

The Maungatautari Ecological Island Trust:  
An Economic Analysis

**A Report**  
**Prepared for Environment Waikato**



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

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MANAGEMENT SCHOOL  
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This report was created for Environment Waikato at no charge as a contribution to the Maungatautari Ecological Island Trust and the people of the Waikato Region.

# The Maungatautari Ecological Island Trust: An Economic Analysis

## Executive Summary

Maungatautari is currently held by the Crown and people have been visiting the area for a number of years. If the MEIT Project succeeds and Maungatautari becomes a mainland island, the value to the Waikato Region will increase significantly in the form of market, non-market and ecosystem service values. As Maungatautari is currently a forested area, the ecosystem service value will not increase significantly, however the market and non-market values will. In this project, we found that the total value of the Maungatautari after its sixth year in operation will be between \$11.7 and \$16.9 million dollars annually. Without the Trust, the value would be much less, especially in market and non-market values. Therefore, in this sixth year, the MEIT will be adding several million dollars annually in value to the Waikato Region.

<u>Estimated Maungatautari Values to the Waikato Region After Its 6th Year of Operation</u>	
Market Value	Approximately \$3 Million Annually
Non-Market Use Value	Between \$2.2 and \$6.6 Million Annually <sup>1</sup>
Non-Market Non-Use Value	Between \$1.3 and \$2.1 Million Annually
Non-Market Ecosystem Service Values	Approximately \$5.2 Million Annually <sup>2</sup>
Total Value	Between \$11.7 and \$16.9 Million Annually <sup>3</sup>

The Maungatautari Project is still in its initial stages. If it follows the path that the Karori Wildlife Sanctuary has taken, it is likely that it could be self sufficient in its sixth year of operation. However, whether it is self sufficient or not, the Maungatautari Project will provide a great deal of value to the Waikato Region.

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<sup>1</sup> Note that non-market recreation value will always exist at Maungatautari as this land is owned by the Crown. However, the value will increase significantly if Maungatautari is run by MEIT as they will attract a significant increase in visitation.

<sup>2</sup> Note that non-market recreation value will always exist at Maungatautari as this land is owned by the Crown. However, the value will increase significantly if Maungatautari is run by the MEIT as they will attract a significant increase in visitation.

<sup>3</sup> This number is based on the visitation estimates in the Maungatautari Report. If visitation is not as predicted, this number may rise or fall.

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## The Maungatautari Ecological Island Trust (MEIT)

In the centre of the North Island of New Zealand is a 3400 hectare forested area called Maungatautari.<sup>4</sup> In the early part of the 21st century, a group of individuals felt that this land was an important relic to preserve, and considered forming a Trust to protect it. A public interest survey in 2001 found a favourable majority of the 2000 respondents in the Waikato Region supported protecting Maungatautari with a pest-proof fence and restoring the area for visitors. These favourable results led to the official formation of the Maungatautari Ecological Island Trust (MEIT) in 2002. MEIT's main goal is to protect the forest by eradicating the non-native pest species and reintroducing native species. To accomplish this task, the MEIT created seven project goals in September of 2003 (MEIT, 2003):

- *To build and maintain a 47 km pest proof fence around the Maungatautari Forest.*
- *To eliminate all warm blooded animal pests within this fence.*
- *To reintroduce threatened New Zealand native species such as the giant weta, tuatara, kokako and kiwi.*
- *To create a wildlife haven where visitors can access the gates and tracks of the area.*
- *To encourage New Zealand wildlife education.*
- *To establish an education facility.*
- *To develop a sustainable business.*

In essence, the trustees of Maungatautari would like to create a mainland island, pieces of land that are intensively managed to keep out introduced pest species.<sup>5</sup> These areas are considered “islands” as they are surrounded on all sides by either a fence, intensive management or a geographical feature such as a rock wall (DOC, 2003). Currently there are seven established mainland islands in New Zealand - two are on the South Island: Hurunui River and Totoiti Nature Recovery Area - while the others are on the North Island: Trounson Kauri Park, Northern Te Urewere, Paengaroa Reserve, Boundary Stream Reserve and Karori Wildlife Sanctuary. The mainland island most similar to Maungatautari is the Karori Wildlife Sanctuary in Wellington and will therefore be the one with which we conduct our comparisons.

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<sup>4</sup>Maungatautari means ‘upright rock’ or ‘suspended mountain’ in Maori (MEIT, 2004)

<sup>5</sup> Examples of New Zealand pest species include possums, stoats and rats.

## Karori Wildlife Sanctuary in Wellington

The Maungatautari Ecological Island Trust (MEIT) Project closely mimics the Karori Wildlife Sanctuary (KWS) Project in that its goals are to create a mainland island by fencing off an area, eradicating pest species and introducing native species. The KWS is located in Wellington, New Zealand and has successfully erected an 8.6 km pest proof fence to protect 252 hectares of native forest. According to the KWS, “it is the only pest-free area on the New Zealand mainland (KWS, 2003)” the MEIT hopes to be the second.

While the KWS and MEIT are similar projects, the MEIT is approximately 13 times larger than the KWS (3400 ha, as opposed to 252 ha) and therefore needs a much larger fence (47 km as opposed to 8.6 km). The MEIT also has the added benefit of being second and learning from any mistakes KWS has made. For example, the KWS fence had problems in that mice are able to enter the premises. The MEIT has solved this issue and is erecting a fence that is mouse proof. Therefore, there are some advantages to going second.

In the KWS’ sixth year of operation, there were 44,000 visitors (Table 1). This is just 1000 shy of their estimated numbers. This sixth year was the first year that KWS was able to make a profit (\$125,000).<sup>6</sup> In its sixth year, the MEIT is expecting visitor numbers to be 107,500 with an expected profit of \$371,230.

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<sup>6</sup> However, the loss in the 5<sup>th</sup> year of operation was only approximately \$25,000.

<i>Location</i>	<b>KWS</b>	<b>MEIT</b>
<i>Fence Size</i>	8.6 km	47 km
<i>Park Area</i>	252 ha	3400 ha
<i>Visitor Number After Being Open to the Public 6 Years</i>	Actual Visitor Numbers = 44,000	Expected Visitor Numbers = 107,500 (87,500 General Public + 20,000 School Children)
<i>Profits After Being Open to the Public 6 Years</i>	Year 2004: +\$125,000	Year 6: +\$371,230
<i>Fees for Adults</i>	\$6	\$6.60 (\$6.60 for general public, \$2.50 for children on school trips)
<i>Operating Revenue</i>	Year 6: Actual: 2004: \$1,665,344 11% Memberships, 6% Public Donations, 63% Grants, 11% Admissions, 8% Retail Sales, and 1% Other	Year 6: 2009: \$1,237,500 22% Memberships, 47% Visitors, 3% Merchandise, 8% Community Support/ Volunteers, 20% Corporate Sponsorship/ Fundraising

Table 1: Comparison of KWS and MEIT (KWS, 2003; KWS, 2004; MEIT, 2003)

### Direct Market Values

The numbers in Table 1 represent the direct market values of the KWS and the MEIT projects, however they do not reflect the projects' total value. In order to measure the total value, both market and non-market values must be accounted for. The next section of this paper will address total values.

## Maungatautari Values

To estimate the total value of a reserve such as Maungatautari, four types of values should be accounted for: market values, non-market use values, non-market non-use values and ecosystem service values.

### Market values

Market Values, in simple terms, relate to money being exchanged for a good or service. This money can be exchanged for a tangible good, such as a car or an intangible good (service), such as a ride in a taxi cab. In both instances, money is being exchanged. The full market impact of the Maungatautari project in its sixth year is predicted to be \$2,936,000 (2004 NZ\$) (Scrimgeour and Hughes, 2003). If we assume that this impact will remain the same from Year 6 onwards, the total Waikato Region market impact results in approximately \$3 million annually.<sup>7</sup> This is an impact that the Waikato Region would not benefit from without the MEIT.

<p>Maungatautari Market Value Impact to the Waikato Region from Year 6 into Perpetuity: <b>Approximately \$3 Million Annually (2004 NZ\$)</b></p>
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### Non-Market Values

Non-market values come in the form of use values and non-use values. A use-value is the value an individual gets from using a resource, for example, someone surfing at a beach or someone walking in a forest. Non-use values are the values one receives from a resource they are not directly using. Non-use values are typically existence, bequest, and/or option values. Existence values are those values one gets from knowing a good exists even though they may never see it, such as a blue whale. Bequest values are the values one gets from knowing something will be around in the future. For instance, you may know that the Milford Track exists on the South Island of New Zealand; even though you do not have any intentions of visiting it. However, your granddaughter is an active tramp and you have value in knowing that the

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<sup>7</sup> This number is based off of the visitation estimates in the Maungatautari Report, if visitation is not as predicted, this number may rise or fall.

Milford Track is available to your granddaughter well after you pass away. The third non-use value is option value. Option value is when you assume that you will never see a resource but you still have value in knowing that you can see it if you want to -, you have the option to see it.

Non-Market Use Values

According to the MEIT 2003 Business Plan, the six main park visitor activities at Maungatautari will be:

Environmental Education	Walking/Tramping
Wildlife Watching	Photography
Picnicking	Relaxing

A survey is typically used to calculate respondents’ willingness-to-pay in order to gather values for this type of non-market information. However, because of time and funding constraints, a non-market valuation survey is not being conducted now. Nevertheless, another method called benefit transfer can be used to estimate willingness-to-pay values.<sup>8</sup> In benefit transfer, existing activity value data is gathered and transferred to another area, such as Maungatautari.

A benefit transfer for New Zealand recreation activities has been compiled from a literature review, with results reported in Table 2. Table 2 shows us that, of the studies conducted, the consumer surplus<sup>9</sup> value for general recreation in New Zealand per person per recreation day is 2004NZ \$26.90.

	Average	N	Std Dev
General NZ Recreation	\$26.90	14	\$25.47

Table 2: New Zealand Consumer Surplus Values (2004 \$NZ) in per person per recreation day (Everitt, 1983; Kane, 1991; Kerr, 1996; Kerr et al., 1986; Sandrey, 1986).

<sup>8</sup> For a more complete description of the benefit transfer method, including its validity, reliability and limitations, please refer to Kaval and Loomis, 2003.

<sup>9</sup> Consumer surplus refers to the difference between the (marginal) benefit a person receives from a particular activity or good and the price they pay. If there is no charge paid to participate in an activity, then the value a person receives is the entire marginal benefit.

If we assume that the numbers of visitors to Maungatautari in its sixth year will be 87,500 full paying visitors (\$6.60 for entrance) and 20,000 school children visitors (\$2.50 for entrance) for a total of 107,500 people and we assume that schoolchildren have the same consumer surplus value as adults, then for Maungatautari, the consumer surplus value is equal to \$26.90 minus the entrance fee.<sup>10</sup> This results in a consumer surplus value for Maungatautari of \$2,264,250.

$$\text{Consumer Surplus} = 87,500 * (\$26.90 - \$6.60) + 20,000 * (\$26.90 - \$2.50) = \$2,264,250^{11}$$

As the number of non-market recreation valuation studies in New Zealand is low, a benefit transfer table for recreation valuation in the United States had been included for comparison (Table 3) (Kaval and Loomis, 2003).

	<u>Average</u>	<u>N</u>	<u>Std Dev</u>
Birdwatching	\$51.12	8	\$40.80
General Recreation	\$60.59	39	\$93.72
Hiking	\$53.25	68	\$61.69
Picnicking	\$71.58	13	\$66.59
Visit Environmental Education Centre	\$27.54	3	\$19.59
Wildlife Viewing	\$73.14	240	\$70.62
Grand Total	\$67.28	371	\$71.22

Table 3: US Recreation Consumer Surplus Values in 2004 NZ\$ in per person per recreation day (Kaval and Loomis, 2003).

The US Recreation Studies contained significantly more detail than the New Zealand studies, this is reflected in Table 3. The value for visiting environmental education centres (\$27.54/person/day) is lower than the value for birdwatching (\$51.12/person/day). However, on average, the consumer surplus for recreation activities that will be participated in at Maungatautari is \$67.28/per person/ per day in 2004NZ\$. If we make the same assumptions as before and use the US Consumer Surplus Value average of 2004 NZ\$67.28, then we find that the consumer surplus value for Maungatautari is:

$$\text{Consumer Surplus} = 87,500 * (\$67.28 - \$6.60) + 20,000 * (\$67.28 - \$2.50) = \$6,605,100$$

<sup>10</sup> Here we are also assuming that all visitors will pay to go to the enclosures.

<sup>11</sup> Note that non-market recreation value will always exist at Maungatautari, as this land is owned by the Crown. However, the value will increase significantly if Maungatautari is run by MEIT as it will attract a significant increase in visitation.

This value is higher than the consumer surplus value from the New Zealand studies. We will therefore use the New Zealand estimation as a low end of consumer surplus value for Maungatautari while the US estimate will be a high estimation. Therefore the recreation use values of Maungatautari fall between \$2.2 and \$6.6 million dollars annually from Maungatautari's sixth year of operation onwards.

### Non-Market Non-Use Values

As stated previously, existence value is the value one gets from knowing something exists, bequest value is the value received from knowing that something will be around for future generations and option value is knowing you have the option to visit a place if you want to. For simplification, these three values will be called the preservation value. In 2003, Environment Waikato conducted a survey to estimate preservation value and found that people in the Waikato area are in favour of protecting natural heritage lands in their Region, such as Maungatautari, for the future and are willing to pay \$4 annually to preserve these Waikato heritage lands. This \$4 represents their preservation value. According to the 2001 Census (NZ Government, 2002), the Waikato region included 127,134 households. If this \$4 is collected via annual rates on properties, the annual preservation value of households is \$508,536.

In addition to the Environment Waikato study, three other New Zealand studies have calculated preservation values.

They measured the preservation values for Kauaeranga Valley in Coromandel Forest Park, Little Barrier Island off Auckland and the creation of Aorangi Awarua in the Manawatu-Wanganui Region. Respondents were found to be willing to pay between \$10.24 and \$16.75 annually to preserve these areas (Beanland, 1992; Riley and Scrimgeour, 1991; Mortimer, et al., 1996). For the Waikato Region, if you consider this value for households,<sup>12</sup> the value would range from \$1,301,852 to \$2,129,495. These numbers may represent what would be available from the Waikato public to preserve all lands in New Zealand, and is significantly higher than the \$4

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<sup>12</sup> As local government rates are charged to households rather than individuals, household value is calculated here.

Environment Waikato had estimated. However, these studies were conducted with different questions and therefore differences should be expected.

### Ecosystem Service Values

Ecosystem services are the functions of nature necessary to sustain ecosystems. Without these services, life on earth would not exist. Therefore, ecosystem services encompass several types of values, including direct or market values, as well as indirect or non-market values and both use and non-use values (Daily, 1997; Daily et al, 1997). If we consider all ecosystem services besides the atmosphere and non-renewable resources, there are 17 major categories: cultural, recreational, genetic resources, raw materials, food production, habitat refugia, biological control, pollination, waste treatment, nutrient cycling, soil formation, erosion control and sediment retention, water supply, water regulation, disturbance regulation, climate regulation and gas regulation (Costanza, 1997).

Costanza et al., 1997 estimated the value of ecosystem services for the world to be approximately US\$33 trillion per year, as a minimum. Patterson and Cole (1999) were able to extrapolate the Costanza et al. data for the Waikato Region of New Zealand to be 2004 NZ\$10.6 billion. In the Waikato Region, there are 13 different types of ecosystems: estuarine, wetland, seagrass/algal-bed, lake, mangrove, river, horticultural, coastal zone, forest, agricultural, scrub/shrubland/tussock, coastal marine area, and cropland. Maungatautari encompasses 3400 hectares of forest land. If we only look at the indirect values of the land (as direct values are calculated in another section of this report), one hectare of forestland in New Zealand provides approximately 2004 NZ\$1618/hectare. Therefore, the Maungatautari ecosystem service values would be worth approximately \$5.5 million annually.

$$3400 \text{ hectares of Maungatautari: } \$1618 * 3400 = \$ 5,500,938^{13}$$

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<sup>13</sup> Note that since the Maungatautari Land is Crown land, this ecosystem service value will exist whether it is run by MEIT or not.

If Maungatautari were to be replaced by cropland, the ecosystem service value would decrease from \$5.5 million to approximately \$327,000. Therefore, the value of the Maungatautari forest to New Zealand is extremely high.

It is possible to calculate a more exact value for ecosystem services with and without the MEIT project. This could be done by calculating avoided costs. For example, fields soak up excess water. If a field was replaced with a parking lot, it would no longer soak up the water excess. Therefore, we would calculate the cost of pumping out this excess water and moving it. Since we currently do not have to pay for pumping the water and moving it, the ecosystem service values are these avoided costs. In this case, however, we will just be reporting the estimates taken from Costanza et al., 1997, and Patterson and Cole, 1999.

## Summary

Maungatautari is currently held by the Crown and people have been visiting the area for a number of years. If the MEIT Project succeeds and Maungatautari becomes a mainland island, the value to the Waikato Region will increase significantly. The increase in values will come in the form of market, non-market and ecosystem service values. As Maungatautari is currently a forested area, the ecosystem service value will not increase significantly, however the market and non-market values will. In this project, we found that the total value of the Maungatautari after its sixth year in operation will be between \$11.7 and \$16.9 million dollars annually. Without the Trust, the value would be much less, especially in the way of market and non-market value. Therefore, in this sixth year, the MEIT will be adding several million dollars annually in value to the Waikato Region.

<u>Estimated Maungatautari Values to the Waikato Region After Its sixth Year of Operation</u>	
Market Value	Approximately \$3 Million Annually
Non-Market Use Value	Between \$2.2 and \$6.6 Million Annually <sup>14</sup>
Non-Market Non-Use Value	Between \$1.3 and \$2.1 Million Annually
Non-Market Ecosystem Service Values	Approximately \$5.2 Million Annually <sup>15</sup>
Total Value	Between \$11.7 and \$16.9 Million Annually <sup>16</sup>

The Maungatautari Project is still its in its initial stages. If it follows the path that the Karori Wildlife Sanctuary has taken, it is likely that it could be self sufficient in its sixth year of operation. However, whether it is self sufficient or not, the Maungatautari Project will provide a great deal of value to the Waikato Region.

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<sup>14</sup> Note that non-market recreation value will always exist at Maungatautari as this land is owned by the Crown. However, the value will increase significantly if Maungatautari is run by MEIT as it will attract a significant increase in visitation.

<sup>15</sup> Note that since the Maungatautari Land is Crown Land, this ecosystem service value will exist whether it is run by MEIT or not.

<sup>16</sup> This number is based on the visitation estimates in the Maungatautari Report, If visitation is not as predicted, this number may rise or fall.

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## Appendix:

### Karori Wildlife Sanctuary in Wellington

The MEIT project will be a learning experience. However, there is a great deal that the MEIT can learn from the KWS experience. Potentially important information is included here.

The detailed process followed by the KWS includes (KWS, 2003):

- 1992-1993 Idea Proposed; Feasibility Studies Completed.*
- 1995-1996 Trust Formed; Fundraising Began; Consents Obtained.*
- 1997-1999 Fence designed and tested; Fence Funding Obtained; Construction Completed; Public Values Survey Conducted.*
- 1999-2000 Pest eradication completed; first reintroductions of fauna: kiwi, weta, weka and brown teal. Public access – guided tours only.*
- 2001 Robin, whitehead, bellbird, tomtot and more little spotted kiwi released. School education program launched. Public access – open weekends and public holidays.*
- 2002 Kaka, saddleback, scaup, robin, whitehead, bellbird and tomtit released. Public access – open seven days a week.*
- 2003 Gateway complex preliminary design work and feasibility study completed. Major fundraising started.*
- 2004 Increase number and productivity of birds; Intensify weed reduction; Strategize on fence improvement to keep out mice.*

Fence construction for this project began in December 1998. The predator fence was completed in August 1999, and the sanctuary was declared free of all mammalian predators except mice in June 2000. The KWS fence is designed to keep out 14 different predators, and according to the Karori website, “is the only pest-free area on the New Zealand mainland (KWS, 2003)”. The KWS is not Government funded, has a central city location and is being restored as a complete ecosystem.

Before the KWS was opened to the public, the New Zealand Tourism Research Institute (NZTRI) created and administered a survey to gain insights of potential visitor preferences in May of 1999. Four groups of people were targeted: residents, visitors, teachers and tourism industry representatives. Response was good, with 332 completed Wellington resident surveys, 125 surveys completed by Wellington visitors, 64 surveys completed by teachers of primary and secondary schools in

Porirua, Hutt Valley and Wellington city as well as six surveys completed by tourism industry representatives (Milne et al., 1999).

Approximately 52 percent of the survey's resident and visitor respondents were female, and the average age of respondents was 15-34. Respondents felt that \$5 would be an acceptable entrance fee. They also felt that nature and the outdoors were primary reasons to visit the KWS (Table 3a).

Respondent	Percent female	Average Age Range	Preferred Entry Fee to Karori Sanctuary	Top Reason to Visit
Residents	53%	15-34	\$5	Interest in Nature Experiences
Visitors: Note 56% are domestic	52%	15-34	\$5	Interest in Nature Experiences
Teachers				Interaction with the Outdoors

Table 3a: KWS Survey Responses

According to the survey results (Table 3b), non-guided walks were to be the primary activity participated in at KWS. Visitor facilities of priority importance were toilets and car parking.

Respondent	What would you like to do at KWS			Top Three Visitor Facilities Wanted		
	First Experience	Second Experience	Third Experience	First Choice	Second Choice	Third Choice
Residents	Non Guided Walks	Activities for Children	Photography	Toilets	Rubbish/ Recycling Bins	Car Parking
Visitors: Note 56% are domestic	Non Guided Walks	Photography	Guided Walks	Toilets	Rubbish/ Recycling Bins	Car Parking
Teachers				Toilets	Brochure Information	Pictorial Displays

Table 3b: KWS Survey Responses.

These survey responses aided with the planning process of KWS. As of November 7, 2003, there is only one entrance to the public: the Karori Wildlife Sanctuary Visitor Centre. The visitor centre and sanctuary are open everyday of the year except for Christmas. Visiting hours are: Monday through Friday – 10 am to 4 pm and

Saturday, Sunday, and Holidays – 10 am to 5 pm. Prices are: \$6 for adults, \$3 for children and \$15 for a family of 2 adults and three children.

In addition to the public being allowed to wander around the KWS unaccompanied, there are also one to three hour guided tours and nocturnal walks available for an average price of \$15.

According to the annual report for July 2003 – June 2004, there were approximately 44,000 visitors.<sup>17</sup> Public access to the park began with guided tours in 1999 and full access in 2001. Therefore, in just six years, 44,000 visitors (for an annual revenue of \$307,635) were coming to the park. It is believed that visitor numbers will eventually peak at 150,000 annually and the economic benefit this will bring to the Wellington economy is \$5 - \$10 million annually.

The 2003-2004 season was the first season in which the sanctuary had an operating surplus (\$125,000). Visitor satisfaction surveys are really good as 95 percent of visitors surveyed report the sanctuary to be very good or excellent (KWS, 2003; KWS, 2004).

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<sup>17</sup> Projected visitor numbers were estimated to be 45,000 (KWS, 2003).