

Internal Assessment Resource

Education for Sustainability Level 3

This resource supports assessment against Achievement Standard 91735

Standard title: Evaluate measures that may be taken to sustain and/or improve a biophysical environment

**Credits:** 4

Resource title: Waikato River

**Resource reference:** Education for Sustainability 3.2A v3

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| This resource:   * Clarifies the requirements of the standard * Supports good assessment practice * Should be subjected to the school’s usual assessment quality assurance process * Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic |

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| Date version published by Ministry of Education | February 2015 Version 3  To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA. |
| Authenticity of evidence | Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.  Using this assessment resource without modification may mean that students’ work is not authentic. The teacher may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

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Teacher guidelines

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

Context/setting

This activity requires students to critically evaluate the effectiveness of the measures put in place to sustain or improve the Waikato River. Their findings will form the basis of a letter to the Minister for the Environment regarding the effectiveness of these measures.

Conditions

It is suggested that this assessment activity take place over an extended period of time, for example 8-10 weeks of in- and out-of-class time.

Resource requirements

Students should have access to:

* Internet, for research and communication.
* Technology and equipment, as and where appropriate.

Additional information

This assessment activity is based on the assumption that students have an in-depth understanding of: the principles and aspects of sustainability; sustainable futures; research methods and data analysis; evaluation; and wherever possible Māori concepts and values relating to the environment as well as a familiarity with Article 2 of the Treaty of Waitangi.

The activity used to assess against this standard, with the choice of a suitable context, could be used in conjunction with assessment activities for EfS 3.1 (AS90828) and 3.5 (AS90832).

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Student instructions

Introduction

This assessment activity requires you to evaluate the effectiveness of different measures taken to sustain or improve the Waikato River.

You are going to be assessed on how well you critically evaluate measures to sustain and improve the Waikato River environment.

The following instructions provide you with a way to structure your work to demonstrate what you have learnt to allow you to achieve success in this standard.

Task

Present the findings from your evaluation as a report to the Minister for the Environment regarding the effectiveness of the measures taken to sustain and improve the Waikato River.

You may work individually or in a group, but you will be assessed individually. Include evidence of your individual contributions in your logbook if working in a group.

You have 8 weeks to complete this task.

Gather information

* Carry out research and a practical investigation on the freshwater biophysical environment of the Waikato River.
* Visit the Waikato River.
* Collect and analyse data and evidence about the ecosystems of the river. You will need to name key species, describe their inter-relationships, and describe relevant physical systems that determine the habitats.
* Make sure the data collection and measurement methods are suitable and appropriate. These could include transects, quadrats, fish counts, mapping. You may need to include maps, showing the location of data collection points.
* Research the freshwater environment of the Waikato River. This may include finding out:
* how people value and use the freshwater environment and its resources such as for food gathering
* why the measures used for the Waikato River were created
* changes to the ecosystems since the measures were first created.
* Research what social, cultural, economic and/or technological measures are commonly undertaken in New Zealand in order to protect and other organisms, and the freshwater environment in general.

Write your letter

Organise your findings.

Your letter will include:

* Analysis of:
* the characteristics of the biophysical (freshwater) environment of the Waikato River
* the nature of the relationship between humans and the freshwater environment and the interactions between them, in relation to aspects of sustainability. Interrelationships may be those that promote or disrupt the sustainability of the environment
* the potential of the measures undertaken to sustain the freshwater environment, both now and in the future, using the Waikato River as an example
* the potential of other measures such as rahui to sustain the freshwater environment, both now and in the future.
* Your informed conclusions about which measures may be most effective in terms of sustaining and/or improving the freshwater environment.
* Your insightful conclusions about the effectiveness of the measures with reference to the aspects of sustainability. These conclusions may include:
* projecting future impacts and discussing wider implications
* using criteria related to the aspects of sustainability to help you evaluate the measures
* making recommendations.

Submit for assessment

Submit your completed letter for assessment together with your logbook if you were working in a group.

Resources

Useful websites include:

<https://en.wikipedia.org/wiki/Waikato_River>

<http://sciencelearn.org.nz/Contexts/Toku-Awa-Koiora/Looking-Closer/The-Waikato-River>

<http://sciencelearn.org.nz/Contexts/Toku-Awa-Koiora/Looking-Closer/Human-impacts-on-the-Waikato-River>

<http://www.waikatoregion.govt.nz/Environment/Natural-resources/Water/Rivers/Waikato-River/>

http://www.waikatoriver.org.nz/

https://www.watercare.co.nz/about-watercare/our-services/waikato-river-water/Pages/default.aspx

http://www.waikatorivercare.co.nz/

http://www.waikato.ac.nz/\_\_data/assets/pdf\_file/0010/179830/Weston-25-Nov.pdf

<http://www.mfe.govt.nz/publications/freshwater-publications/user-guide-macroinvertebrate-community-index>

http://www.waikatoregion.govt.nz/Services/Publications/Technical-Reports/A-New-Fish-Index-of-Biotic-Integrity-using-Quantile-Regressions-the-Fish-QIBI-for-the-Waikato-Region

<http://www.mfe.govt.nz/publications/fresh-water/waikato-river-independent-scoping-study>

http://www.landcare.org.nz/BilingualGuide

https://www.niwa.co.nz/freshwater-and-estuaries/research-projects/waikato-river-independent-scoping-study-wriss

http://www.waikatotainui.com/environmental-management-plan/c-11-the-vision-strategy-for-waikato-river/

http://www.stuff.co.nz/waikato-times/life-style/8628956/Cleaning-up-the-Waikato-River

Assessment schedule: Education for Sustainability 91735 – Waikato River.

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| Evaluate measures that may be taken to sustain and/or improve a biophysical environment.  The student has:   * Carried out research and a practical inquiry to: * analyse the characteristics of the biophysical (freshwater) environment of the Waikato River.   *The Waikato River is the longest river in New Zealand and includes a variety of freshwater ecosystems, supporting many organisms, both native and introduced. Different organisms live in different parts of the river. The fish species are eating freshwater plants or the invertebrates that feed on the plants. In turn they are eaten by other fish, shags and people. (Diagram of simplified food web provided). The native fish species here include eels, kokopu and koura (data referenced). These fish rely on there being enough food and oxygen in the river water. The river flows from Lake Taupo which is formed from a caldera volcano which has been extinct for thousands of years. The lake’s surrounding slopes contain many large volcanic rocky outcrops. These have been weathered and eroded over the years producing sediments. These have washed down to form fertile soils on the surrounding land. Due to the porosity of the soils, they are prone to leaching. Today, the river is fed by over 17 000 km of tributary streams and drains (a*[*catchment*](http://sciencelearn.org.nz/About-this-site/Glossary/catchment)*area of 11 013 km2). The river initially travels through a narrow valley and has a steep gradient, swift flows and many rapids. Eight hydroelectric dams occur on the steep-gradient section between Taupō and Karāpiro (often referred to as the upper river). Impoundments in the hydro lakes have increased the time of water in the river from around 5–6 days (before the dams) to about 40 days under low water flow conditions and 16 days under high water flow conditions. The geology and the river flow provide a range of habitats for the freshwater organisms. There are many different species of fish, lake weed and organism in these ecosystems.*   * analyse the nature of the relationship between humans and the freshwater environment in relation to aspects of sustainability.   *Human activity over the years has had a negative impact on the environmental sustainability of the river. Farming is an activity that happens in the region surrounding the Waikato River. Some of the practices that happen on farms have an impact on the Waikato River. For example, fertiliser run-off adds more nutrients to the water, either running straight off the farm into the river, into the streams that feed the river, or by being washed underground, where they work their way to the river eventually. The most common fertilisers that are used and are found in the waterways are phosphorus and nitrogen. The consequences of this include increased nutrients in the river water and a decline in water quality. The increased nutrients can affect the organisms living in the river.*  *For many people recreational fishing in the Waikato River is an important pursuit. Reduction in numbers of fish available hadn’t just reduced the sustainability of the environment, but there was also a negative social and cultural impact. The area couldn’t sustain the continuing collection of fish and koura. Local Māori had always collected food from the river and are the kaitiaki for the area. They agreed with providing measures to protect food stocks and the sustainability of the river.*   * Analysed the potential of the measures to sustain the freshwater environment, both now and in the future, using the Waikato River as an example.   *The measure of riparian planting to create a*[*vegetation*](http://sciencelearn.org.nz/About-this-site/Glossary/vegetation)*filtering system for overland flow and suitable vegetation to provide shade and bank stability has partially mitigated many of the effects associated with land use intensification and land activities that generate sediment. This will allow fish and koura numbers to build up and ensure there will be plenty for future generations. Some people we spoke to also said there were more fish there now than even before the riparian planting. If this increase continues, we should be able to sustain recreational fishing for now and in the future. Customary practices regarding the collection of food are already able to be carried out.*   * Analysed the potential of other possible measures such as alleviation of fish passage restrictions in areas with suitable upstream habitat for native galaxiid and eel species to sustain the freshwater environment, both now and in the future.   *The use of wriggle up ropes threaded through perched culverts are being used to enable fish to migrate up rivers as part of their life cycle so they can reach suitable adult breeding habitats.*  *Culverts are large pipes that allow water to pass underneath roads and farm tracks. Perched culverts hang above water level, blocking fish migration through rivers and streams. Unfortunately, even well installed culverts can end up blocking fish passage over time, because the water rushing through erodes away the land away the end of the culvert. This can leave the culvert hanging above the stream, creating a drop that fish just can’t get past.*   * Drawn conclusions about which measure(s) may be most effective in terms of sustaining and/or improving the freshwater river environment.   *Community partnerships with council to restore and manage river banks have the advantage in terms of sustainability because not only does it have positive environmental outcomes for the river and the organisms such as fish living in them, but groups are developed, that can be involved in the ongoing programme. The best step for the river is to create partnerships between the locals and the city and regional councils that will be able to establish riparian plantings on the river banks, and continue to monitor native fish species in the river to see the impact.*  In addition to the completed letter, the student has submitted a logbook containing evidence of their individual contributions.  *The examples above are indicative samples only.* | Evaluate, in depth, measures that may be taken to sustain and/or improve a biophysical environment.  The student has:   * Carried out research and a practical inquiry to: * analyse the characteristics of the biophysical (freshwater) environment of the Waikato River.   *The Waikato River is the longest river in New Zealand and includes a variety of freshwater ecosystems, supporting many organisms, both native and introduced. Different organisms live in different parts of the river. The fish species are eating freshwater plants or the invertebrates that feed on the plants. In turn they are eaten by other fish, shags and people. (Diagram of simplified food web provided). The native fish species here include eels, kokopu and koura (data referenced). These fish rely on there being enough food and oxygen in the river water. The river flows from Lake Taupo which is formed from a caldera volcano which has been extinct for thousands of years. The lake’s surrounding slopes contain many large volcanic rocky outcrops. These have been weathered and eroded over the years producing sediments. These have washed down to form fertile soils on the surrounding land. Due to the porosity of the soils, they are prone to leaching. Today, the river is fed by over 17 000 km of tributary streams and drains (a*[*catchment*](http://sciencelearn.org.nz/About-this-site/Glossary/catchment)*area of 11 013 km2). 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Some of the practices that happen on farms have an impact on the Waikato River. For example, fertiliser run-off adds more nutrients to the water, either running straight off the farm into the river, into the streams that feed the river, or by being washed underground, where they work their way to the river eventually. The most common fertilisers that are used and are found in the waterways are phosphorus and nitrogen. The consequences of this include increased nutrients in the river water and a decline in water quality. The increased nutrients can affect the organisms living in the river.*  *For many people recreational fishing in the Waikato River is an important pursuit. Reduction in numbers of fish available hadn’t just reduced the sustainability of the environment, but there was also a negative social and cultural impact. The area couldn’t sustain the continuing collection of fish and koura. Local Māori had always collected food from the river and are the kaitiaki for the area. 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The economics of the programme might have to involve fundraising, but it is likely that some support will come from the council partners, which is an advantage to having a partnership with them (funding availability referenced). River bank restoration is a long term process, one step at a time, and in other river restorations (data, research evidence referenced) it has been important to involve people so they become attached to the place and project.*  In addition to the completed letter, the student has submitted a logbook containing evidence of their individual contributions.  *The examples above are indicative samples only.* | Critically evaluate measures that may be taken to sustain and/or improve a biophysical environment.  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This can leave the culvert hanging above the stream, creating a drop that fish just can’t get past.*   * Drawn informed conclusions about which measure(s) may be most effective in terms of sustaining and/or improving freshwater river environment and insightful conclusions about how these relate to aspects of sustainability.   *Community partnerships with council to restore and manage river banks have the advantage in terms of sustainability because not only does it have positive environmental outcomes for the river and the organisms such as fish living in them, but groups are developed, that can be involved in the ongoing programme (examples given). The best step for the river is to create partnerships between the locals and the city and regional councils that will be able to establish riparian plantings on the river banks, and continue to monitor native fish species in the river to see the impact. The economics of the programme might have to involve fundraising, but it is likely that some support will come from the council partners, which is an advantage to having a partnership with them (funding availability referenced). River bank restoration is a long term process, one step at a time, and in other river restorations (data, research evidence referenced) it has been important to involve people so they become attached to the place and project.*   * Drawn insightful conclusions about the effectiveness of the measures with reference to the aspects of sustainability.   *The best measures to protect the Waikato River ecosystem for the future is to create community partnerships. Having the local Tainui iwi involved in partnership would be even better as it means that long term the restoration programme can involve some acknowledgement of the history of the river. There maybe even wāhi tapu sites that could be protected too. (Interviews with iwi referenced.) People working together will mean that the knowledge and skills of all of them can be utilised and everyone will be involved and ready to keep going long term, so culturally and socially, as well as environmentally, this measure is working towards sustainability.*  In addition to the completed letter, the student has submitted a logbook containing evidence of their individual contributions.  *The examples above are indicative samples only.* |

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.