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THE QUANTIFICATION OF INDIRECT BENEFITS FROM FLOOD PROTECTION IN THE LOWER WAIKATO

A Thesis submitted in partial fulfilment of the requirements for the
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New Zealand.

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Abstract

Flood protection schemes provide a wide range of benefits to people living in the immediate floodplain area and to those living further away from the floodplain area. Since such schemes are public goods, they are often provided and managed by the government or local bodies. According to the Local Government Act (No.3) of 1996, the community based funding of such works are to be allocated purely according to benefit received. In other words, those who benefit from the works are required to contribute towards the costs of the works, in proportion to the benefits they received. Hence the need for the quantification of benefits.

The Rating Powers Act of 1988 requires the rating of flood protection schemes to take into account direct and indirect beneficiaries. In this research the aim was to quantify the indirect benefits from flood protection in the Lower Waikato, using the non-market valuation technique of Contingent Valuation. In particular the study focused on the indirect beneficiaries of the Lower Waikato Waipa Flood Control Scheme (LWWCS). A total of 800 households in the indirect benefit area of the LWWCS were sent a mail questionnaire to elicit their willingness to pay for indirect flood protection. A return rate of 31 percent was obtained.

The results obtained indicated that 56.8 percent of the respondents perceived to benefit from the LWWCS, and 65.3 percent respondents believed that flood protection was worth paying for. The dollar value allocated to indirect flood protection in the Lower Waikato was estimated at \$21.40 per year per household.

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Chapter 1

Introduction

1.0 Introduction

Flood protection schemes are public goods from which society derives a wide range of benefits. Such goods have the characteristics of being non-excludable and non-rivalous. This means that no one can be excluded from their use and the use by one individual does not affect the use of another.

The benefits from flood protection schemes accrue to everybody living in the floodplain area, irrespective of whether they have contributed to the cost of providing the scheme or not. It is for this reason that flood protection schemes are not provided by the market but by some central or local authority that can extract payment from all those affected.

Once in place, flood control schemes provide benefits to those in the floodplain area in terms of avoided flood damage, however others living in close proximity to the flood plain who are not directly threatened by floods also benefit from the scheme. These people benefit if their access to towns, work, hospitals and schools runs through the floodplain area. Further people in the wider region also benefit from an increase in economic activity due to the presence of the scheme. It is these indirect beneficiaries who are the focus of this thesis.

The Lower Waikato Waipa Control Scheme (LWWCS) is a major flood control scheme instigated by the Waikato Regional Council (Environment Waikato). The scheme is designed to provide protection and drainage improvements within the flood plains of the Lower Waikato and Waipa Rivers. Scheme construction was commenced in 1961 and completed in 1982 at a total cost of some \$135 million in today's values. The scheme primarily consists of stopbanks, pumpstations, floodgates, and main river channel improvement works. The indirect beneficiaries of the LWWCS are the main focus of this study.

1.1 New Zealand Legislation

1.1.1 The Resource Management Act 1991

In New Zealand the primary legislation that controls environmental effects is the Resource Management Act 1991 (RMA). Its purpose is to promote the sustainable management of New Zealand's natural and physical resources. This includes avoiding or mitigating any negative effects on the environment. The purpose and principles are set out in Part II of the Act (see Appendix 1).

Section 30 of the RMA sets out the functions of Regional Councils under the Act. In particular, subsection (1)(c)(iv) focuses on the avoidance and mitigation of natural hazards. It states:

S30. Functions of regional councils under this Act-

(1) Every regional council shall have the following functions for the purpose of giving effect to this Act in its region:

(c) The control of the use of land for the purpose of-

- (i) Soil conservation:
- (ii) The maintenance and enhancement of the quality of water in water bodies and coastal water:
- (iii) The maintenance of the quantity of water in water bodies and coastal water:
- (iv) The avoidance or mitigation of natural hazards:
- (v) The prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances.

As this directly relates to the purpose of the Act, the construction and maintenance of flood control schemes clearly become a responsibility of the Regional Council in achieving the purpose of the Act. To help the council achieve this, the Local Government Amendment Act sets out the funding principles.

1.1.2 The Local Government Act (No.3) 1996

The Local Government Act No.3 (LGA), in particular Section 122F, addresses the principles in respect of community based funding, beneficiary contributions, and contributory or exacerbator contributions (see Appendix 2).

The development of funding systems under the LGAA is a three-step process. The three steps can be summarised as:

1. Allocate costs purely according to benefit and contribution.
2. Modify cost allocation taking into account the interests of residents and ratepayers, fairness and equity, Council policies, and avoidance of significant adjustments.
3. Consideration of the extent to which it is practical and efficient to fund expenditure in a way that achieves the modified cost allocations arrived at step two.

1.1.3 Rating Powers Act 1988

The Rating Powers Act 1988 (RPA) provides Environment Waikato with a specific mechanism for rating drainage and river protection. Section 41 of the Act sets out the matters that are to be taken into account in respect of direct and indirect benefits. This includes consideration of the extent to which the characteristics or the use of any property or actions of the occupier are likely to contribute to or alleviate the need for the work or service provided. It states:

S41 Differential rates -

- (1) In adopting a differential rating system in terms of section 79 to 93 of this Act in accordance with section 40(3) of this Act, a Board shall take account of -
 - (a) The benefits that are, in the opinion of the Board, likely to accrue, directly or indirectly, to any property from the work or service in respect of which the separate rates are to be made; and
 - (b) The extent to which the characteristics or the use of any property, or any actions of its occupier, are, in the opinion of the Board, likely to either contribute to or alleviate the need for the work or service concerned.

The combined effect of the respective sections of the Local Government Act (No.3) and the Rating Powers Act are that the differential rating system should take account of direct benefit, indirect benefit, and contributory or exacerbatory matters.

1.2 Objectives of research

The purpose of this research is to find a methodology that will help decision-makers identify and quantify the indirect benefits from flood protection. The results of this research can then be used in the allocation of yearly maintenance costs among the direct and indirect beneficiaries of the LWWCS.

The specific objectives of the research are:

1. To select an appropriate method for evaluating the indirect benefits from the LWWCS.
2. To gather peoples opinions and attitudes towards paying for flood control in the Lower Waikato.
3. To place a dollar value on flood protection to the indirect beneficiaries.
4. To provide information to determine the most significant factors influencing this value.

1.3 Methodology

This study focuses on the identification and quantification of indirect benefits from flood protection in the Lower Waikato. Since goods and services such as protected road access and peace of mind are not traded in the market, there is no market valuation of their worth to society. Alternative means need to be employed to value these goods and services. It is through the non-market valuation techniques that we set out to value their worth.

Since public funds are used to finance public projects which lack market values, non-market valuation approaches this problem either of two ways:

- (i) observe peoples revealed preferences for substitute or complement marketed goods
- (ii) elicit people's preferences using a stated preference technique.

1.4 Importance of research

- This research will contribute to the decision making process of the Waikato Regional Council and to the general field of resource evaluation research.
- It will aid decision-makers in the identification and estimation of indirect benefits from flood protection schemes, which will in turn help allocate the yearly maintenance costs from such schemes among the direct and indirect beneficiaries.

1.5 Thesis outline

In Chapter two, a discussion of the economic theory behind non-market valuation and its various techniques are presented. In particular the Contingent Valuation Method is discussed in detail. Reasons why the Contingent Valuation Method was chosen as the appropriate technique for this study are explained.

Chapter three provides some background information about the Lower Waikato area in general and the indirect benefit areas of the LWWCS. It also presents some information regarding the LWWCS.

In Chapter four, the research methodology is discussed. The identification of benefits from the scheme, survey design and method, questionnaire design and implementation are explained.

Chapter five presents the responses of the survey. The statistics compiled from the survey are presented and explained.

In Chapter six, the Dichotomous Choice format of Contingent valuation and the Logit model are explained. The logit model is then applied to the data collected to derive the dollar value for indirect flood protection in the Lower Waikato.

Chapter seven concludes by summarising the study. It explains how the objectives of the study have been satisfied and presents the limitations of the methodology. Recommendations based upon the findings are then presented.

1.6 Summary

This chapter has outlined the presence of the LWWCS, the issues associated with the financing of a public good and the legislation in New Zealand regarding the funding of such works and services. According to the Local Government and Rating Powers Acts, those who benefit from the presence of such works are required to pay towards the yearly maintenance of the scheme based on how much benefit they receive. Therefore, in order to charge the beneficiaries equitably, we must be able to quantify the amount of benefit they receive. For this purpose, in the next chapter we set out to select a non-market valuation technique whereby we can estimate the benefits received by the indirect beneficiaries of the LWWCS.