include the Training & Marketing of National Boating Safety and BeachEd, a beach water safety programme aimed at children up to 12.

As well as direct educational activities, WSNZ also undertakes research on specialised topics of interest to particular water safety organisations.

WSNZ maintains 'Drownbase', a comprehensive database of all fatal drowning victims over the last twenty year period.

Surf Life Saving NZ

Surf Life Saving New Zealand (SLSNZ) has been providing surf lifesaving services to New Zealand communities for nearly 100 years. It is the national association representing nearly 14,700 members, nine districts and 71 surf lifesaving clubs.

SLSNZ's main water safety activity is patrolling beaches. Last summer, (2008/09), SLSNZ performed 155,000 hours of beach patrols.

As well as search and rescue activities, SLSNZ also offers educational programmes; two include BeachEd and the Integrated Aquatic Programme, which informs teachers on the appropriate curriculum-based resources available.

Surf lifesaving as a sport is also a critical part of SLSNZ and provides an avenue for recruiting volunteers.

A number of activities undertaken by SLSNZ, and the resources it uses, have significant tangible spill over effects into other areas. For example:

- training organisations such as the Fire Service and Police;
- the provision of general first aid training; and
- the use of SLSNZ's Inflatable Rescue Boats, skills and other resources in response to natural disasters such as floods.

Royal New Zealand Coastguard

The Royal New Zealand Coastguard is a volunteer, charitable organisation which provides New Zealand's primary Maritime Search and Rescue service.

The main activity of the Coastguard is to provide 24 hour, on-call trained professionals, rescue vessels and air patrol craft ready to respond to distress calls.

There are 2,500 active volunteers who belong to one of the 61 affiliated units situated throughout the country. Most of these units were established by passionate locals following a local boating tragedy. In 2004, these 63 units agreed to regionalisation, with each unit now falling under the responsibility of the Coastguard in one of four Regions.

Maritime New Zealand

Maritime New Zealand (MNZ) is a Crown entity established to ensure a safe, secure and clean marine environment in New Zealand.

MNZ's responsibilities cover a wide range of maritime activity, both commercial and recreational. These responsibilities include standards development, seafarers' qualifications and licensing, oil spill prevention and response, search and rescue, inspection of foreign and New Zealand flagships, port and ship security, commercial and recreational vessel safety, accident investigation and aids to navigation.

The DPS relates only to MNZ's recreational boating activities.

WaterSafe Auckland Incorporated

WaterSafe Auckland Incorporated (WAI), established in 1994, originated from a need for a cross sector approach to drowning prevention in the Auckland region.

WAI is a regional co-ordinating body primarily concerned with water safety promotion and education. WAI produces water safety resources and provides professional development and ongoing assistance to all levels of educational institutions.

New Zealand Search and Rescue Council

The New Zealand Search and Rescue Council (NZSAR) was established by government in 2003 to provide oversight and governance to search and rescue agencies in New Zealand. NZSAR's focus is to improve collaboration, co-ordination, cohesion and capability of the search and rescue providers, be they land, air or sea based services.

NZSAR, with its secretariat, provides the government with strategic advice and an over-arching plan for search and rescue in New Zealand.

University of Otago Injury Prevention Research Unit (IPRU)

The Injury Prevention Research Unit was created in 1990 and has six main areas of focus in injury prevention research. Three of these areas relate to the water safety sector – sport and recreational injury, child and adolescent injury and injury in Māori.

Its prime purpose is to provide research that can be used to help reduce the incidence, severity and consequences of injury in New Zealand.

New Zealand Recreation Association (NZRA)

Formed in 1992, NZRA is a not-for-profit organisation originating from an amalgamation of three organisations, the New Zealand Institute of Park and Recreation Administration (NZIPRA), the Recreation Association of New Zealand (RANZ), and the New Zealand Association of Swimming Pool Managers (NZASPM).

This was a purposeful move by these organisations to strengthen their effect in advocating for and supporting the professional needs of people and organisations associated with all aspects of recreation, leisure, parks, open space management, aquatic, conservation and sport delivery.

The NZRA provides professional growth and development through training programmes and networking in the aquatic and wider recreational sector.

Drowning Prevention Council

In January 2008, the Drowning Prevention Council was formed along with four advisory committees to take over the role of the initial Implementation Management Group. Each of the four advisory groups focus on one of the major components of drowning prevention - Rescue, Research, Education and Awareness, and the Environment.

Essentially, the same organisations are involved either on the Council itself or by way of the advisory committees. The advisory committees also include other organisations that contribute to drowning prevention such as the New Zealand Police and the New Zealand Fire Service. This has further widened the spectrum and involvement of those that can and do contribute to water safety and injury prevention.

4 Challenges Facing the Water Safety Sector

Key Points

- Drowning and water-related injury does not have a high profile in the community or government. Incidents of drowning occur infrequently and direct costs are small compared to other causes of death and injury.
- Coordination and collaboration within the water safety sector has historically been limited, as the sector generally competes for the same pool of funding.
- The DPS has had a positive effect in increasing dialogue between organisations within the sector and the DPC supports the sector gaining a wider strategic perspective.
- In more recent years some joint organisational initiatives have developed in service provision, for example in rescue and educational activities. The need for further coordination and collaboration is widely accepted within the sector.
- The water safety sector relies heavily on volunteers. Conservatively this goodwill equates to the use of 425 full time equivalents or $11 million per annum.
- The water safety sector relies on lottery board, government, corporate and public funding. The amount of funding is not guaranteed beyond a year and can vary considerably, making planning, budgeting and the implementation of longer term strategic initiatives difficult.
- Information regarding drowning and water-related injury is not gathered, processed or kept in a consistent and comprehensive manner across the sector.

Introduction

In the context of the changing environment in which the water safety sector works, the challenges facing the water safety sector as it strives to meet the demand for its services, relate to four principal areas namely:

- coordination and collaboration;
- infrastructure;
- funding; and
- gaps in knowledge and data.

Context

Invisibility of Drowning

Most people that get into difficulty in water are successfully rescued and require little, if any, ongoing medical attention. The scene of the rescue is unobtrusive and, for the most part, does not disrupt the activities of the general public. There is little sensory or media impact and, in some instances, the incident may not even be recorded.

Compared with other injuries, drowning has minimal impact on our health system, as those that experience drowning generally survive well or not at all. Neither scenario places a burden on the health system.

Added to this, water-related injuries that do require hospitalisation are not captured in a way that reliably quantifies their cost. Admissions are coded according to diagnosis, rather than causative factors.

ACC does capture non–hospital related costs of drowning and water-related injury. These costs are comparatively small when compared with non-water-related injury which includes motor vehicle accidents, slips, trips and falls, burns and work related injury.

Population Mobility

New Zealand, like the rest of the world, has seen an increase in mobility of its population. Most New Zealanders live relatively close to the sea but with readily available personal transport they do not need to go to a local beach, river or lake as they can easily access a greater variety of inland and coastal waters.

This wide range and expansive area of water resources throughout New Zealand puts a considerable stress on the water safety sector to ensure people remain safe. For example, through direct supervision and identification of hazards such as rips, unexpected changing depths of water holes and such like. Added to this, there are people that have little knowledge of what to expect in New Zealand waters through the effects of tourism and immigration. In more recent years New Zealand has been actively promoted as an adventure destination.

As a result of these factors, there is an increased risk in the number of people undertaking water-related activities in unfamiliar places. This may change the nature of effective water safety initiatives, for example, signage identifying dangers to those new to the area, may become more important.

Related to adventure tourism, there is an increase in the variety of water activities that people can participate in. For example, the use of jet skis, biscuits, kite surfing and sail boarding, increases the public's exposure to injuries, as does the increase in the number of people participating in aquatic activity.

Aquatic Survival

Over half the people that drown have not planned to be in water. The remainder, over and above intentional death by drowning, have found themselves in unexpected circumstances in the water. To survive in water there is a need to have a level of understanding of aquatic skills. School based Learn to Swim classes can provide the core components of gaining confidence in water, how to keep safe in water, as well as how to swim.

The education sector, however, has moved away from centrally based prescriptive curricula with schools determining what is taught to meet their perceived community needs. The demand on what skills and knowledge should be taught to children has increased, while the time available has remained static.

Added to this, schools now have greater direct fiscal responsibility for their operations and assets. As a consequence, learning to swim is no longer taught in all schools and an increasing number of schools around the country have chosen to close their pools.

These factors affect the level of access that New Zealand children have to a safe and controlled environment in which to gain safety skills in water and learn to swim.

Water Safety New Zealand believe that, as a consequence, the level of swimming ability in New Zealand is decreasing [Water Safety NZ, 2008]. Water Safety NZ anticipates that the effects of this decrease in swimming skill level will start to become apparent in a greater incidence of drowning as these children become late teens and young adults. WSNZ has predicted that annual drowning fatalities will exceed 150 by the year 2025.

Effective Coordination and Collaboration

The people in the water safety and other related sectors are extremely committed to the cause of their respective organisations. This, plus the fact that the non-government organisations (NGOs) are dependant on the same sources of funding, has limited the extent to which collaboration has occurred in an operational sense.

Coordination and collaboration only occurs rarely for the following reasons:

- Most of the organisations are non-government organisations with no secure funding stream.
- Water safety organisations historically and currently compete with each for the limited money available even.
- Organisations can be working on the same idea from different philosophical view points.
- Organisations work to raise their own profile and brand to raise revenue for their work.

However, there has been feedback from the sector on how the DPS has had a positive effect on creating goodwill and dialogue between NGOs. This is a sector strategy which is predicated on cooperation and coordination of initiatives. The development of the DPS has increased understanding of how collaboration can, as well as benefit the individual organisations, increase the likelihood of preventing drowning and water-related injury.

The need for increased coordination is widely accepted. Some in the water safety sector suggest that all rescue services might be integrated and a single organisational body put in place to govern and coordinate cooperation between the NGOs. It is also recognised, however, that the separate organisational entities, within the water safety sector, value and gain benefit from their sense of independence, ownership and accountability for their specific areas of expertise.

An example of increased collaboration, in recent years, is seen between Surf Life Saving NZ and the Coastguard who now have a working strategic relationship after years of largely working in isolation from one another. They are working together to enhance rescue coverage through sharing their operational plans and some operational activities such as radio. They also have joint initiatives to raise money.

Another example is MNZ and WSNZ who similarly collaborate on educational activities.

With greater collaboration, led from the top, increasingly scarce grants and voluntary resources could be better utilised. For example, a consistent approach toward water safety and communication and coordination of water safety messages could be reinforced and more effective.

Water Safety Infrastructure

Reliance on Volunteers

The water safety sector relies heavily on volunteers. The current workload is undertaken by 33 water safety organisations with at least 100 paid staff and 17,000 volunteers.

Not-for-profit organisations have arisen to meet local needs within the bounds of the resources they have available. While some services are similar throughout the country, this has led to some areas being better serviced than others.

Membership to parent organisations does provide access to common guidelines and policies. However, there is only limited opportunity to ensure coordination and consistency of service provision and data collection within the water safety sector.

The water safety sector also faces the challenge of keeping long standing and experienced volunteers, whilst recruiting new ones just to maintain current service levels.

If the volunteers were replaced by paid workers on the minimum wage, their monetised contribution to the sector is estimated to be $11 million per year.

Low Government Profile

The water safety sector has a low government profile and has no Minster to report to and there is no Minister with a responsibility for water safety as part of their portfolio. The sector has a limited ability to ensure there is sound water safety policy and sufficient sustainable funding to provide effective levels of service.

Appropriate Level and Distribution of Funding / Financial Resources

Sustainability of funding is a prime issue for the water safety sector.

Over the last three years, total industry funding for the major water safety organisations (WSNZ, SLSNZ, Coastguard, WAI) has been around $40 million per annum.

As outlined earlier, the majority of organisations within the water safety sector are not-for-profit, non-government organisations. There is limited financial information published by these organisations. As a result, it is difficult to obtain a detailed breakdown of the sources and amounts of funding for a number of them. We have only been able to attribute about 40 percent of total industry revenue to a source.

Discussions held with the major water safety organisations identified that:

- a significant proportion of industry funding is received from charities and gaming trusts. For example, Water Safety New Zealand received 87 percent of its income from charitable and gaming trusts in the 2008 financial year;
- in general, central government funding is minimal;
- as non-commercial organisations mandated to provide a wider public benefit, their ability to generate independent revenue streams is limited; and
- some revenue is received from membership schemes and similar sources.

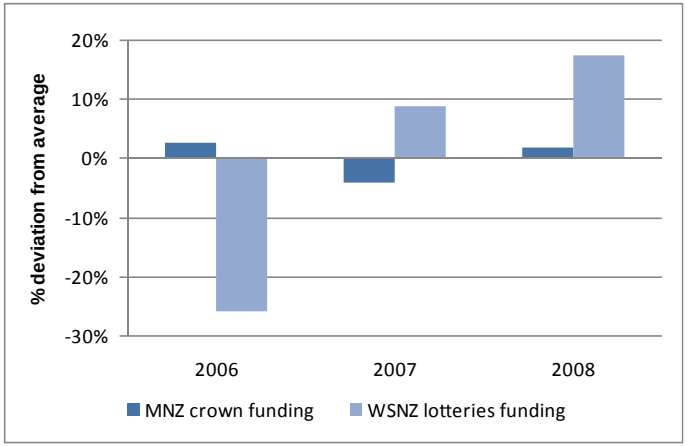
The exceptions to this are MNZ (Recreational Boating), NZSAR and the Police, which as government organisations with a direct interest in water safety, are mainly funded by government appropriation.

The reliance on charitable funding

The reliance on charitable and annual grant funding is a source of considerable uncertainty for water safety organisations. Charitable and gaming trust funding is allocated on a competitive basis annually and often only for projects in a given year. Another feature of charitable and grant funding is that it usually excludes salaries and wages for paid staff.

Figure 22 highlights the volatility in lottery funding over the past three years. It compares the volatility in the major source of revenue for WSNZ (lotteries) to that of MNZ (Government funding).

Figure 22: Water safety industry funding volatility 2006-2008



Source: Water safety industry, 2009

Funding uncertainty encourages a short term focus

Due to the uncertainty in funding, water safety organisations tend to take a short-term view with respect to strategic and operational planning, giving rise to operational plans with only a one year outlook. This restricts the ability for these organisations to take a strategic, long-term approach to their roles. In general, it is likely to reduce their effectiveness compared to what would be possible with guaranteed, longer-term and recurring funding.

Despite this need for a reliable funding stream, a number of water-safety organisations have expressed reluctance in obtaining direct government funding, due to:

- perceived compliance costs that come with government funding;
- an unwillingness to sacrifice independence from government, especially in respect of water-safety initiatives; and
- the belief that the government has a limited understanding of the water safety sector, due to its limited involvement historically.

Volatility of funding

An example of the effects of the volatility of funding is seen in the degree to which MNZ has been able to implement its education programme on water safety. MNZ focuses on four areas of education: lifejackets, alcohol, sea conditions and the need for communication equipment. MNZ has traditionally used advertising campaigns, promoting two of the above areas per year.

Sponsorship for this has recently fallen from $0.6 million to $0.2 million per year so campaign activity has been substantially curtailed.

Education is recognised as a key driver both in New Zealand and overseas in reducing the incidence of drowning and water-related injuries.

Accountability for expenditure

Another issue for the water safety sector is accountability for expenditure. Some money spent in the water safety sector is not controlled by the sector. This can lead to money not being directed to the most important areas of need and impact. Instead the money can be spent on resources that are duplicated and compete for further resources by different organisations. An example might be a local service group or regional local authority raising money for their own water-related facility or services when these are already established in the vicinity.

Concerns over the Outlook for Future Funding

Water safety organisations have voiced concerns over the risk of a fall in future funding for the sector. The organisations believe that funding from local trusts and corporate sponsors is likely to decrease over the next few years while lotteries revenue is likely to increase. The reason for this is that the current economic downturn is reducing the amount of donations and sponsorships (at the same time that community and welfare organisations have greater pressure on them to provide services). On the other hand, there is evidence to show that lottery money increases during times of economic slowdowns.

The Royal New Zealand Coastguard, for example, expects a fall in revenue of $2 million next year. This fall is attributed to the economic downturn causing an expected decrease in funding from local community trusts and corporate sponsors. Already, a major banking sponsor has reduced sponsorship by $0.2 million per annum [Reid, 2009].

SLSNZ expects a fall in its revenue of around 30 percent to the end of the 2012 financial year and then a steady increase to current funding levels by 2015. This is due to similar reasons to Coastguard, including a withdrawal of sponsorship by a bank worth $1 million per annum. Public donations and corporate sponsors are expected to decline due to the decrease in discretionary spending power as a result of the current economic situation.

Gaps in Knowledge and Information

The water safety sector faces challenges with consistent data collection across the sector and the ability to provide useful information from the data.

Currently data is collected from 21 different databases. None of these are linked or combined to provide a consolidated overview of the sector. There are also poor linkages with other injury prevention and health promotion groups. This limits the sector's ability to observe what interventions, activities and services are most effective and what can be learnt from the data. The sector, for example, cannot confidently identify why people are getting into difficulty in water and the systemic patterns surrounding water-related injury and fatalities.

5 Current Activity Levels for the Water Safety Sector

Key Points

- Despite the historical downward trend in New Zealand drowning numbers, the water safety sector projects that the number of drowning fatalities will increase over the next seven years.
- This increase can be attributed to a decrease in industry funding, a change in population demographics and a general increase in the population.
- The historic trend of rapid growth in the number of water-related injuries is expected to slow over the forecast period.

Introduction

This chapter projects the trend in water safety related outcomes over the next seven years. This projection is made on current activity and initiatives. It provides a base for comparison of the effect of the Drowning Prevention Strategy initiatives (DPS initiatives) described later in the report.

Described in this chapter is the business as usual or the 'baseline' situation for water safety in New Zealand. It reflects an expected decline in funding for the major organisations in the water safety industry, as well as changing demographics and the lagged impacts of the reduction and cessation of water safety programmes over the last 10 - 15 years.

This baseline is then applied as a comparison platform for the cost benefit analysis of the DPS initiatives.

The focus of the baseline analysis has been on the primary measurable outcomes for water safety which are the:

- expected number of water-related deaths; and
- expected number of water-related injuries.

Specifically, the analysis has developed forecasts of the number of water-related drowning fatalities and injuries expected each year, out to 2015.

This analysis reflects the water safety industry's views, as well as consideration of the historical trends and key drivers for the sector outcomes.

Approach

Initially, a forecast of the underlying trend in the number of drowning fatalities was developed. As discussed in Chapter Two, over the past 25 years New Zealand has experienced and reported an overall decline in drowning fatalities. The lowest level of drowning fatalities occurred in 2006.

The water safety sector believes drowning fatalities will continue to increase from this low point in 2006 based on the following factors:

- the reduced ability by the sector to invest in water safety campaigns;
- the reduction in school-based learn to swim programmes;
- an increase in the mobility of the population enabling greater access to lakes, rivers and the coast line, particularly areas that are not well populated and/or monitored;
- increased participation in water-related activities and growth in adventure tourism; and
- the wider variety of water-related activities available to the population, for example kite surfing, jet skis, wakeboarding, et cetera.

The forecast of the numbers of drowning fatalities and water-related injuries, from 2009 to 2015, has been adjusted for the other major determinants recognised by the water safety sector and our research. Specifically, those determined include:

- expected population growth, including migration (Statistics NZ);
- changes in expected ethnic and age profile of the New Zealand population (Statistics NZ); and
- anticipated reductions in the level of funding of the water safety sector over the period.

Forecasts have been performed on data expressed as a proportion of the population in order to exclude population changes in the past. The population factor has then been placed onto the forecast data going forward until 2015 to account for the expected increase in population over the analysis period.

Population has been broken down by age and ethnicity to account for the change in demographics of New Zealand over the period. The change has then been matched with the drowning profile to identify population changes in "at risk" groups.

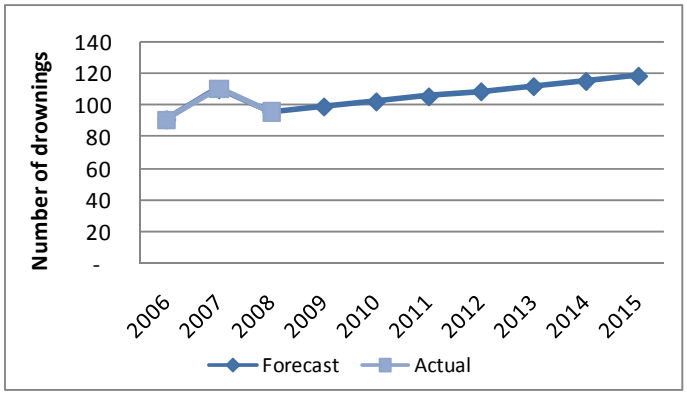
The water safety sector has indicated that total industry revenue has an inverse relationship with total number of recreational drowning fatalities. This means that for any percentage increase in total funding there is a corresponding decrease in drowning fatalities. Similarly, a reduction in revenue will result in a corresponding increase in drowning fatalities. This effect is not seen immediately, as the benefits from education, training and use of resources take time to take effect if increased and diminish if decreased. The length of the lag does depend on the specific initiatives it may impact. Overall, the lag is considered to be two years by the water safety sector, particularly those involved directly in rescue activities.

For all forecasts, a range of regression models have been tested for closeness of fit against the data.

Forecast Drowning

Figure 23 shows the forecast of the underlying trend of total drowning fatalities until 2015 (before population, demographics and water safety industry funding).

Figure 23: Drowning forecast disregarding population, demographics and water safety sector funding changes



Source: Forecast based on water safety industry data

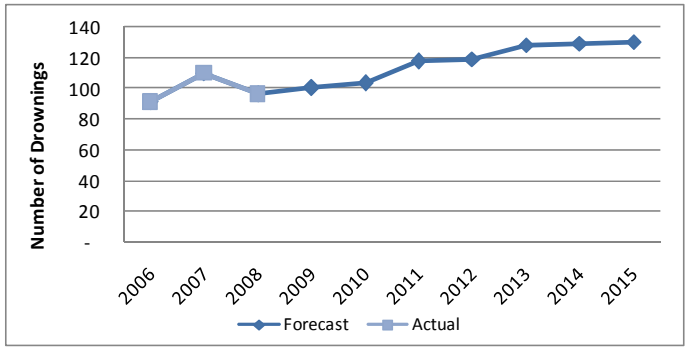
The Figure 24 on the next page indicates the total level of drowning under the baseline, if the initiatives are not implemented. The years 2006-2008 show an actual drowning fatalities rate. From 2009 to 2015, the drowning forecast has been adjusted by the key determinants of drowning trends of population increases, demographic trends and industry funding.

The population trends and the demographic breakdown of the population are those projected by Statistics NZ. This data has been utilised in order to determine whether more, or less, people in New Zealand are falling into the "at risk" groups identified by the drowning statistics to date.

Water safety industry revenue / funding also have a significant influence on the drowning rate. As identified in Chapter Four, the funding rate is expected to be volatile over the period due to economic conditions.

The effect of funding change will incur a delayed effect, causing an increase in the drowning rate in 2011 and 2013 resulting from decreases in funding in 2009 and 2010.

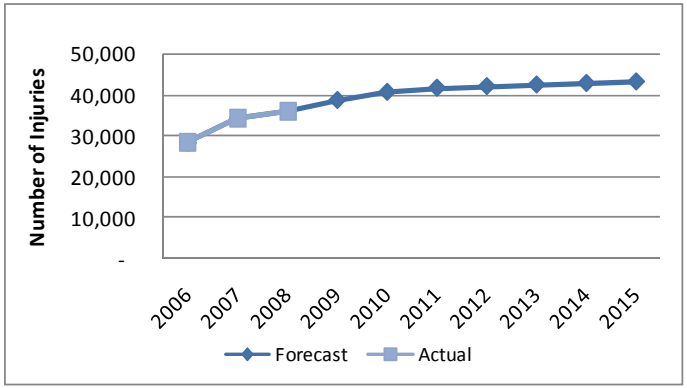
Figure 24: Number of drowning fatalities under the baseline scenario



Source: Forecast based on water safety industry data

As displayed in Figure 25, the ACC data on water-related injuries has increased rapidly in terms of the number of incidences per annum over the period 2003 to 2008. This increase is expected to slow into the foreseeable future. It has, therefore, been assumed that the increase will step down, from the three year average of 10 percent growth per annum, to 7.5 percent in 2009, 5 percent in 2010 and 2.5 percent in 2011. From 2012 to 2015, it is assumed the increase in water-related injuries will grow at a rate equal to the population increase.

Figure 25: Number of water-related injuries under the baseline scenario



Source: Forecast projected based on ACC actual claims data to 2008

6 The Cost of Drowning and Water-related Injuries – 2004 to 2008

Key Points

- From 2004 to 2008, 539 people drowned and 146,270 experienced water-related injuries in New Zealand.
- The economic cost to New Zealand of a water drowning fatality has been estimated as $3.4 million.
- The economic cost to New Zealand of a water-related injury has been estimated as $13,611 (minor) and $340,269 (serious).
- These cost estimates incorporate the direct costs of drowning and water-related injuries (such as medical costs), as well as the intangible costs (such as the income lost to the economy and the social cost to society).

Introduction

Over the period 2004 to 2008, a total of 539 people drowned and 146,270 experienced water-related injuries in New Zealand. This has had significant adverse effects on both New Zealand's society and economy.

Estimating the economic and social costs of drowning fatalities and water-related injuries (in dollars) assists in understanding the magnitude of the issue.

There are a range of costs incurred by New Zealand for each drowning fatality or water-related injury. These include direct costs, such as medical care and search and rescue costs, and indirect / intangible costs, such as the lost contribution to the economy, and the emotional cost to families, communities and society in general.

Approach – Direct Costs Measurement

Due to a lack of suitable data and an overall lack of materiality, the average search and rescue cost per drowning fatality and water-related injury has been assumed to be zero, for the purpose of estimating the total direct costs. Sensitivity tests on the direct costs of incidents were shown to be minimal.

Drowning Fatalities

The Ministry of Transport has estimated the average medical cost per road transport related fatality as $6,100 (in June 2008 dollars) [Ministry of Transport, 2008]. Typically, drowning fatalities do not require the same level of medical cost as road transport related fatalities [ACC, 2009]. To be conservative, and in the absence of suitable data, it has been assumed that the medical cost for the purpose of estimating the direct cost of a fatality is zero.

Water-related Injuries

The medical cost of a water-related injury has been estimated based on ACC data as $425 (in December 2008 dollars). This incorporates the medical costs incurred by ACC, plus an estimate of the District Health Board costs incurred.

Approach – Intangible Costs

Drowning Fatalities

A number approaches have been used, both nationally and internationally, to estimate the economic and social cost of fatalities and injuries. Until recently, most countries used the Human Capital approach (also known as the Gross Output approach). This approach estimates the amount of income lost to the New Zealand economy due to the premature death or incapacitation of the victim.

Recently, international literature shows a shift from the Human Capital approach to the Willingness to Pay (WTP) approach. The WTP approach attempts to estimate the amount society is willing to pay to prevent a death or injury. Conceptually, it reflects the social and emotional value families, friends, communities and society place on a human life, as well as the economic costs (i.e. the income lost to the New Zealand economy).

In 1991, the Ministry of Transport developed an estimate of the cost to society of a road transport related death using the Willingness to Pay approach. This estimate has been updated annually since 2006, and is generally considered to be the benchmark for the cost to society of a death in New Zealand. The latest estimate is $3.4 million (adjusted to December 2008 dollars).

A review of similar studies overseas revealed that the Ministry of Transport estimate is at the conservative end of the range of estimates developed internationally. The estimated cost to society of a death ranged from $2.65 million to $55 million (New Zealand, 2008 dollars). Refer to Appendix A for further detail.

Water-related Injuries

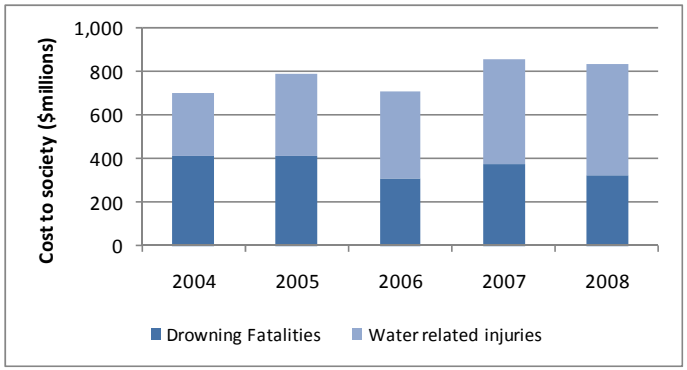
The intangible benefit of preventing an injury has been estimated by applying an 'adjustment factor' to the estimate of a value of a life ($3.4 million). The adjustment factor reflects the lower value society places on preventing on injury as opposed to a death. The Ministry of Transport's estimates of these adjustment factors have been used (10 percent for a serious injury and 0.4 percent for a minor injury). This results in an estimated cost to society per minor and serious injury of $13,611 and $340,269 respectively (December 2008 dollars).

Results

Based on the approach described above, the estimated total cost to society per drowning fatality is $3.4 million (December 2008 dollars). The estimated total cost to society per minor and serious water-related injury is $13,611 and $340,269 respectively (December 2008 dollars).

The figure below summarises the estimated cost to society, both in terms of direct and intangible costs, of drowning fatalities and water-related injuries in New Zealand over 2004 to 2008. The total estimated cost from 2004 to 2008 was $4.2 billion (December 2008 dollars).

Figure 26: Cost of drowning fatalities and water-related injuries 2003-2008



Source: ACC, PwC calculation

This is a significant cost to New Zealand. The estimated economic cost of drowning fatalities and water-related injuries is $864 million in 2008, represent approximately 0.49 percent of New Zealand's gross domestic product in that year.

Figure 27: Estimated economic cost of drowning fatalities and water-related injuries in 2008

Degree of Injury	**Estimated Cost**	**Number**	**Total** (2008)
Fatal Drowning	$3,402,686	96	$326,657,856
Serious Injury	$340,269	149	$ 50,700,081
Non-serious Injury	$13,611	35,780	$487,001,580
Total			**$864,359,517**

Source: ACC, PwC calculation

7 Economic Impact and Voluntary Contribution of the Water Safety Sector in New Zealand

Key Points

- The purpose of measuring the water safety sector's economic and social impact is to look at the wider contribution the sector makes. As it relies heavily on volunteers, donations and in-kind contributions of materials, accommodation and equipment, the contribution of the water safety sector is likely to be underestimated if it is measured in terms of its financial statements only.
- A formal economic impact analysis of the sector's contribution to the economy shows that its activities result in 460 jobs created for the year-ended December 2008.
- An indication of what the impact of the sector's current prevention and rescue role might be is estimated at approximately $4.28 billion per annum based on the lives saved through drowning prevention and rescue activities.
- A considerable part of the activity of the water safety sector is carried out by volunteers and is funded through voluntary contributions including donations, in-kind contributions and free or low-cost access to offices and other spaces. This reliance on volunteers makes the sector vulnerable.
- There are a number of other qualitative and/or potential but as yet unmeasured impacts of the water safety industry to consider as well, including the benefits to health from physical activity and the existence of commercial business activities that support water-related activities.

Introduction

This chapter examines the wider economic and social impact of the water safety sector in New Zealand. It provides both a quantitative and a qualitative perspective on the contribution the sector has made to the New Zealand economy for the year ended December 2008.

Approach: Quantitative Economic Impact Study

The standard approach to an economic impact study is to consider the value of goods and services that are provided and what other goods and services are consumed in the process.

"Economic Impact Studies" provide an assessment of the contribution of a sector or industry to the wider New Zealand economy[5].

Any increase in the provision of goods and services may generate further expansion in other sectors that contribute to the goods and services, like a ripple effect. The estimation of this ripple effect is called the multiplier.

For example, the water safety sector has a key role in providing education. This will impact on the printing industry, the television and media sector and so forth.

There are three types of economic benefits generated:

- direct benefits, for example employment and income;
- indirect benefits, for example jobs in the media industry; and
- induced benefits, for example the effects of spending wages derived from the direct and indirect activities.

5 In terms of Gross Domestic Product (GDP), the measure used to report economic growth and output based on the system of national accounts (SNA).

To quantify the economic impact, the main drivers are the number of paid employees (in the water safety sector), and, the value of the economic goods and services produced because of the activities of the sector. A proxy for this is the analysis of the expenditure of each organisation in the sector.[6]

The water safety sector carries out its services by using funding of $40 million per year to purchase the raw materials required.

Note that this is only part of the value of its contribution to the economy. When the economic impact of the sector is analysed as described above, an economic impact study follows an approach to identify and value the wider impact of the sector. This includes the value of induced, indirect and downstream activities that occur. These activities are difficult to separate out because of the aggregated nature of the formal national accounting framework applied by Statistics New Zealand.

Based on the application of the specific areas that can be identified, the sector's current activities are estimated to generate an additional 460 paid employees over and above the number of employees if the sector did not interact with the economy.

These jobs reflect results of the multiplier effects of the water safety sector. The jobs arise from the water safety sector's reliance on other goods and services for example:

- the manufacture of flutter boards that are used when teaching children to swim; and
- the financial ability of those employed in the sector to purchase consumer goods.

[6] An input-output table is a means of presenting a detailed analysis of the process of production and the use of goods and services (products) and the income generated in that production (OECD, 2008).

This economic impact can be seen as a basis for estimating the additional contribution the water safety sector makes above and beyond its benefit to the lives of individuals that are examined in the next chapters based on the cost benefit analysis.

Current Value of Lives Saved

Chapter Six discussed the approach to measuring the cost of drowning. In looking at the economic impact of the sector, the concepts behind the costing can also be used to estimate the economic and social value of the lives saved by the sector.

Normal financial and economic reporting relates to activities that make things happen (or to products that are produced). It takes a different approach to measuring the value of preventing something from happening.

An added challenge when thinking about prevention is identifying what would have happened if the water safety sector did not exist – would there have been other influences that might reduce accidents? For example, an extreme view is that evolution would lead to the survival of people who take fewer risks around water. Another view is that people would take greater responsibility for keeping themselves and their children safe in, on and around water.

Much time and experience has gone into understanding human behaviour around water. There is evidence based on this experience, research and performance monitoring that shows how water safety activities save lives by preventing drowning fatalities.

For the purposes of this analysis, then, the contribution that the prevention of drowning makes is estimated. The estimates are based on conservative assumptions about the number of lives currently saved by the water safety sector in the year ending December 2008. This data has been provided by the DPC based on its members' knowledge of the number of drowning fatalities that have been prevented.

Based on industry knowledge, the sector contributes to the economy with an estimated saving of 1,259 lives just through the activities of Surf Life Saving New Zealand and the Royal New Zealand Coastguard. Through these activities, the sector makes an economic and social impact.

Although economic concepts are used for the calculation, it is a different perspective from a formal economic impact approach, which is focused on the sector as an industry. This perspective uses the value of lives saved because of drowning fatalities prevented which focuses on the sector's impact on the individual, family and communities, as well as its impact on the economy.

As described in Chapter Six, the estimated value of a statistical life for the water safety sector, results in a value of $3.4 million per life saved from drowning. This is then multiplied by the industry estimate of an average of 1,259 lives saved per year.

This equates to a value for water safety activities that prevent drowning fatalities at $4.28 billion a year in 2008 dollar values.

Qualitative Economic and Focal Impacts

The water safety industry is made up of NGOs whose activities are largely funded by lottery grants and the charitable sector[7]. The sector is able to do what it does through activities carried out by paid staff and volunteers.

The significant information from impacts of the sector can be described, based on what the sector is about and how it carries out its activities.

There are two categories of qualitative economic and social impacts to consider. One relates to the voluntary contributions applied by the sector to carry out its activities.

[7] While Statistics NZ is working on developing a set of satellite accounts for the not-for-profit sector that also take volunteer activity into account, this is a work in progress. The detailed information about NGOs volunteers and the specification of the value of voluntary contributions is under development for the satellite accounts.

The second category relates to the qualitative activities that take place because of the existence of the water safety sector and the things that it does.

Voluntary and in-kind contributions

Voluntary contributions include:

- contributions that arise from people giving voluntarily of their time;
- the equipment that volunteers use (including, for example, home computers used by volunteers to communicate, as well as search and rescue equipment); and
- the attributed value of accommodation supplied for free or at a subsidised rent.

Beath [2007, p.3] says to manage the volunteers and members, "there are only 100 paid full-time equivalent staff…" Given that there are relatively few paid staff working in the sector, the activities of volunteers make an important contribution to preventing drowning fatalities.

This contribution is enhanced by the training that volunteers receive, plus the contribution that education and research also play a role in water safety.

Beath collected data from the water safety sector that showed there are 17,000 volunteers involved in carrying on the activities of the water safety sector. In addition, these organisations also have a total of 36,000 members. This gives a total human resource pool of 53,000 [Beath 2007, p.13].

The volunteers are involved in a range of water safety activities including life saving as life guards and search and rescue operations. Volunteers also assist with administration, training and education. Members may also carry out activities that contribute to water safety prevention.

Thus the hours volunteers work within the sector may vary from only a few hours from time-to-time to working longer hours in summer months and /or round the clock during search and rescue operations.

To give a context for understanding the value that volunteers add, a range of assumptions are examined below.

It is important that the number, roles and outcomes achieved by volunteers are visible when thinking about initiatives to prevent further drowning fatalities and bring about a decline in annual drowning numbers. The scenarios adopted for analysing the contribution from volunteers are:

- conservative, where the 17,000 volunteers work an average of 1 hour per week;
- medium, where they work 5 hours per week on average; and
- high, where they work an average of 10 hours per week.

These scenarios are illustrative only. They highlight the benefits to the water safety sector (and New Zealand) of managing and supporting volunteers in the water safety sector. Figure 28 illustrates the calibration the additional value from volunteers for the three sector scenarios.

Based on the conservative scenario, which assumes 1 hour per week, the total number of hours worked by the 17,000 volunteers would be 884,000 a year. Based on a 40 hour working week, this is the equivalent of 425 full-time staff.

If the volunteers were replaced by paid staff and Board members on the minimum wage, their monetised contribution to the sector is estimated to be $11 million per year. This means that for every dollar of the $40 million per annum that the sector receives in funding, volunteers' contribution equates to another $0.28.

It is likely, however, that some of the volunteers will be contributing in a way that would be remunerated in an equivalent paid position above the minimum wage, for example, those who act in the role of managers and supervisors. A more realistic estimate of the value of volunteers might be to base it on assumptions of what they would be paid in equivalent paid positions[8].

Figure 28 is based on the following assumptions:

Board Directors/Trustees:

- 16 of the 33 organisations do not pay their board members;
- Each board averages six members;
- An average director's fee of $20,000 per year;

Managers:

- One manager in 100 full time equivalent volunteers workers (one percent of the total full-time equivalent volunteer staff);
- An average manager's salary of $100,000 per year.

Supervisors:

- One supervisor in 10 full time equivalent volunteers (ten percent of the total full time equivalent volunteer staff);
- An average supervisor's salary of $50,000 per year.

Experienced volunteer staff:

- Approximately 45% of non-supervisor/ manager staff;
- An average staff salary of $34,000 per year.

Volunteer staff in training:

- the remaining balance of volunteers;
- payment at the minimum wage of $12.50 per hour or $26,000 per year, per FTE.

[8] To monetise the value of volunteers, assumptions related to the paid equivalent are required. Note, however, the literature is clear that for a large proportion of volunteers, they become volunteers because the work is unpaid and involves giving back to the community.

Figure 28: Estimation of Value-Added by Volunteers (2008 Dollars)

Staff FTE and Pay	Scenario		
	Conservative	**Medium**	**High**
Hrs per week	1	5	10
Full Time Equivalent	425	2125	4250
Board Director			
Number (9.6 fte)	96	96	96
Average Fee ($20,000)	$1,920,000	$1,920,000	$1,920,000
Manager			
FTE	4	21	42
Pay ($100,000 p.a.)	$400,000	$2,100,000	$4,200,000
Supervisor			
FTE	42	212	425
Pay ($50,000 p.a.)	$2,100,000	$10,600,000	$21,250,000
Experienced Staff			
FTE	170	850	1700
Pay ($38,000 p.a.)	$6,460,000	$32,300,000	$64,600,000
Staff in Training			
FTE	199	1032	2073
Pay ($26,000 p.a.)	$5,174,000	$26,832,000	$53,898,000
Total Value-Add	**$16,054,000**	**$73,752,000**	**$145,868,000**

Source: PwC based on information from the water safety sector.

Based on the above assumptions, taking the most conservative estimate of volunteer time, the value of the volunteer' contribution to the water safety sector in 2008 is estimated as follows:

- Board Directors/Trustees: $1.9 million;
- Managers: $0.4 million;
- Supervisors: $2.1 million;
- Experienced: $6.46 million; and
- Trainees: $5.17 million.

The above totals $16.0 million. In other words, for each dollar of the $40 million in funding received by the water safety sector, these estimates suggest that volunteers add a further $0.40.

For the medium scenario, assuming 5 hours per week for each volunteer, this addition value-add is $73.7 million or a further $1.85 for every dollar invested. If the average hours of volunteers are 10 per week, then this value-add contribution escalates further to $3.65 for every dollar invested.

As other parts of this study describe, there is also a large amount of equipment used by the sector. A large proportion is likely to have been contributed voluntarily to the sector as in-kind contributions. This is a further addition to the sector's voluntary contribution. If it was fully quantified and monetised, the sector's value would be further enlarged.

Meeting rooms, changing rooms, storage for equipment are amongst the forms of accommodation that the sector may use free of charge or at a subsidised cost. Access to these facilities is an additional resource that enables and increases the capability of the water safety sector to carry out its activities. It is because of volunteers' in-kind contribution and access to these facilities that the water safety sector can add substantial value when investment is made in the DPS initiatives.

Other qualitative benefits

Other economic and social impacts of the sector that also provide significant wider benefits are those that come about from the increased productivity of the may come about with increased water safety.

Effectively, those members of the population who feel safer may swim and undertake a range of water-related activities more frequently. This physical activity has been shown through many clinical studies to lead to:

- better health;
- higher levels of involvement in work;
- greater application of education; and
- overall better wellbeing.

All these, in turn, contribute to higher levels of productivity.

There is a growing body of research that shows and measures how routine amounts of physical activity can reduce health costs, chronic conditions and increase productivity. As the scope of this study was on the prevention of drowning and water-related injury, the population studied was directly related to drowning and injury. A future study of the relationship between swimming and increased physical activity linked to increased productivity and improved health is likely to show substantial increased benefits from this sector.

Other possible qualitative benefits relate to the value of the recreational activities themselves which may increase because people feel safer around water. This may include both a commercial return, for example, to manufacturers of water-related gear, which would have a direct economic impact, for example, through greater use of recreation venues and so on.

Conclusion

A description of the economic impact and voluntary contribution of the water safety sector indicates that its contribution is considerable. Indicative amounts in this Chapter show that it is above and beyond what it is funded. With the implementation of the DPS initiatives, this value is likely to be increased. The next sections discuss the initiatives and the approach for estimating the value that they add.

8 Industry Initiatives to Achieve the Goals of the Drowning Prevention Strategy

Key Points

- ACC, in conjunction with major organisations in the water-safety sector, has developed four water safety initiatives to meet the objectives of the DPS.
- The initiatives relate to research, rescue, education and the environment.
- The research initiative does not directly contribute to water safety outcomes; however it is believed that it will play an important role for ensuring the effectiveness of the other initiatives.

Overview

This chapter outlines four proposed water safety initiatives to be implemented as part of the Drowning Prevention Strategy:

- the **research initiative** will develop the tools required to monitor and evaluate the performance of the other initiatives and associated organisations;
- the **rescue initiative** will establish and enforce sector best practice in rescue activity, develop an internal networking and collaborative framework and carry out a stock take of rescue providers for evaluation purposes;
- the **education initiative** includes research, review and a stocktake to evaluate current educational measures within the industry, including determining the groups not currently targeted.

  The other goal within the educational initiative is to provide targeted promotional materials; and
- the **environment initiative** includes three distinct processes, namely to:
  - develop a sector wide risk analysis tool which can be implemented across the wet spaces sector;
  - upgrade the current water safety signage standard; and
  - set up a forum for managers of aquatic spaces, to be used for sector development and awareness.

Although the research initiative is not, on its own, expected to have a direct effect on the number of drowning fatalities and injuries, it has been identified by the industry as necessary in order for the other initiatives to be effective. The four initiatives target specific objectives within the DPS .

Objectives of the DPS

The objectives of the DPS are:

Objective 1: to provide strategic direction and effective co-ordination by and for the water safety sector;

Objective 2: to ensure an appropriate water safety infrastructure;

Objective 3: to ensure an appropriate level and distribution of resourcing for water safety initiatives and agencies;

Objective 4: to improve our water safety knowledge through research and development;

Objective 5: to provide quality water safety emergency rescue services;

Objective 6: to provide quality water safety education and awareness;

Objective 7: to create safer environments in, on, under and around water; and

Objective 8: to enhance community and sector engagement in water safety initiatives.

The proposed initiatives will contribute to each of these objectives (directly to objectives 2 – 8 and indirectly to objective 1) by requiring a common strategy and effective coordination. We have performed a cost benefit analysis for the initiatives as part of the implementation of the DPS. We could not conduct a discrete cost benefit analysis for each objective of the strategy in isolation.

The Research Initiative

The research initiative will consist of the following four activities:

1. Ensure all identified national datasets for drowning prevention, water-related injuries and rescue statistics can be systematically utilised. Analyse data from the identified national datasets for drowning prevention, water-related injuries and rescue statistics to identify potential trends, high risk groups and identify if drowning prevention initiatives are working.

2. Develop indicators for non-fatal incidents which can be reported annually.

3. Establish criteria to evaluate water safety programmes and interventions.

4. Conduct a comprehensive analysis of water-related injuries to determine specific areas of benefit for targeting.

The total cost of the research initiative and the breakdown over each of the years and actions is set out in the figure below.

Figure 29: Research DPS initiative costs

Research								
($000)	*Year Ending*	**Dec-09**	**Dec-10**	**Dec-11**	**Dec-12**	**Dec-13**	**Dec-14**	**Dec-15**
Research initiative								
1.Uitilse/analyse national datasets		50			50			50
2.Develop and report indicators		200						50
3.Establish evaluation criteria		450						350
4.Injury analysis for targeting		150		50		50		50
Total		**850**	**-**	**50**	**50**	**50**	**-**	**500**

Source: Water safety sector

The research initiative targets Objective 4 of the DPS, as it aims to improve New Zealand's water safety knowledge through research and development. Specific areas within the objective that have been identified as areas for targeted improvement are:

- Objective 4.1.2 - enhance surveillance systems;
- Objective 4.2.2 - develop and use key indicators for water safety and objectives; and
- Objective 4.3.2 - evaluate water safety programmes and interventions.

The Rescue Initiative

The rescue initiative consists of the six key activities briefly described below:

1. Develop a partnership plan to link water rescue under the DPS with other rescue and emergency entities (for example the Search and Rescue Council) and key organisations involved in water rescue.

2. Determine a best / good practice guide for water rescue practitioners.

3. Demonstrate improved internal networking and collaboration within the rescue (and wider) water safety community. This will include Civil Defence emergencies within Police Search and Rescue in order to utilise all the expertise available.

4. Conduct a stock take of all water rescue providers.

5. Conduct an analysis of the findings of the rescue needs study, against existing rescue capacity to identify overlaps and gaps. Develop a Public Rescue Equipment (PRE) Standard to ensure the correct piece of PRE is utilised in the correct environment.

6. Develop an integrated aquatic rescue training framework. This role based framework (curriculum) would ultimately lead to efficiencies in training through the delivery of generic competencies horizontally

across the sector. This will also involved re-establishing the aquatic component of the framework currently proposed by NZSAR.

The total cost of the rescue initiative and the breakdown for each year is set out in the figure below:

Figure 30: Rescue DPS initiative breakdown

Rescue							
($000) *Year Ending*	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Rescue initiative							
1.Partnership plan	5	1	1	1	1	1	1
2.Good practice guide	100	100					
3.Networking and collaboration	5	1	1	1	1	1	1
4.Stock take of water rescue providers	40	5	5	5	5	5	5
5.Gap analysis rescue need/capacity	40	5	5	5	5	5	5
6.Aquatic rescue training framework	200	200	100	50	50	50	50
Total	**390**	**312**	**112**	**62**	**62**	**62**	**62**

Source: Water safety sector

The rescue initiative targets Objective 5 as it intends to further the supply of quality water safety emergency rescue services. Specific areas within the objective that have been identified as areas for targeted improvement are:

- Objective 5.1.1 - review and continue to support existing water rescue services;
- Objective 5.1.2 - co-ordinate water rescue services; and
- Objective 5.1.3 - identify priority areas for water rescue.

The Education Initiative

The education initiative consists of five actions as set out below.

1. Complete a review of literature on the effectiveness of education in reducing the risk of drowning and other water-related injuries in the DPS risk environments, activities and groups.
2. Undertake analysis of the findings of the literature review and stock take against existing water safety education and awareness initiatives to identify overlaps and gaps.
3. Ensure existing messages are correct and relevant, thereby identifying any gaps.
    - The range of safety messages have been developed but there needs to be more research and analysis of each accident to develop an understanding of which safety messages will have the most impact on reducing the number of fatalities and injuries.
4. Provide ongoing support for NGOs, as well as relevant government agencies, to ensure that safety promotions are consistent, relevant and achievable.
5. Develop messages and promotions that are simple, consistent and carefully focussed on the most important key factors in order to have the greatest impact.
    - The uptake of safety messages and their translation into safer behaviour takes time and, therefore, there is a need for ongoing, repeated and consistent safety messages.

The total cost of the education initiative and the breakdown for each year is set out in the figure below.

Figure 31: Education DPS initiative breakdown

Education							
($000) *Year Ending*	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Education initiative							
1.Literature review effectiveness education	50					50	
2.Gap analysis education/awareness initiatives	50					50	
3.Impact analysis safety messages	200	200	200	200	200	200	200
4.Ongoing support NGOs/government agencies	250	250	250	250	250	250	250
5.Messages and promotions	500	400	300	300	300	300	300
Total	**1,050**	**850**	**750**	**750**	**750**	**850**	**750**

Source: Water safety sector

The education initiative targets Objective 2, through ensuring an appropriate water safety infrastructure, Objective 3 by providing an appropriate level and distribution of resourcing for water safety initiatives and agencies, Objective 4 as it intends to improve our water safety knowledge through research and development and Objective 6 through improved quality water safety education and awareness.

The Environment Initiative

The environment initiative consists of three key activities briefly described below.

1. Develop a sector-wide risk analysis tool and implement across the aquatic environment sector.
    - Develop and implement best practice risk management tools on aquatic spaces in order to develop evidence based implementation plans to generate drowning prevention priorities.
2. Update the Water Safety Signage Standard.
    - Modernise the existing standard of water safety signage to have an Australian / New Zealand standard that aligns with ISO signage standards.
    - A fundamental cause of drowning is a lack of provision of warnings to hazardous environments - being able to provide better signage guidelines will align messages from site to site.
    - This initiative also provides universal education on symbol meanings.
    - This enables coordination between signage standard and public rescue equipment standards.
3. Set up a manager forum for sector development and awareness to enable aquatic spaces to be informed of public safety practices.
    - Delivery of the forum will be via bi-annual conference, supported by the “managing water environments" website interface, including resources for land managers and providing centralised access to standards, guidelines, plans, advice links/contact and case studies.
    - Over time, the aim is to build this content into business as usual for all land managers of 'wet' environments.

The estimated costs of this initiative are set out in the figure below, broken down for each of the three activities for each of seven years of the DPS.

Figure 32: Environment DPS initiative breakdown

Environment							
($000) *Year Ending*	**Dec-09**	**Dec-10**	**Dec-11**	**Dec-12**	**Dec-13**	**Dec-14**	**Dec-15**
Environment initiative							
1.Develop sector-wide risk analysis tool	800	500	350	350	350	350	350
2.Update Water Safety Signage Standard	10	50			10	10	
3.Manager Forum for sector developoment	150	10	105	10	110	10	115
Total	**960**	**560**	**455**	**360**	**470**	**370**	**465**

Source: Water safety sector

The DPS environment initiative targets four of the DPS objectives. It relates to Objective 2 through ensuring an appropriate water safety infrastructure, Objective 6 through improved quality water safety education and awareness, Objective 7 by creating safer environments in, on, under and around water, and Objective 8 through enhancement of community and sector engagement in water safety initiatives.

Specific areas within Objective 7 have been identified as areas for targeted improvement within the environment initiative:

- Objective 7.1.1 - identify existing, and develop new, practices which promote safe environments;
- Objective 7.2.1 - support co-ordination between agencies with responsibilities for managing environments;

- Objective 7.3.1 - develop and promote key water safety messages to create safer environments;

- Objective 7.4.1 - increase the understanding and application of risk and hazard management principles and tools in respect of the DPS priority environments; and

- Objective 7.5.1 - promote the uptake of environmental interventions.

Conclusion

The estimated costs of the four identified initiatives, as part of the wider DPS, can be set out over the years until 2015. The next chapters examine the potential impacts of these initiatives. Chapter 9 compares outcomes based on a cost / benefit analysis of the initiatives.

9 Cost / Benefit Analysis of DPS Initiatives

Key Points

- Key drivers of the value of the costs and benefits of the DPS are lives saved and injuries prevented resulting from the proposed industry initiatives.
- Estimates of these drivers have been quantified and projected using an effectiveness factor multiplied by a targeted drowning population, based on the views of members of the DPC.
- The key costs and benefits are given a monetary value (monetised) through the use of a measure of the value of statistical life, using a willingness to pay methodology.
- A net present value (NPV) analysis has been conducted, resulting in a positive NPV of $213 million under the DPS initiatives (base assumptions).
- Through sensitivity analysis of the key drivers, the NPV of the project is in the range of $77 million (conservative assumptions) to $213 million (base assumptions).
- The benefit cost ratio (BC ratio) is estimated to be in the range of 9.0 to 23.3.

Introduction

Drowning and water-related injuries are significant costs to New Zealand and have significant negative impacts on the social and economic welfare of affected stakeholders. Initiatives that prevent drowning fatalities and water-related injuries not only benefit the individual and families of friends, but also provide economic and social benefit to New Zealand.

A cost / benefit analysis (CBA) provides a number of objective measures which can be used to assess the attractiveness of an initiative or proposal. This chapter sets out the approach taken, the assumptions made and findings from the CBA carried out for the proposed DPS initiatives.

Scope

The CBA has been carried out in accordance with Treasury guidelines, which provide the primary guidance for the public sector in New Zealand [New Zealand Treasury, 2005]. In particular, the guidelines recommend:

- identifying costs and benefits consistent with other standard approaches;
- excluding depreciation, capital charges and financing costs;
- expressing costs exclusive of GST and other taxes;
- only considering marginal benefits and costs; and
- presenting all benefits and costs in real terms and for a common price year.

The CBA has also been prepared:

- using an economic approach (as opposed to an accrual accounting approach); and
- on a national basis – benefits have been considered from a ‘whole-of-country’ perspective.

The time period for the analysis is 1 January 2009 to 31 December 2015. This is consistent with the intended completion of the initial phase of the initiatives. The majority of economic benefits are expected to be realised, and costs incurred, during this time period.

Benefit Identification

The definition of a benefit given by Treasury is “any gain in the welfare of society or the individuals that comprise it from the proposal being considered”.

The direct and intangible benefits of the initiatives were identified through extensive consultation with the water safety industry, a literature review and discussions with ACC.

Direct Benefits

The direct benefits of the DPS initiatives are the financial costs that are saved as a direct result of the initiatives. These include:

- search and rescue costs, as in some circumstances the initiatives should preclude the need for search and rescue activity;
- medical and rehabilitation costs, including:
  - hospital level services provided by the District Health Boards;
  - the medical component of ACC claim costs; and
  - medical costs incurred in the primary health sector.

Intangible Benefits

In addition, there are likely to be significant intangible benefits from preventing water-related deaths and injuries. Benefits identified include the prevention of pain, suffering and the loss of productivity and output (a temporary loss for injuries and a permanent loss for deaths) [Ministry of Transport, 2008].

Quantifying the Benefits

An important step in a cost benefit analysis is quantifying the key drivers of the benefits. In this case, the key drivers are clearly the number of lives saved and injuries prevented. The water safety industry has provided estimates of:

- the number of people, who currently drown and are injured, that each initiative plans to target (Figure 33); and
- an ‘effectiveness’ factor, reflecting the expected achievement of the target number of preventions (i.e. the percentage of targeted drowning fatalities and injuries that are expected to be successfully prevented) (Figure 34 and Figure 35).

Figure 33: Number of drowning fatalities and injuries targeted by the DPS initiative per annum

Drowning fatalities	
Research	N/A
Rescue	5.5
Education	15
Environment	20

Injuries	
Research	N/A
Rescue	45
Education	45
Environment	500

Source: Water safety sector
Note: The research initiative will not directly prevent drowning fatalities and injuries.

Figure 34: Drowning fatality prevention effectiveness factors (% of targeted number of drowning fatalities prevented) of DPS initiatives

Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Research	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rescue	30%	30%	30%	30%	30%	30%	30%
Education	5%	10%	15%	15%	15%	15%	15%
Environment	5%	10%	30%	40%	60%	70%	80%

Source: Water safety sector

Figure 35: Injury prevention effectiveness factor (% of targeted number of injuries prevented) for DPS initiatives

Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Research	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rescue	30%	30%	30%	30%	30%	30%	30%
Education	5%	10%	15%	20%	20%	20%	20%
Environment	5%	10%	30%	40%	60%	70%	80%

Source: Water safety sector

Figure 36 summarises the expected number of drowning fatalities and injuries prevented, based on the water safety sector assumptions set out in Figures 36 to 39.

Figure 36: Number of drowning fatalities and injuries expected to be prevented by the DPS initiatives

Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Lives saved	3	5	10	12	16	18	20
Minor injuries prevented	40	68	169	221	321	370	420
Serious injuries prevented	0	0	1	1	2	2	3

Source: Water safety sector, PwC calculation

The number of injuries expected to be prevented has been split into minor and serious injuries[9]. This is because the benefit (in monetary terms) of preventing a serious injury and a minor injury is quite different. This is explained further in the following section of this chapter.

Monetising the Benefits of the DPS Initiatives

Estimating the value, in monetary terms of the benefits of the proposal or initiative being considered is often the most challenging aspect of a cost benefit analysis. The analysis in Chapter Six of this report relating to the cost of drowning fatalities and injuries is also applicable to this section. The benefit (in monetary terms) of saving a life is conceptually the same as the cost of losing a life.

Direct Benefits

Drowning Fatalities Prevented – Medical Costs and Search and Rescue Costs

As Chapter Six describes, there is a lack of robust data about the direct medical costs and search and rescue costs for drowning fatalities.

Due to the relative insignificance of these costs, and in the interests of being conservative, it was assumed the direct benefit of preventing a drowning fatality is zero. This approach has been replicated here, for the same reasons.

[9] The split into minor and serious injuries is based on work done by the Ministry of Transport. The Ministry considered any injury with a medical cost of greater than $13,400 as serious. Historical ACC data suggests that approximately 0.6 percent of water-related injuries would be considered serious under this definition.

Injuries Prevented – Medical Costs and Search and Rescue Costs

The approach used for estimating the direct benefit of preventing an injury in Chapter Seven has been replicated here. The direct benefit for each injury prevented is based on the medical component of the ACC data plus a proportion of ACC costs incurred from District Health Board (DHB) services (search and rescue costs have been excluded due to a lack of robust data). The proportion used reflects the proportion of non-DHB ACC costs for water-related injury.

Figure 37: Table of direct benefits 2009-2015

($000) Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Direct benefit per life saved	-	-	-	-	-	-	-
Direct benefit per injury prevented	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Source: Water safety sector, PwC calculation

Figure 37 summarises the monetary value of the direct benefit per drowning fatality / injury prevented.

Intangible Benefits

Drowning Fatalities Prevented

As discussed in Chapter Six, PwC carried out research into approaches used both internationally and within New Zealand for estimating the benefit of preventing a fatality. The value of a statistical life approach, specifically the willingness to pay methodology (WTP), was considered the most appropriate approach for this analysis. This estimates the value of a life, estimating the amount society is willing to pay to prevent a death.

The estimate of the value of a life used in this analysis is based on the Ministry of Transport's estimate of $3.4 million (adjusted to December 2008 dollars).

Injuries Prevented

As discussed in Chapter Six, the intangible benefit of preventing an injury has also been estimated by an adjustment factor to the estimate of the value of a life lost through drowning ($3.4 million). The adjustment factor reflects the lower value society places on preventing injury as opposed to death. The Ministry of Transport estimates of these adjustment factors have been used (10 percent for a serious injury and 0.4 percent for a minor injury). This results in an estimated benefit per minor and serious injury prevented of $13,611 and $340,269 respectively.

Summary

Figure 38 summarises the estimated direct and intangible benefits per injury / drowning fatality prevented.

Figure 38: Estimated benefit per injury / drowning fatality prevented

($000) Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Direct benefits							
Medical costs - drownings	-	-	-	-	-	-	-
Medical costs - injuries	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SAR costs - drownings	-	-	-	-	-	-	-
SAR costs - injuries	-	-	-	-	-	-	-
Intangible benefits							
Drowning prevented	3,403	3,403	3,403	3,403	3,403	3,403	3,403
Minor injury prevented	14	14	14	14	14	14	14
Serious injury prevented	340	340	340	340	340	340	340

Source: Water safety sector, PwC calculation

The estimated total value of the benefit of the initiatives due to lives saved (injuries prevented) can then be calculated by multiplying the number of drowning fatalities prevented (injuries prevented) over the period as shown in Figure 36 by the benefit rates identified in Figure 38.

Figure 39 summarises the estimated total benefit per annum of the initiatives[10]. It highlights the expected increase in benefits over time, primarily driven by the expected increase in the effectiveness of the DPS initiatives.

Figure 39: Estimated value of benefits 2009-2015

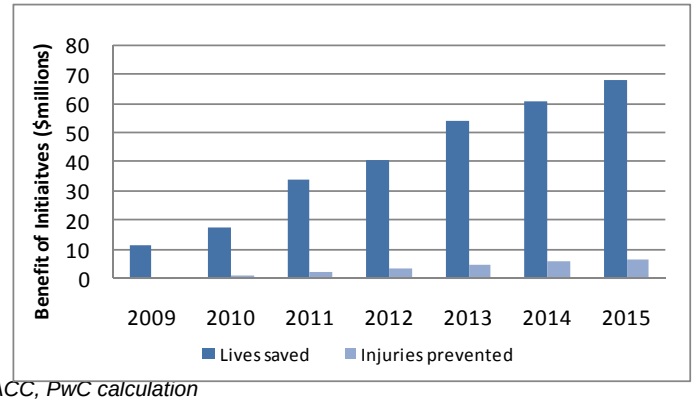
($000) Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Direct benefits							
Lives saved	-	-	-	-	-	-	-
Injuries Prevented	18	29	73	94	135	159	179
Intangible benefits							
Lives saved	11,569	17,524	33,687	40,492	54,103	60,908	67,713
Injuries Prevented	645	1,062	2,654	3,468	5,005	5,822	6,586

Source: Water safety sector, PwC calculation

Figure 40 presents the same information from the table above in graphical form. It highlights that the estimated benefit of drowning prevention is significantly higher than for injury prevention.

The key point is that the prevention of drowning, rather than the prevention of injury makes up the majority of the value in the benefits of the initiatives.

Figure 40: Estimated value of benefits 2009-2015



Source: ACC, PwC calculation

Costs

The water safety sector will require additional funding in order to implement these initiatives. An estimate of these costs is set out in Figure 41.

Figure 41: Total costs of initiatives by year

($000)	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Research	850	-	50	50	50	-	500
Rescue	390	312	112	62	62	62	62
Education	1,050	850	750	750	750	850	750
Environment	960	560	455	360	470	370	465
Total	**3,250**	**1,722**	**1,367**	**1,222**	**1,332**	**1,282**	**1,777**

Source: Water safety sector

As these estimates have been provided by the organisations that have a vested interest in the initiatives, sensitivity analysis is used later in this chapter, in the risk and uncertainty section, to assess their robustness.

[10]The direct benefit plus intangible benefit per drowning fatality prevented, multiplied by the number of drowning fatalities prevented, plus the direct and intangible benefit per injury prevented, multiplied by the number of injuries expected to be prevented.

Analysis of the Economic Merit

The Net Present Value Approach

There are a number of approaches to evaluating the attractiveness of an initiative as part of a cost benefit analysis. The most commonly used approach is to calculate the net present value (NPV) of the estimated economic costs and benefits of the initiative. This involves multiplying the cost and benefit estimate for each year by a discount factor, which reflects the 'time value of money' (money or a benefit received now is more valuable than one received in the future), and the level of risk associated with achieving the expected costs and benefits.

A discounted cash flow financial model is commonly used in order to calculate a net present value. Given that the estimated economic costs and benefits of the initiatives have been expressed in real terms, a rate expressed in real terms has been used to derive the discount factor for each year. A discount rate of 8 percent has been used, which is consistent with Treasury guidance [New Zealand Treasury, 2008].

Benefit Cost Ratio

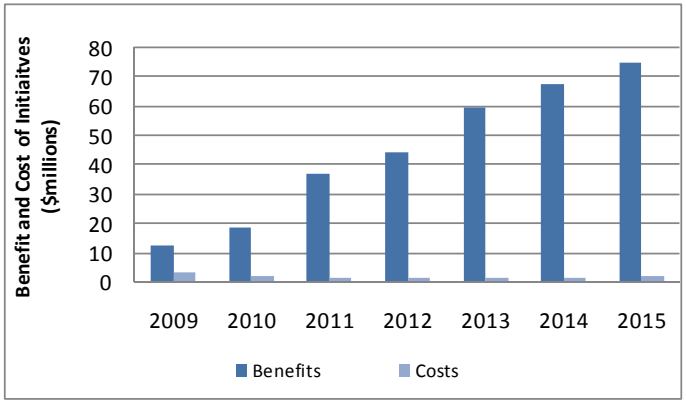
Benefit cost ratios can also be used to evaluate the attractiveness of an initiative. The benefit cost ratio is equal to the sum of the discounted estimates of the benefits of the initiative, divided by the sum of the discounted costs. The discounted costs and benefits are calculated on the same basis as for the net present value approach. Intuitively, a benefit cost ratio represents the number of dollars benefit for each dollar of cost (in present value terms).

Results

The following figures summarise the results of the net present value analysis. Key points include:

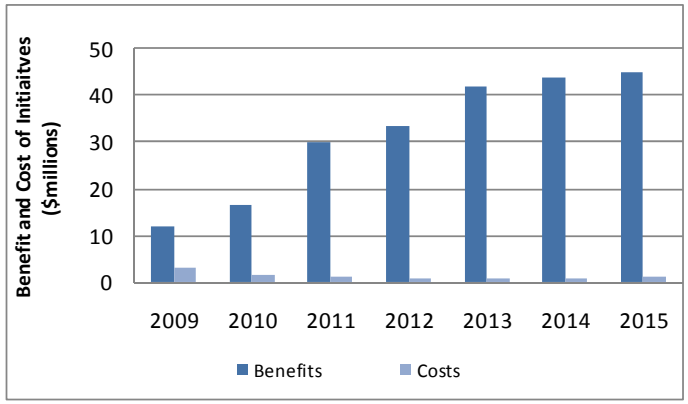
- the estimated net present value of the initiatives is $213 million;
- the benefit cost ratio of the initiatives is 23.3; and
- benefits relating to drowning prevention are significantly greater than those expected to accrue from injury prevention (drowning prevention contributes approximately 92 percent of the discounted total value of benefits).

Figure 42: Estimated total benefits and costs experienced 2009-2015



Source: Water safety sector, PwC calculation

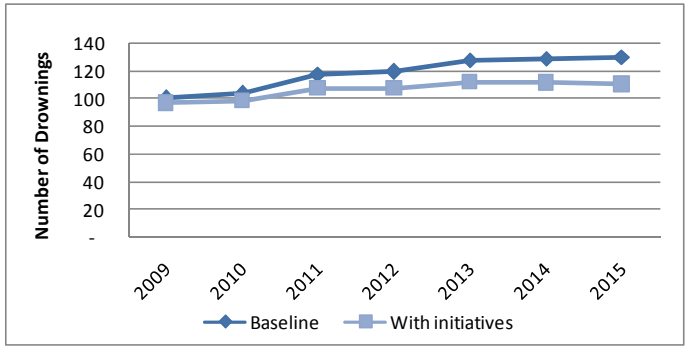
Figure 43: Estimated present value of total benefits and costs experienced 2009-2015



Source: Water safety sector, PwC calculation

The figure below contrasts the number of drowning fatalities expected over 2009 to 2015, both with and without the DPS initiatives.

Figure 44: Estimated number of drowning fatalities prevented with and without the initiatives 2009-2015



Source: Water safety sector, PwC calculation

It is estimated that between 3 and 20 lives per annum will be saved through the initiatives between 2009 and 2015 (85 lives in total).

Risk and Uncertainty

There is a degree of risk and uncertainty associated with any proposed initiative. For this analysis, risk and uncertainty are considered in terms of:

- the robustness of each input assumption; and
- the significance or materiality of each input assumption in relation to the net present value and benefit cost ratio results.

Key risks in achieving the level of net economic benefit estimated above are described in more detail below.

- The accuracy of the Ministry of Transport estimate of the value of a statistical life, in regard to drowning fatalities. The fire safety sector recently carried out a study which recognised that the value society places on saving a life is to some degree dependant on the way that death occurs [BERL et al. 2007]. The fire safety study estimated that the cost society places on a fire related death is approximately 66.7 percent of the cost of a road transport related death. This equates to an estimated cost of a fire related death of $2.3 million (December 2008 dollars). Analysis of this VOSL approach has been included in the sensitivity analysis on the next page; and
- The estimated effectiveness factor (the percentage of targeted lives saved for each of the initiatives). As the water safety industry both provided this estimate and would be the recipient of funding for the initiatives, it is important to conduct a sensitivity analysis around their estimates to minimise the threat of 'optimism bias.' There may also be a degree of risk resulting from organisational strategic and / or operational factors, as opposed to estimation issues. These issues have not been considered as part of this review.

Although not material to the result of the net present value and benefit cost ratio calculations, there is also an element of risk associated with the estimated costs of the initiatives, as:

- similar to the effectiveness estimates provided by the water safety sector, the estimates were developed by the parties who have a vested interest in the initiatives being approved - the costs provided may also contain an element of optimism bias; and

- we have not been able to review or consider the approach taken by the water safety organisations in developing these estimates.

Analysis on other input assumptions indicated they are not material to the results of the net present value and benefit cost ratio analysis.

Sensitivity Analysis

It is common practice when carrying-out a cost benefit analysis to carry out sensitivity analysis on the input assumptions identified as key risks.

The outcome of the sensitivity analysis can be used to generate a range (as opposed to a single point estimate) for the net present value and cost benefit ratio. A greater degree of comfort can be taken that net benefits in this range are achievable.

The net present value and cost benefit ratio has been calculated for the base case (scenario 1) and three sensitivity scenarios:

- applying the fire industry's adjustment factor to the standard value of statistical life, Ministry of Transport estimate (Scenario 2);

- reducing the estimate of the drowning prevention effectiveness of the initiatives by 50 percent (i.e halving the number of drowning fatalities expected to be prevented each year) (Scenario 3); and

- Applying the fire industry's adjustment factor and reducing the estimated drowning prevention effectiveness by 50 percent (Scenario 4).

Figure 45 sets out the results of the sensitivity analysis.

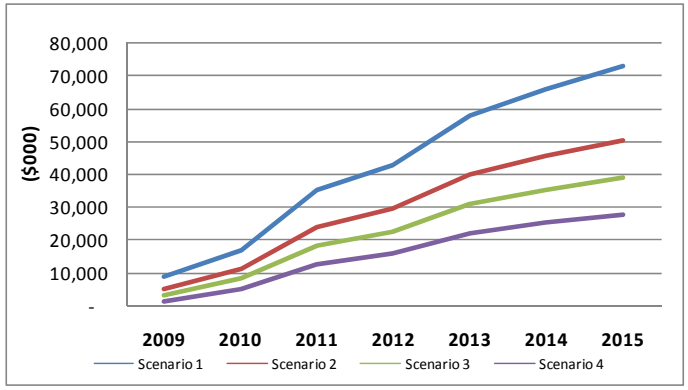
Figure 45: Summary of sensitivity analysis

	NPV ($m)	BC Ratio
Scenario 1 (base case)	213	23.3
Scenario 2 (Fire Safety WTP)	145	16.1
Scenario 3 (50% Effectiveness)	111	12.6
Scenario 4 (Fire Safety/50% Effectiveness)	77	9.0

Source: Water safety sector, PwC calculation

Figure 46 compares the three scenarios to the results using the 'base case' assumptions (Scenario 1) described above. Figure 46 shows the net benefit profile of each of the four scenarios. Scenario 1 represents the 'base case' assumptions. The net benefit of all scenarios increases over time as the initiatives become more effective in preventing drowning fatalities and water-related injuries.

Figure 46: Scenario analysis showing net benefit of DPS Initiatives 2009-2015



Source: Water safety sector, PwC calculation

Additional Economic Impacts of DPS Initiatives

The estimated costs of the proposed DPS initiatives have been allocated across the appropriate industry groups of research, cultural and recreation services, education and government services. On this basis, the estimated impact of the DPS initiatives, on the wider New Zealand economy, are shown in the following figure.

Refer to Chapter Seven for further detail regarding the approach taken for estimating "economic impacts", via "Economic Impact Studies" in this review

Figure 47: Direct and indirect economic value derived through DPS initiatives

Year Ending	Dec-09	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15
Direct employment (FTEs)	35	23	19	18	19	20	22
Total employment (FTEs)	58	36	29	28	28	30	35
Total value added ($m)	$3.90	$2.20	$1.70	$1.60	$1.70	$1.70	$2.20

Source: PwC calculation

The direct employment shows the estimated number of additional FTEs required for the DPS initiatives to be implemented. These employees will add value to the New Zealand economy through consumption. The total additional employment is equal to the direct additional employment as well as the flow on effects through an increase in the total demand within New Zealand.

The total increase in employment has a total value add to the New Zealand economy of $15 million for the analysis period. The present value of additional economic impacts of the DPS initiatives is $12 million, using the real discount rate of 8 percent.[11]

[11] Economic multipliers measure the economic changes that occur when there is an increased investment and/or activity in a particular sector or business. The changes are based on researched industry links and economic relationships. They are based on the additional contribution the DPS would make based on the contribution of its four components – research, rescue, education and environment. Of these, the government and management of the DPC members, along with the research and education initiatives are activities similar to those defined by the input/output tables.

Conclusions

In considering the conclusions from the CBA review, it is important to acknowledge that both the effectiveness factors for drowning prevention and the VOSL adjustment factor have significant impacts on the results of the CBA.

For example:

- decreasing the effectiveness factor for drowning prevention, by 50 percent reduces the estimated NPV by $102 million, to a total NPV of $111 million;

- applying the fire industry's adjustment factor to the value of a statistical life reduces the NPV estimate by $68 million, total NPV of $145 million.

Scenario 4 is 'conservative', with a 50 percent reduction in the effectiveness factor for drowning prevention and applying the fire industry's adjustment factor to the value of a statistical life. The NPV under Scenario 4 is $77 million (with a benefit cost ratio of 9.0). This represents a conservative estimate of the NPV of the initiatives.

Figure 45, on the previous page, summarises our analysis. It has generated an estimate of the NPV of the project in the range of $77 million (conservative assumptions in Scenario 4) to $213 million (base assumptions in Scenario 1). The benefit cost ratios are in the range of 9.0 to 23.3.

It is important to highlight the degree of conservatism that has been taken in developing the assumptions relating to all the assumptions in all four scenarios. The use of sensitivity analysis has furthered strengthened the robustness of the key variables.

As well as the extensive benefits identified through the CBA, additional economic impacts for the wider New Zealand economy from the implementation of the DPS initiatives has a present value of $12 million. This economic impact is derived through the creation of jobs within the New Zealand economy and the associated flow on effects.

In addition, as shown in Chapter Seven, the estimated net benefits of volunteers are significant. This has not been included in projections.

10 Conclusions

Extending over ten degrees of latitude, New Zealand is an island nation with more than 11,000 kilometres of coastline, lakes and numerous fast flowing rivers.

With 1.6 million visitors in 2008 and over 3 million domestic visitors going to the beaches and 1.5 million fishing, the aquatic environment is one of the most important sites for leisure and recreation for tourists and New Zealanders.

Claiming 537 lives over the last five years this diverse environment is as deadly as it is dramatic (WSNZ, 2009). Preventing this toll from being any higher is largely thanks to 33 non-government organisations, 17,000 volunteers, 35,000 members and at least 100 paid staff. The reliance on this large voluntary component increases the vulnerability of the sector's service provision.

Despite the decline in the incidence of drowning over past 20 years, New Zealand still has a high incidence of drowning internationally and particularly compared with Australia, the United States of America and the United Kingdom.

The economic and social cost of drowning is high. General health strategies aimed at reducing accidents do not target the high incidence of drowning fatalities and water-related injuries associated with recreational activity, immersion and non-work related activities. These costs would be much higher in the absence of the water safety sector whose activities prevent drowning fatalities.

The implementation of further initiatives to prevent drowning fatalities and water-related injuries will reduce these costs still further.

There are some groups who are at greater risk of drowning that can be specifically targeted. These are males (15 – 44 years), children under five and Maori and Pacific peoples. Over and above these groups, it should be noted that the level of swimming ability in New Zealand has decreased with fewer primary schools teaching children to swim and providing water safety skills as part of their curriculum.

The water safety sector is served by a myriad of not-for-profit organisations (NGOs). The funding of the sector is on an annual basis with no guarantee of sustained levels of funding from year-to-year. This limits the sector's ability to invest in longer term strategies and projects.

Funding of the NGOs is subject to economic conditions. Decreases in corporate revenue sponsorship, donations and charitable trusts because of the current economic downturn, has already placed increased pressures on to the water safety sector. This is expected to continue to decline over the next few years, providing significant revenue risk and anxiety within the sector.

In addition to this financial risk, the sector also has a heavy reliance on volunteers. Using the most conservative estimates of volunteer hours, the sector relies on at least $11 million dollars worth of goodwill.

For the purposes of this review the ability of the sector to continue to maintain current levels of service provision in a sustainable manner has been assumed.

Co-ordination and collaboration of the different organisations within the sector groups in the sector can be challenging. The organisations operate independently, sometimes in the same geographic locations. They compete for the same sources of funding nationally and often locally.

The drowning prevention strategy has had a positive effect in creating good will and dialogue between water safety NGOs and has encouraged greater collaboration. This has resulted in improved coordination of services.

There are four proposed categories of initiatives to be implemented which target specific objectives within the DPS. These initiatives cover research, rescue, education and the environment.

Without the projected benefits from the four proposed DPS initiatives, drowning fatalities can be expected to steadily trend upwards over the years to 2015.

Investing in the proposed initiatives has been shown to be sound as the results of the Cost Benefit Analysis display significant benefit cost ratios and strong net present values.

Using the most realistic estimates of the effects of the strategies on drowning fatalities results in a benefit cost ratio of 23.3 and net present value of $213 million.

Benefits relating to drowning prevention are significantly greater than those expected to accrue from water-related injury prevention. Drowning prevention attributes approximately 92 percent of the discounted total value of benefits.

While there are a relatively large number of water-related injuries (compared to drowning fatalities), the associated medical and other costs are relatively low (compared to road accident injuries for example).

Even using the most conservative estimate, with a 50 percent reduction in the effectiveness factor for drowning prevention and applying the fire industry's adjustment factor to the value of a statistical life, the benefit cost ratio is 9.0 and net present value of $77 million. This still displays a strong case for investment.

As well as the extensive benefits identified through the CBA, additional economic impacts for the implementation of the DPS initiatives, have a present value of $12 million. This economic impact is derived through creation of jobs within the New Zealand economy and the associated flow on effects.

The water safety sector has an economic, as well as social and indirect benefit to the economy. Even though its impact is not fully visible when analysed in national accounting terms, a description of its quantitative and qualitative impact is one way of estimating the value that it adds.

This methodology looks at the sector as an industry and shows that there is additional value above that calculated by the cost benefit modelling.

Its gross direct impact adds $40 million to the expenditure side of the national accounts annually, generating an increase in value added of at least $35 million. Household incomes benefit through an increase of at least $18 million.

Qualitative evidence, based on the value of volunteers, improved health and wellbeing and other recreation related activities could multiply these benefits still further.

Appendix A VOSL Methodology

In 1991, the Ministry of Transport began research into the cost of pain and suffering due to an unidentified road crash in order to determine a willingness to pay, by the New Zealand population, for safety improvements that result in expected avoidance of one premature death. From 1991, this estimate has been updated using an index of average hourly earnings to express the value in current dollars. The Ministry of Transport's WTP valuation is equal to $3.4 million (adjusted to December 2008 dollars).

Adjustment Based on BERL's Analysis Fire Fatalities

In 2007, Berl Economics [Sanderson et al. 2007] estimated the difference in willingness to pay for the reduction in of one premature death in fire circumstances versus road accidents.

In-depth analysis was undertaken to determine the most appropriate method to determine the relativity between fire and road mortality risk. The analysis included:

- "disability weights" as are used in the construction of health status indices such as DALYs and QALYs (these weights measure social preferences for a specified health state); and

- a survey using a matching questions approach which establishes the number of fatalities in one context whose prevention the respondent would regards as being "equally as good" as the prevention of a given number of fatalities in another context over the same period and at the same cost.

The survey was determined as the most appropriate to determine the difference in WTP. Its findings were that New Zealand individuals perceive that the value of fire VOSL falls in the range 56.6 percent to 66.2 percent of the value of the road VOSL, to a 95 percent confidence level.

BERL identified that the consistency of the survey results provide relative confidence that the VOSL relativity falls within the range displayed above. It is also recognised, however, that there is a possibility of some bias whereby the national preference differs from the one obtained through the survey. In this case, the fire VOSL may fall outside the range displayed above and the fire VOSL will differ relative to the road VOSL. From this analysis BERL adopted and an adjustment factor of two thirds (66.7%).

Considering an appropriate adjustment factor for drowning related fatalities was outside the scope of this review. On this basis, and in order to be conservative, an adjustment factor of 66.7 percent was adopted based on the BERL analysis. The implicit assumption is that the value the New Zealand public places on drowning prevention is similar to the results for fire prevention. Sensitivity analysis has been conducted to further the robustness of this variable later in the Chapter.

The International Literature

Although the New Zealand Ministry of Transport's estimate of the value of a statistical life is an accepted measure, the approach in the analysis of the DPS also takes into account other estimates. This is because, as a key input for the cost benefit analysis, the assumptions adopted about the VOSL have a material impact on the results. As discussed above, the literature review identified a series of studies that provide a range of estimates for a VOSL, in a range of different contexts. These contexts are briefly described below.

- WTP-based estimates for road safety fatality preventions are currently used in road project appraisals in the United Kingdom, United States, Canada, with several other countries employing values that have been substantially influenced by the results of WTP studies. The United Kingdom the Department for Transport uses a figure of £1.25 million in 2002 prices [United Kingdom Department of Transport, 2002].

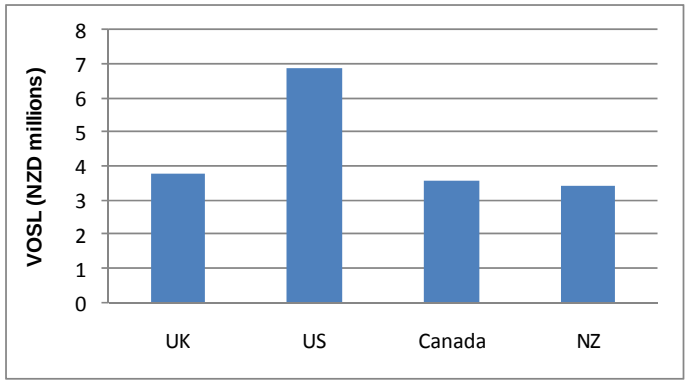
  When adjusted for inflation and the exchange rate, this estimate equates to NZ$3.77 million, as at 31 December 2008.

- In the United States, the US Department of Transportation has valued the prevention of a statistical road fatality at $US 2.6 million (1994 dollars). This was based on a literature survey of empirically estimated WTP-based values [U.S. Department of Transportation, 1994]. When adjusted for inflation and the exchange rate, this estimate equates to NZ$6.90 million, as at 31 December 2008.

- Transport Canada employs a WTP-based value for the prevention of a statistical fatality of $Cdn 1.5 million in 1991 prices based on a survey of the literature. When adjusted for inflation and the exchange rate, this estimate equates to NZ$3.58 million, as at 31 December 2008.

Figure 48 compares the New Zealand Ministry of Transport's VOSL estimate to these other Transport authorities. The New Zealand estimate is in line with the United Kingdom and Canada but significantly lower than that for the United States.

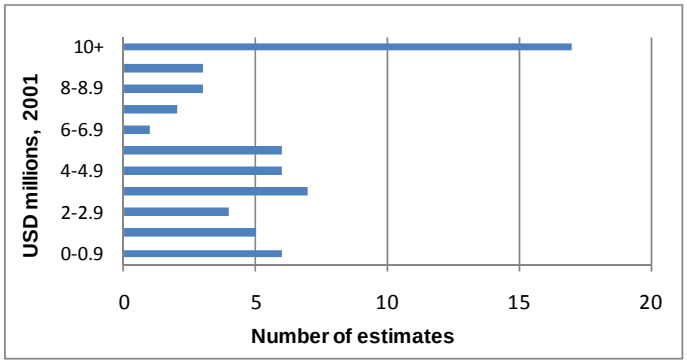
Figure 48: International transport Authority's VOSL estimate – Adjusted to December 2008 dollars



Source: UK Department for Transport, US Federal Highway Administration, Transport Canada, New Zealand Ministry of Transport
Note: figures have been adjusted for inflation and converted to NZD using 31/12/08 exchange rates.

The literature review identified a range of other studies that developed estimates of the VOSL. Figure 49 provides an overview of these estimates.

Figure 49: Distribution of historical value of statistical life estimates (USD millions, 2001)



Source: Neumann J et al (2001)

Water-related Injuries

Of the water-related injuries, 942 were serious injuries and 145,318 were minor injuries. Each type of injury is identified using the medical component of the ACC data, including hospital health services.

The intangible costs of injuries avoided have been calculated by applying the adjustment factor to the Ministry of Transport's estimate of a value of statistical life reflecting the lower value society places on preventing on injury. The Ministry of Transport estimates of these adjustment percentages has been applied. These are 10 percent for a serious injury and 0.4 percent for a minor injury.

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Appendix C Key Terms of Business and Restrictions

This Report has been prepared solely for the purposes stated herein and should not be relied upon for any other purpose.

This Report is strictly confidential and (save to the extent required by applicable law and/or regulation) must not be released to any third party without our express written consent which is at our sole discretion.

To the fullest extent permitted by law, PwC accepts no duty of care to any third party in connection with the provision of this Report and/or any related information or explanation (together, the "Information"). Accordingly, regardless of the form of action, whether in contract, tort (including without limitation, negligence) or otherwise, and to the extent permitted by applicable law, PwC accepts no liability of any kind to any third party and disclaims all responsibility for the consequences of any third party acting or refraining to act in reliance on the Information.

We have not independently verified the accuracy of information provided to us, and have not conducted any form of audit in respect of the Company. Accordingly, we express no opinion on the reliability, accuracy, or completeness of the information provided to us and upon which we have relied.

The statements and opinions expressed herein have been made in good faith, and on the basis that all information relied upon is true and accurate in all material respects, and not misleading by reason of omission or otherwise.

The statements and opinions expressed in this report are based on information available as at the date of the report.

We reserve the right, but will be under no obligation, to review or amend our Report, if any additional information, which was in existence on the date of this report was not brought to our attention, or subsequently comes to light.

We have relied on forecasts and assumptions prepared by the Company about future events which, by their nature, are not able to be independently verified. Inevitably, some assumptions may not materialise and unanticipated events and circumstances are likely to occur. Therefore, actual results in the future will vary from the forecasts upon which we have relied. These variations may be material.

This report is issued pursuant to the terms and conditions set out in our engagement letter and the Terms of Business attached thereto.

In addition the following should be noted:

- certain numbers included in tables throughout this report have been rounded and, therefore, do not add exactly; and

- unless otherwise stated, all amounts are stated in New Zealand dollars.