

# Integrated Impact Assessment (IIA) Framework

Draft: July 2023

The integrated impact assessment framework (IIA) has been developed alongside key stakeholders to aid policy-makers in regional and central government, as well as other stakeholders, to provide a consistent framework for evaluating scenarios about future developments in land use. The integrated impact assessment (IIA) framework covers social, economic, cultural, and environmental impact of changes to land use, with an education focus.

The framework therefore shows the impact of land use changes in the economic, social, cultural and environmental indicators. The land uses and indicators in the framework were chosen by the stakeholders. Where possible the information on which the indicators has been is from secondary sources or based on literature. This is especially the case with economic indicators and some environmental indicators. However, many of the social and some environmental indicators are scales which where possible have been informed by literature and also consultation. These may well vary according to circumstance and as such are an educational tool which can be altered. This identifies the key gaps in data and inform the development of new information on the impact of land use change. It must also be stressed that whilst many indicators are interrelated, this has not been captured directly in the framework but is highlighted in the results.

The framework has been developed for two case study regions, the Ashburton district and Mosgiel. The particular issues were examined to aid the development of the framework were the impact of land use changes associated with nitrate leaching and peri-urban development.

The following is a guide to operating the framework.

# Getting Started

## Introduction

The purpose of this framework is to allow exploration of scenarios where Land Use is changing for a specified region of New Zealand.

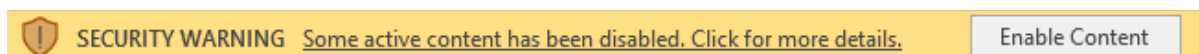
There are:

- three ways for specifying scenarios,
- a form for applying region specific data
- two Dashboards providing overviews and detail signalling likely impacts.

The tool enables users to ...

## User Interface Overview

This framework tool has been developed in Microsoft Excel and uses macros to provide functionality. Please note when first opening the workbook you will be prompted with a Security warning:



*Figure 1 – Security warning seen opening a Microsoft Excel Macro-Enabled Workbook*

Provided you trust the source of this workbook, please click the **Enable Content** button to enable use of the macros.

The sheets of the workbook include:

- **Welcome Sheet** – a quick overview of the purpose of the tool and buttons linking to three main entry points to using the tool
- **Example Scenarios** – simple scenarios demonstrating the Integrated Impact Assessment Framework
- **Quick Scenario** – form to quickly enter a scenario for a region where land is changing from one Land Use to another
- **Full Scenario** – form for full specification of a scenario across the sixteen land uses, including baseline data
- **Dashboard** – an overview of possible impacts across the Wellbeing domains including charts and overview of possible benefits and negative impacts
- **Details Dashboard** – a more detailed dashboard presenting assessed scores and measures across the Wellbeings
- **Adjust Base Data** – a form for updating base data used in the framework assessments

## Welcome Sheet

**Integrated Impact Assessment (IIA) Framework**

This tool is for running scenarios changing Land Use and measuring the integrated effects to give guidance for future and more detailed inquiry by highlighting areas with their directions of change.

It covers: **Economic impacts**  
**Environmental impacts / Wellbeing**  
**Social impacts / Wellbeing**

For Ashburton District, Mosgiel Region, User-Specified Region

**Get Started**

- Example Scenarios**  
Example Land Use scenarios to get you started
- Quick Scenario Sheet**  
Simple form for one Land Use changing to another Land Use
- Full Scenario Sheet**  
Complete form for specifying all Land Uses and Baseline data

**How are things connected?**  
Land uses have multiple impacts across the Economic, Environmental and Social Wellbeings. A change in land use has multiple effects, some better, some worse, some neutral.

**Why is this important?**  
A change in land use has impacts across those multiple well-beings and understanding these impacts will lead to better outcomes.  
This tool helps highlight these impacts that may happen in land use change.

**How do I use this?**  
Land Use Changes can be specified in the Scenario pages (see 'Get Started' above) and an assessment of those impacts across the wellbeing domains can be seen in the **Dashboard** pages.  
These results indicate directions





Developed at   With  

Figure 2 – The *Welcome sheet*

The Welcome Sheet provides a quick overview of the purpose of the tool and provides buttons linking to three main entry points to using the tool.

## Example Scenarios




### Example Scenarios

This sheet presents some example scenarios demonstrating the Integrated Impact Assessment Framework to get you started. Select a scenario under one of the themes below then click 'See Results' to see a summary of the assessment.

**Theme: Nitrate Limits**  
Region: Ashburton District

These examples look at scenarios that will help reduce nitrate limits in the Ashburton District




**What happens if:**

- 50% Dairy Farming is converted to Forestry 
- 50% Sheep & Beef is converted to Forestry 
- 20% Dairy Farming is converted to Arable farmland 

**Theme: Peri-Urban Development**  
Region: Mosgiel

These examples look at scenarios that will change from agricultural land uses to urban developments

**What happens if:**

- 50% Sheep & Beef Farming is converted to Urban 
- 50% Dairy Farming is converted to Urban 
- 50% Exotic Forestry is converted to Urban 

**Quick Scenario Sheet**

Simple form for one Land Use changing to another Land Use

**Full Scenario Sheet**

Complete form for specifying all Land Uses and Baseline data

**See Results**

Go to the Dashboard showing impacts across the wellbeings

Figure 3 – The Example Scenarios sheet

The **Example Scenarios** sheet presents scenarios demonstrating the Integrated Impact Assessment Framework to help users get an understanding of the tool.

There are two example scenarios under the themes of:

- **Nitrate Limits in Ashburton District**, and
- **Peri-Urban Development in Mosgiel**.

Simply select a scenario by clicking on it, then click on the **See Results** button to be taken to the Dashboard sheet to see results for that scenario.

**See Results**

Go to the Dashboard showing impacts across the wellbeings

**Integrated Impact Assessment: Dashboard**

Scenario assessed: Mosgiel, 50% Sheep & Beef is converted to Urban

Environmental Scores	Economic Impacts	Social Scores																					
<p>Night Sky Brightness</p> <p>Mining &amp; Geology</p> <p>Air Pollution</p> <p>Soil Quality</p> <p>Biodiversity</p> <p>Swimming Index</p> <p>Zero line Environmental Change</p>	<p><b>Gross Output</b></p> <table border="1"> <tr><td>Direct</td><td>Change</td><td>-\$20M</td></tr> <tr><td>Indirect</td><td></td><td>-\$9M</td></tr> <tr><td>Induced</td><td></td><td>-\$3M</td></tr> </table> <p><b>Employment</b></p> <table border="1"> <tr><td>Direct</td><td>-40 FTE</td></tr> <tr><td>Indirect</td><td>-40 FTE</td></tr> <tr><td>Induced</td><td>-10 FTE</td></tr> </table> <p><b>Value Added (VA)</b></p> <table border="1"> <tr><td>Direct</td><td>-\$7M</td></tr> <tr><td>Indirect</td><td>-\$4M</td></tr> <tr><td>Induced</td><td>-\$1M</td></tr> </table>	Direct	Change	-\$20M	Indirect		-\$9M	Induced		-\$3M	Direct	-40 FTE	Indirect	-40 FTE	Induced	-10 FTE	Direct	-\$7M	Indirect	-\$4M	Induced	-\$1M	<p>Public Transport</p> <p>Voting Status</p> <p>Alcohol Licences</p> <p>Housing Affordability</p> <p>Connection to Nature</p> <p>Access to Basic Amenities</p> <p>Zero line Social Change</p>
Direct	Change	-\$20M																					
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Induced	-\$1M																						
<p><b>Overall impacts across all Wellbeings</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 33%; vertical-align: top;"> <p><b>Possible benefits of Changes</b></p> <ul style="list-style-type: none"> <li>• Increase Public Transport</li> <li>• Increase Access to Basic Amenities</li> <li>• Improve Housing Affordability</li> <li>• reduce Alcohol Licences</li> <li>• Improve Voting Status</li> <li>• Improve Housing Quality + Maintenance</li> </ul> </td> <td style="width: 33%; vertical-align: top;"> <p><b>Possible negative impacts of Changes</b></p> <ul style="list-style-type: none"> <li>• reduce Night Sky Brightness</li> <li>• reduce Sense of Belonging</li> <li>• increase Air Pollution</li> <li>• reduce Connection to Nature</li> <li>• increase Discrimination</li> <li>• reduce Biodiversity</li> </ul> </td> <td style="width: 33%; vertical-align: top;"> <p><b>Consider consultation with:</b></p> <ul style="list-style-type: none"> <li>• Fresh Water Ecologists</li> <li>• Soil Ecologists</li> <li>• ...</li> </ul> </td> </tr> </table> <p style="text-align: center; font-size: small;">See Dashboard Details sheet for indicative figures on GHG emissions, Rateable Value and more</p>			<p><b>Possible benefits of Changes</b></p> <ul style="list-style-type: none"> <li>• Increase Public Transport</li> <li>• Increase Access to Basic Amenities</li> <li>• Improve Housing Affordability</li> <li>• reduce Alcohol Licences</li> <li>• Improve Voting Status</li> <li>• Improve Housing Quality + Maintenance</li> </ul>	<p><b>Possible negative impacts of Changes</b></p> <ul style="list-style-type: none"> <li>• reduce Night Sky Brightness</li> <li>• reduce Sense of Belonging</li> <li>• increase Air Pollution</li> <li>• reduce Connection to Nature</li> <li>• increase Discrimination</li> <li>• reduce Biodiversity</li> </ul>	<p><b>Consider consultation with:</b></p> <ul style="list-style-type: none"> <li>• Fresh Water Ecologists</li> <li>• Soil Ecologists</li> <li>• ...</li> </ul>																		
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## Quick Scenario

**Quick Scenario**  
 This is a simple form for one Land Use in a region changing to another Land Use. Use the drop-boxes provided to:  
 Select the Region the scenario applies to, the Land Use to change, the percentage Change, and the Land Use offsetting that change

**Region** in which scenario is applied  
 In Mosgiel

Change Land Use Dairy 4 & 5 Change -20% to Land Use Wetlands

Example Scenarios

Example Land Use scenarios to get you started

Full Scenario Sheet

Complete form for specifying all Land Uses and Baseline data

Apply Scenario

Apply this Quick Scenario to see impacts across the wellbeings

Figure 4 - The Quick Scenario sheet

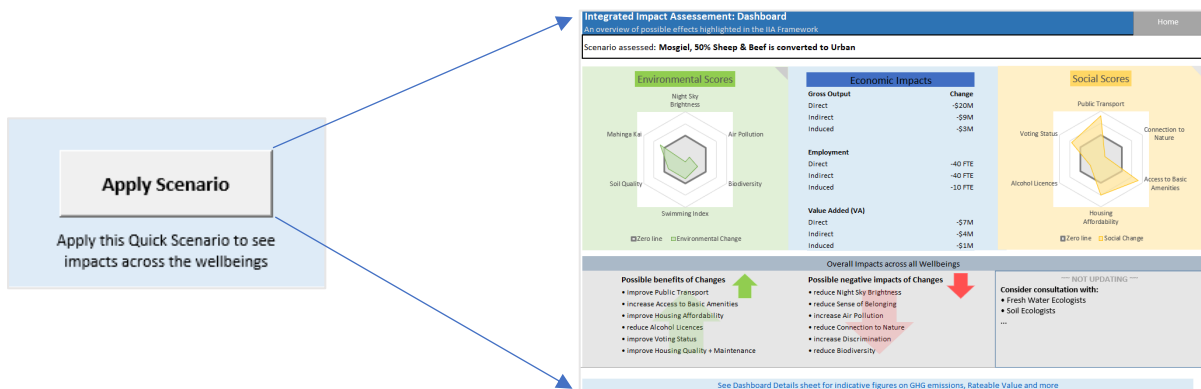
The **Quick Scenario** sheet allows you to quickly enter a scenario for a region where land is changing from one Land Use to another.

The **Region** is the region in which the scenario is applied. This is selected from a dropdown box, currently limited to **Ashburton District** or **Mosgiel**.

The **Change** is specified as a percentage of the current area for one of the land uses. This is selected from a dropdown box with levels of **-50%, -20%, -10%, -5%, +5%, +10%, +20%, +50%**.

There are two **Land Use** dropdown boxes, the first is the Land Use the change is based on, the second is the Land Use the land is changed to or from. For example, in the screenshot above, **20%** of the current land used for **Dairy 4 & 5** is **changed to Wetlands**.

Click on the **Apply Scenario** button to run the scenario and be taken to the Dashboard sheet to see results.



## Full Scenario

**Full Land Use Scenario**
Home

This is a form for specifying all Land Uses for a scenario and for the regional baseline

**Region**

Ashburton District

**Scenario Description >**

Ashburton, Sheep & Beef is changed to Forestry, Parks and Recreation and Wetlands

Land Uses	Scenario	Slider (% of Baseline)	Baseline
Sheep + Beef 6	51,982 ha	<input type="range" value="75.0"/> 75.0%	69,309 ha
Sheep + Beef 7	51,982 ha	<input type="range" value="75.0"/> 75.0%	69,309 ha
Sheep + Beef 8	51,982 ha	<input type="range" value="75.0"/> 75.0%	69,309 ha
Dairy 1 & 2	15,603 ha	<input type="range" value="100.0"/> 100.0%	15,603 ha
Dairy 3	15,603 ha	<input type="range" value="100.0"/> 100.0%	15,603 ha
Dairy 4 & 5	15,603 ha	<input type="range" value="100.0"/> 100.0%	15,603 ha
Deer	14,134 ha	<input type="range" value="100.0"/> 100.0%	14,134 ha
Arable	98,524 ha	<input type="range" value="100.0"/> 100.0%	98,524 ha
Horticulture	375 ha	<input type="range" value="100.0"/> 100.0%	375 ha
Forestry - Exotic	10,482 ha	<input type="range" value="200.0"/> 200.0%	5,241 ha
Forestry - Indigenous	67,394 ha	<input type="range" value="200.0"/> 200.0%	33,697 ha
Parks and Recreation	9,088 ha	<input type="range" value="200.0"/> 200.0%	4,544 ha
Wetlands	5,730 ha	<input type="range" value="200.0"/> 200.0%	2,865 ha
Urban - Low Density	3,426 ha	<input type="range" value="200.0"/> 200.0%	1,713 ha
Urban - Medium Density	231 ha	<input type="range" value="100.0"/> 100.0%	231 ha
Urban - High Density	71 ha	<input type="range" value="100.0"/> 100.0%	71 ha
	412,210 ha	Reload Last    Reset	416,131 ha

Sample Scenarios

Quick Scenario Sheet

Apply Scenario

Figure 5 - The **Full Scenario** sheet

The **Full Scenario** sheet allows full specification for a scenario across the sixteen land uses within the tool.

The **Region** is the region in which the scenario is applied. This is selected from a dropdown box: **Ashburton District, Mosgiel** or **User Specified**. If User Specified is selected, the user is prompted to provide a Region Description for records.

The **Scenario Description** allows the user to label their scenario and any relevant notes. If none is provided, a description automatically generated when the scenario is run.

For each of the sixteen **Land Uses** in the tool, the user can specify the area used for that purpose in the scenario (Scenario) and in the current use (Baseline).

The Scenario can be provided as an area (hectares) for each Land Use (**Scenario**), or as a percentage relative to current usage using the sliders.

## Using the Sliders to specify Change in Land Use

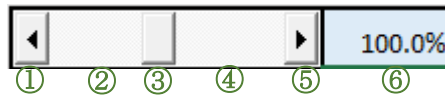


Figure 6 - The slider for adjusting scenario percentage change relative to current usage (Baseline)

- Clicking on the ◀ button ① will decrease the usage by a small amount (0.1%).
- Clicking on the **track left of the thumb** ② will decrease by 10%.
- The **thumb** ③ can be dragged along the track
- Clicking on the **track right of the thumb** ④ will increase by 10%.
- Clicking on the ▶ button ⑤ will increase the usage by a small amount (0.1%).
- The desired value can be typed in the box on the right ⑥.

The Slider allows percentages from 0% of current usage (i.e. no usage) up to 200% of current usage (i.e. doubled), however the Scenario (hectares) is unconstrained.

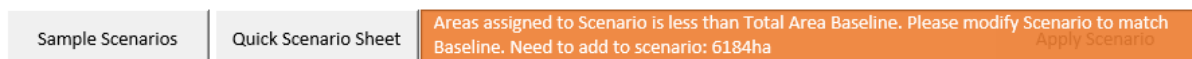
There are buttons to **Reload** the last scenario applied, and to **Reset** all sliders to 100%.

The current area of land used for that purpose (**Baseline**) is listed in the far-right column (hectares). For Ashburton District and Mosgiel region, this is loaded automatically however can be adjusted. For User Specified regions, this is cleared for the user to provide current usage.

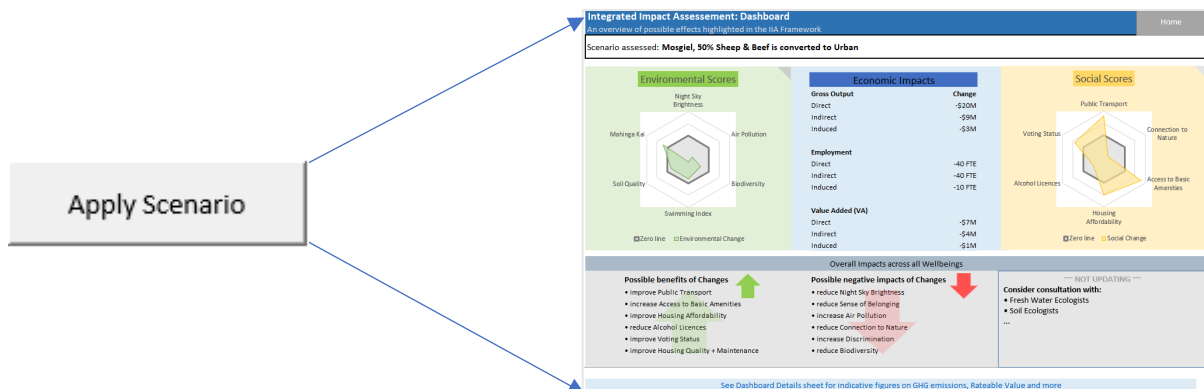
Click on the **Apply Scenario** button to run the scenario and be taken to the Dashboard sheet to see results.

Users are expected to assess the viability and suitability of scenarios, however the tool checks that the total area assigned to a Scenario matches the total area described in the Baseline land uses (i.e. no land can be created or lost in a scenario).

If a violation of this rule is detected, then a warning message is displayed over the 'Apply Scenario' button to inform the user of this and what change to the scenario needs to be made.



When the Land Uses are balanced, the Apply Scenario button is available to go to the Dashboard



## Dashboard

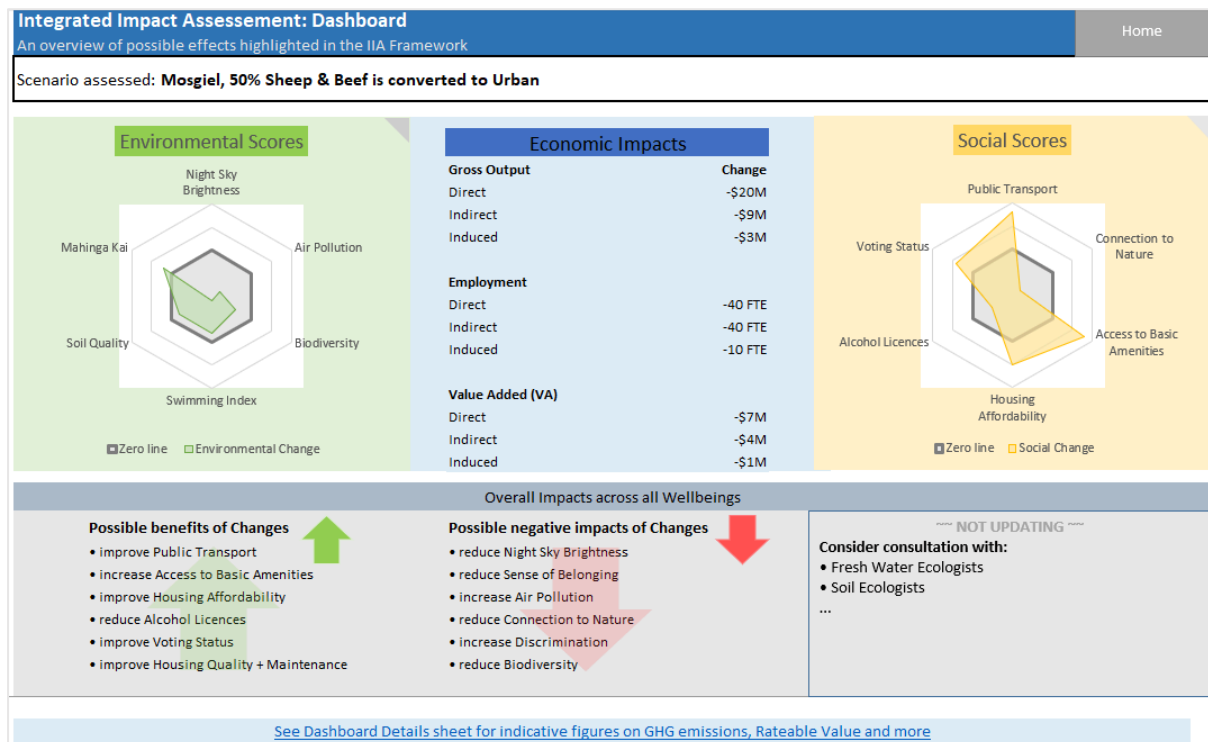


Figure 7 - The Dashboard, showing an overview of possible impacts across the Wellbeing domains

The Dashboard shows an overview of possible impacts across the Wellbeing domains.

Radar charts are provided for the biggest changes in the Environmental and Social Wellbeing domains. They show the neutral line for comparison against -- indicators outside this are improving, indicators within this are worsening – and the change for the six biggest changes in indicator score.

For Economic impacts, the magnitude of change is presented in terms of Gross Output, Employment and Value Added. For each of these, the direct, indirect, and induced impacts are shown.

In the bottom portion of the Dashboard, the Overall Impacts across all Wellbeings are presented in terms of possible **benefits** of changes and possible **negative impacts** of changes.



## Details Dashboard

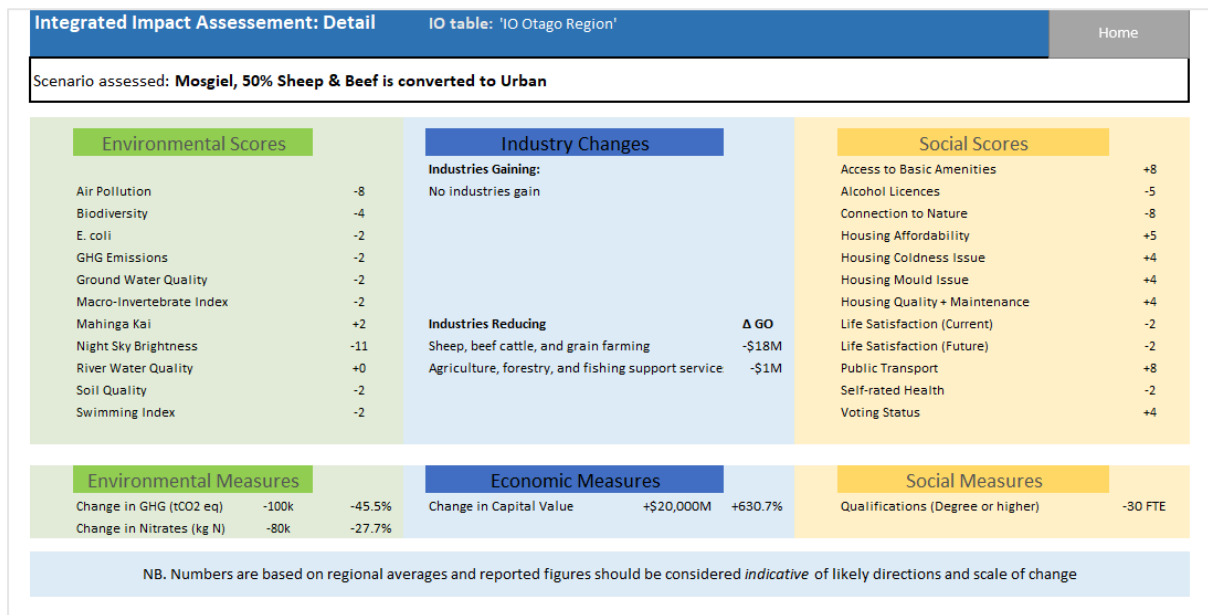


Figure 8 - The Details Dashboard, showing the assessed scores for the Environmental and Social wellbeings and select measures

The Details Dashboard shows the assessed scores for each of the Environmental and Social Wellbeing indicators. In the middle pane, it shows industries most likely to be affected positively and negatively by the changes to Land Use. And in the bottom pane it shows selected measures for each of the Wellbeing.

## Adjust Base Data Sheet

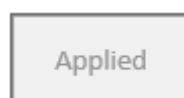
Adjust Base Data		Home		
This sheet allows updates to the base data used in the IIA framework				
Land Use		Revenue/ha	GHG/ha	Nitrates/ha
Sheep + Beef 6	<i>SI finishing and breeding</i>	\$ 1,244	9.01	10.00
Sheep + Beef 7	<i>SI intensive finishing</i>	\$ 1,662	28.68	10.00
Sheep + Beef 8	<i>SI mixed finishing</i>	\$ 3,701	11.74	13.00
Dairy 1 & 2	<i>Low input</i>	\$ 7,380	10.05	46.00
Dairy 3	<i>Middle input</i>	\$ 8,459	10.82	46.00
Dairy 4 & 5	<i>High input</i>	\$ 10,326	11.98	44.00
Deer		\$ 500	0.00	
Arable		\$ 200	0.00	
Horticulture		\$ 5,000	0.00	
Forestry - Exotic	<i>National average</i>	\$ 2,561	-1.37	
Forestry - Indigenous		\$ -	0.00	
Parks and Recreation		\$ -	0.00	
Wetlands		\$ -	0.00	
Urban - Low Density		\$ -	0.00	
Urban - Medium Density		\$ -	0.00	
Urban - High Density		\$ -	0.00	

Figure 9- The Adjust Base Data sheet allows users to update the tool with data more specific to their scenario

The base data used within the tool is based on national averages and best estimates. Users may provide data more specific to their scenario using the Adjust Base Data sheet.

The **Reset** button will reload the base data from the tool.

The **Apply** button will apply the variables provided on this sheet to the scenarios in assessments using the tool. To confirm that the update has been applied, the button will display 'Applied' and become inactive:



The User is responsible for checking the accuracy of the data.

## Further questions

Please feel free to contact with any questions, comments or suggestions:

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Paul Rutherford [Paul.Rutherford@lincoln.ac.nz](mailto:Paul.Rutherford@lincoln.ac.nz)