Skills for Sustainability

Manufacturing Skills Australia

Assessment Guide:

MSS015001A Measure and report carbon footprint

This project is supported by the Australian Government
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Assessment Guide

MSS015001A Measure and report carbon footprint

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About the assessment guide

Aim of the guide

The Sustainability Skills assessment guide will assist Registered Training Organisations (RTOs) to design and contextualise their assessment activities and evidence requirements for the unit of competency **MSS015001A Measure and report carbon footprint.**

In particular the guide demonstrates how:

- **Assessment methods can be chosen to suit the learner**, for example, if a learner has existing skills and experience in the unit of competency a portfolio of evidence is more useful than direct observation.
- **Assessment methods can be chosen to suit the industry context**, for example, where a work place has established sustainability policies and procedures direct observation and work place documentation / records could be used.
- Specific types of evidence can be identified that relate to the unit requirements and the industry context, for example, if the company has weekly production meetings minutes of these might provide evidence of making recommendations.

These decisions are used to design the assessment activities. For example a work place project might be developed around the aspects of the unit that can be applied and/or demonstrated in the workplace. Portfolio requirements might be designed around evidence that can be found, or generated, from typical day to day activities. An interview or test might be designed around aspects of the unit where knowledge needs to be tested because it is not clearly demonstrated in the practical activities or to test an individual's knowledge in a team environment.

The guide also provides examples that show how:

- **a contextualised workplace project can be developed** that demonstrates relevant aspects of the unit
- **questions can be identified** to assist in the authentication of evidence and show understanding of the application of the concepts of sustainability.

The assessment guide uses a fictional scenario as the basis for demonstrating one approach to developing an assessment tool for this unit of competency.

Note that the guide should be read in conjunction with the unit of competency (see training.gov.au).

What the guide does not provide

The guide focuses on selecting assessment methods and evidence and does not provide a complete or validated assessment instrument. It is for guidance only; there are others ways that the unit could be assessed and many ways that an assessment can be contextualised. None of the processes or ideas in this guide is mandatory.

It does not cover everything that an RTO must address to deliver an assessment and meet compliance. For example the RTO will need to address:

- development of assessment instruments and documentation
- validation of assessment tools, processes and outcomes
- consulting with industry and developing a training and assessment strategy
- how the assessment will be 'delivered', for example, scheduling the activities, monitoring and providing support to the learner, and engaging input from enterprise managers
- full mapping of evidence to units of competency.

Each RTO will need to decide whether to follow any of the processes demonstrated here. If so, the RTO will need to amend the evidence and other details to reflect the characteristics of their learner/s and the context of their assessment. This should be based on their consultations with industry and clients, and the other information within their training and assessment strategy.

Focus of the guide

MSS11 Sustainability Training Package Assessment Guidelines

The Assessment Guidelines in MSS11 state that "*assessment should be conducted in the workplace or in a in a work-like environment. Many of the units also require the measurement of environmental and other indicators over a period of time and for this reason project based assessment is also preferred*."

This unit of competency states that "*Assessors must be satisfied that the candidate can competently and consistently apply the skills covered in this unit of competency in new and different situations and contexts.*"

In addition the Sustainable Operations qualifications are designed for workers experienced in their industry who require an 'overlay' of skills to improve the sustainability of the business.

Therefore the assessment guides focus on assessment methods for experienced workers and workplace assessment.

Contextualising

The guide focuses on contextualising assessment to the participants / learners and the workplace context. It demonstrates how the context of the assessment can be analysed and used to select assessment methods and evidence to meet the requirements of the unit of competency.

Typically the context comprises information about:

- industry or enterprise systems, practices and documentation
- characteristics of the learner/s
- mode of delivery of any training.

The guide outlines one approach to planning and designing assessment activities and evidence that are contextualised.

There are many ways that an assessment can be designed to meet the context and the unit requirements. The approach outlined in this guide is just one way. If an RTO follows this approach they should amend the activities, evidence and other details to reflect the characteristics of their learner/s and the context of their assessment.

Contextualising for different sectors is critical. The sustainability issues that are significant to one industry sector or process might not be found in another. For example the casting and forging sectors use large amounts of energy and produce emissions such as dust and greenhouse gases (GHGs). However, one of the key sustainability issues in furniture manufacture may be sourcing plantation timber.

Additional information is available on the Skills for Sustainability website at http://www.sustainabilityskills.net.au including information about this unit of competency and information about sustainability issues in different sectors.

The website also has information about contextualization, understanding sustainability issues within different sectors, designing an assessment, developing workplace projects and using simulated workplace environments.

What's in the assessment guide

This guide provides:

- a scenario outlining the RTO, learner and enterprise context
- key points drawn out from the scenario
- checklists to help link the context to the assessment methods and evidence:
    - checklists relating to the context for the assessment
    - checklists relating to assessment methods, and methods of collecting and submitting evidence
- an evidence planning table, linking the scenario context with evidence and the unit of competency
- a work based project based on the scenario and unit of competency and contextualised using the identified evidence
- questions based on the scenario and unit of competency and contextualised using the identified evidence.

Assessment planning and design

Planning every aspect of an assessment is a broad process that requires many steps and sources of information. Arguably it can start with industry consultation and developing the training and assessment strategy; and conclude with the assessment decision and feedback to the learner.

This guide focuses on a small section of the process. It targets the steps of analysing the unit of competency and the context of the assessment in order to select appropriate assessment activities and evidence collection. These steps are represented in the flow chart at Figure 1.

Typically the context comprises the industry or enterprise systems, practices and documentation and characteristics of the learner/s and mode of delivery of any training. As an RTO you will collect much of this information from your industry consultation and discussion with clients, and capture it in your training and assessment strategy.

In this guide the context is described in a scenario which includes a fictional RTO, learner profile and an industry sector or enterprise context. It uses this information to identify suitable assessment methods and available evidence that are aligned to the unit of competency. These are used to design the assessment activities linked to the unit requirements.

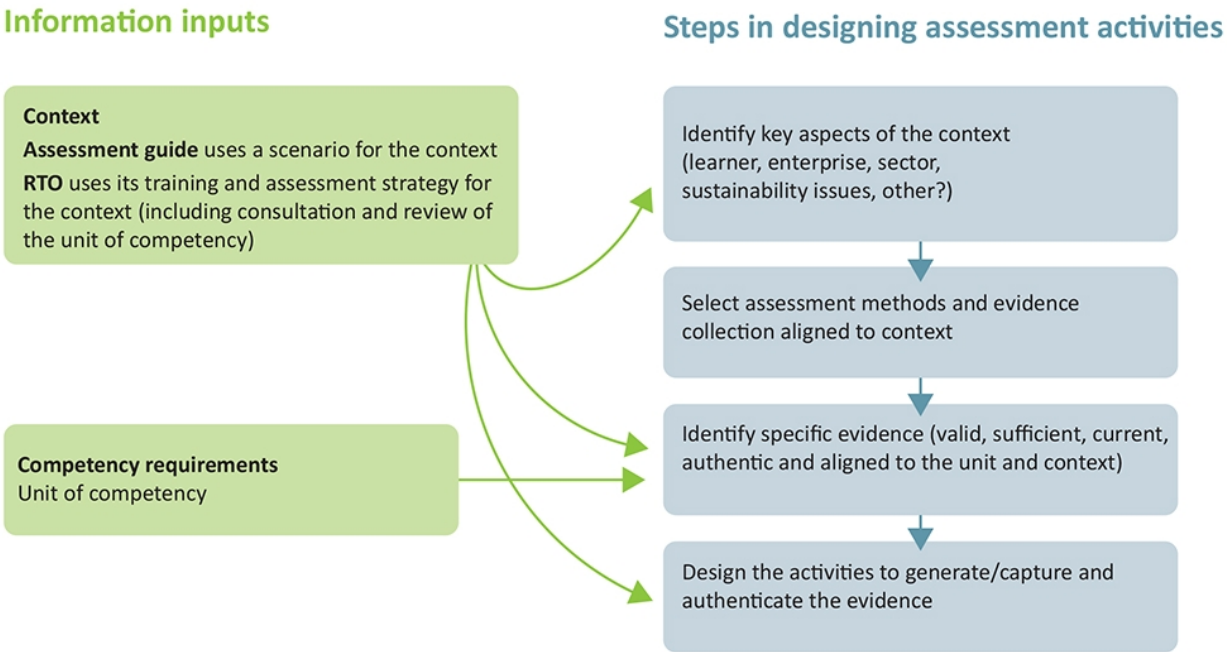

Figure 1 Designing assessment activities

Context: The scenario

The RTO

Greater Southern Institute of TAFE is delivering a popular short course titled 'How to measure and reduce your carbon footprint' and will issue a Statement of Attainment for successful learners. The TAFE provides access to the internet, and has a sustainability learning hub for learners to find relevant resources.

This term there are 23 learners in the class, who come from a variety of manufacturing companies. As this is a nationally recognised competency based program the learners are required to implement their skills in the workplace and provide evidence of competency. As the target group is adult learners at Diploma level there is an expectation of self-directed learning and discussion with the assessor about appropriate evidence of competency.

The learners are enrolled in the unit of competency MSS015001A Measure and report carbon footprint.

The learner

Vu has been working in foundries for all of his working life is now a senior technical supervisor at Ocean Castings. Now he's getting older he's finding the physical work more difficult, so he has decided to study sustainability part time at the local TAFE, starting with measuring and reducing a carbon footprint. He has access to the workplace data and documentation and the production manager is supportive of him doing the course as he hopes it will lead to some cost savings on the gas and electricity bills which can then be passed on to the customers or put into profits.

The enterprise context

Ocean Castings makes finished steel castings to order for the mining and oil and gas production industries. It provides a full service, including design, metallurgical testing, finishing and delivery.

The senior technical supervisors at Ocean Castings report to the production manager. The materials engineer/metallurgist is available to provide technical advice to the employees as well as clients.

Electric induction furnaces are used to melt the iron and steel, and gas furnaces are used to temper the products. Heavy machinery, such as cranes, lifters and rollover machines use diesel or electricity. Sand is used for the casting process and is recycled into road making.

The DMAIC (Define, Measure, Analyse, Improve and Control) data-driven improvement cycle is used for improving, optimising and stabilising the processes and products.

Key points from the scenario

- The industry sector is casting and forging.
- Vu has detailed technical knowledge of the processes at Ocean Castings and is confident with using information technology.
- Vu has access to workplace documents and key performance indicators (KPIs) for sustainability, such as production records and energy bills, and will be able to identify and liaise with the stakeholders.
- Vu is attending a course and will be implementing the competency in his workplace, so a workplace project is a feasible assessment method.
- The sustainability issues in this scenario include use of fuel, electricity and gas; emissions of dust, fumes and volatile organic compounds into the air, water and landfill; and reducing waste.

What does the scenario tell us about the context for the assessment?

☑ Classroom based
☑ Existing worker in this field
❑ Not currently employed in this field
☑ Off the job learning
☑ On the job implementation
❑ RPL
❑ Simulated workplace environment
☑ Single unit of competency
❑ Skill cluster
❑ Whole qualification
☑Workplace based

Which assessment methods are suitable?

Direct observation, for example;
☑ Practical demonstration in the workplace
❑ Real work/real time activities in the workplace
❑ Work activities in a simulated workplace environment

Structured activities, for example;
❑ Activity sheets
❑ Presentation to colleagues
❑ Scenario based project
❑ Simulation exercises such as hypotheticals and role plays
❑ Work based case study
☑ Work based project (and documentation)

Questioning, for example;
❑ Oral or written examinations (may be applicable at higher AQF levels)
❑ Questionnaires
❑ Self assessment
☑Verbal questioning / discussion / interview
❑ Written questions

Portfolios of evidence, for example;
❑ Authenticated prior achievements
☑ Collection of work samples compiled by the learner
❑ Evidence of training courses attended
❑ Historical evidence
❑ Information about life experience
☑ Journal or log book
❑ Photographs or video
❑ Product with supporting documentation
❑ Verified workplace history/CV
☑ Workplace documentation / records

Third party feedback, for example;
❑ Interview with employer, supervisor, or peer
❑ Letter of support from a work place
❑ Testimonials and reports from employers and supervisors
❑ Third party report from supervisor or technical expert

How will evidence be collected or submitted?

☑ Documents - electronically / in person / mail
❑ Data capture - video / audio / notes /smart pen by assessor / 3rd party / candidate
☑ Data submission - web upload / mail (USB drive / SD card / disc etc)
❑ Online real time - Skype, web conference
❑ Online self paced – online tests, interactive simulation

Evidence: What will be available and suitable?

The evidence planning table shows one way of linking the context of the scenario with the unit of competency. It examines the unit of competency, the context and the selected assessment method in order to identify appropriate assessment evidence.

Based on the scenario, the learner and the context identified above, the following evidence could be expected to be available as part of the assessment. Keep in mind that some evidence might apply to several aspects of the unit or even several units.

In the scenario used in this guide the learners all work in a different enterprise and sector. So the RTO would need to adapt the evidence and to reflect each enterprise context and learner.

Evidence planning table

This table provides an example of identifying evidence that is available in the workplace. The evidence listed here has been selected so that it covers the required skills, required knowledge and critical aspects of assessment for this unit, however, this has not been shown in the table.

The table is not intended as a format for mapping to meet compliance requirements and each RTO needs to determine the type of mapping that may be required by its registering body.

Element	Performance criteria	Evidence
1 Map carbon sources and sinks along the value chain	1.1 Select portion of the value chain for analysis 1.2 Identify process steps along the chain 1.3 Identify the carbon-related change which occurs at each step	☑ **Work-based project (and documentation)** • Work plan for a work-based project to measure and report carbon footprint • Spreadsheet of the process map for the portion of the value chain being analysed identifying process steps, carbon-related changes at each step, carbon sources and carbon sinks ☑ **Workplace documentation/records** • Sustainability audits for energy and emissions of the process ☑ **Verbal questioning in a discussion or as an interview** • Interview by the production manager and assessor about the work-based project

Element	Performance criteria	Evidence
2 Determine nature and source for carbon emissions	2.1 Determine carbon emissions from each step 2.2 Determine source of each emission 2.3 Identify measurements available for each emission and each source	☑ **Work-based project (and documentation)** • Excel worksheet of carbon dioxide (CO_2) emissions for each process step ☑ **Collection of work samples compiled by the learner** • Examples of data for KPIs for carbon, such as GHG emissions from purchased electricity • Sustainability audits for energy, emissions and/or transport • Examples of complex documents which have been interpreted to determine the nature and source of carbon emissions e.g. operating procedures, manuals, regulations ☑ **Practical demonstration in the workplace** • Recording of a discussion with the production manager and assessor about emissions sources and carbon equivalence of different emissions at the company ☑ **Verbal questioning in a discussion or as an interview** • Interview by the production manager and assessor about the work-based project
3 Quantify carbon	3.1 Quantify each emission 3.2 Determine CO_2 equivalent tonnes for each emission 3.3 Determine point of obligation and total obligation, as required 3.4 Determine total carbon embodied in product	☑ **Work-based project (and documentation)** • Spreadsheet of CO_2 equivalent tonnes for each emission and each process step showing the calculations and quantified carbon changes • Report of point of obligation and total obligation and total carbon embodied in the product (or a reasonable estimate if there is no access to workplace data for the total value chain) ☑ **Verbal questioning in a discussion or as an interview** • Interview with the production manager and assessor to draw out required knowledge about the point of obligation, total obligation and total carbon embodied in the product

Element	Performance criteria	Evidence
4 Recommend strategies for reducing carbon footprint	4.1 Short list high carbon sources 4.2 Determine root cause of emissions 4.3 Identify relevant carbon sinks 4.4 Investigate methods for reducing emissions 4.5 Prepare recommendation for improvement	☑ **Work-based project (and documentation)** • Spreadsheet of the process map for the portion of the value chain being analysed identifying process steps, carbon related changes at each step, carbon sources and carbon sinks • Notes from a team meeting, including a short list of high carbon sources and the root cause analysis (RCA) for each ☑ **Verbal questioning in a discussion or as an interview** • Discussion with the materials engineer/ metallurgist and assessor to draw out knowledge about alternative methods to reduce carbon emissions and embodied carbon at the company • Interview by the production manager and assessor about the work-based project
5 Report carbon footprint	5.1 Identify purpose of report and key stakeholders 5.2 Compile data, implications and recommendations 5.3 Consult with stakeholders, as appropriate	☑ **Work-based project (and documentation)** • Project plan for a workplace project to measure and report a carbon footprint, including planning who the internal and external stakeholders are and purpose of the carbon footprint report • A final report of the carbon footprint comprising a spreadsheet of the value chain with boxes identifying the quantified carbon changes, the data, calculations, implications and recommendations for reducing the carbon footprint ☑ **Journal or log book** • Journal outlining the barriers to measuring the carbon footprint and strategies used to overcome the barriers ☑ **Verbal questioning in a discussion or as an interview** • Interview by the production manager and assessor about the work-based project

Assessment activity: Work based project

The work based project defines a project that the learner can do in the work place. This might be part of their normal activities or it could be an additional activity. In this example there is a clear relationship between the unit of competency and a work place activity to 'measure and report a carbon footprint'.

So, for this unit, the outline of the project can come from the unit itself. The details of the project can be designed by bringing together the context with the evidence that is available in the work place (or that can be generated by the project). The evidence that has been identified in the evidence planning table helps to define the project.

A work-based project for Vu at Ocean Castings

The project is to measure the carbon footprint of a product along the value chain at Ocean Casting and recommend strategies to reduce emissions.

Measuring the carbon footprint of a product includes calculating the embodied carbon, determining the CO_2 equivalent tonnes emitted and determining the point of obligation for reporting purposes.

Vu will need to complete the following:

1. Liaise with the production manager to identify and tee up the human and financial resources needed to undertake project.
2. Plan out the project so he knows what he is (and is not) doing and how he will go about it, including:
    - providing a description of the overall business
    - identifying who the key stakeholders are and how and when he will consult with them
    - identifying the portion of the casting value chain that the carbon footprint is being measured for
    - confirming the reason for measuring the carbon footprint and the purpose of the final report
    - identifying the point of obligation for the product
    - identifying legislation, Environment Protection Authority (EPA) regulations, protocols, covenants and International standards relevant to the casting industry
    - identifying how the work relates to the strategic sustainability goals of the casting industry
    - how he will be calculating total embodied carbon for the product.

3. Map the carbon sources and sinks for all the process steps and identify the carbon-related changes that occur at each step.
4. Determine the nature and source of the carbon emissions for each step.
5. Quantify the carbon (emissions and embodied) for each step in the section of the value chain being examined, and the total embodied carbon in the product, showing the calculations.
6. Short list the high carbon sources.
7. Determine the root cause using the problem solving technique used at Ocean Castings.
8. Determine possible solutions for each short listed carbon source in consultation with the production manager and materials engineer/metallurgist.
9. Prepare a report, based on the DMAIC process, which recommends the preferred solutions to reduce the carbon footprint.

Assessment activity: Questions

In this guide, questioning is used to assess required knowledge and aspects of competency which are difficult to assess in other ways, for example, testing the application of the concepts to the project activities. The questions also help to authenticate the evidence.

Based on the scenario, the assessor will discuss these questions with Vu at pre-determined points during the project, as part of the delivery and assessment responsibilities.

Questions for Vu at Ocean Castings

How did you decide what you were going to do and how you were going to go about it?

Who did you have to liaise with at Ocean Castings?

Did you need to discuss the project or request assistance from anyone else?

What are the nature and sources of the major carbon equivalent emissions of the process you mapped?

Apart from CO_2, what other GHGs were emitted?

Does the process have any carbon sinks? If so, what are they?

Did you do this work as part of a team? If so outline what your role was.

Would the process you have gone through apply to other parts of the supply chain?

Would the process you have gone through apply to reducing other non-carbon emissions?

What methods can be used to measure and calculate carbon use?

What are the points of obligation for the process you mapped?

If you mapped only a portion of the value stream how would you calculate the total carbon embodied in the product?

Talk us through your recommendations for reducing the carbon footprint and why you have made them.

What alternative methods could be used to reduce carbon emissions and embodied carbon?