

Research into waste reduction infrastructure and services suitable for Western Australian high schools

Funded by the Waste Authority WA



29 November 2016



Level 2
33 Park Street
South Melbourne VIC 3205
(03) 8807 0139
info@eqlomg.com
www.eqlomg.com

Table of Contents

Executive Summary	1
Recommendations for implementing recycling infrastructure and services in high schools	.3
1. Background	4
1.1 Purpose of the research.....	4
1.2 Waste Wise Schools.....	4
1.3 Research methodology.....	4
2. Summary of research findings	5
2.1 Desktop research	5
2.2 Follow-up phone interviews	5
2.3 School surveys.....	8
2.3.1 Current waste management and recycling activities	8
2.3.2 Summary of current waste and recycling programs	10
2.3.3 Key successes and barriers for waste management and recycling at high schools	11
2.3.4 Expression of interest to participate in a composting trial	11
3. Conclusions	11
4. Recommendations for implementing recycling infrastructure and services	12
Appendix A – Research summary	14

Tables and Charts

Figure 1. Breakdown of the status of the high schools surveyed	8
Figure 2. Surveyed schools' Waste and Recycling Management group participants.	9

Executive Summary

This report presents the findings of the research into suitable infrastructure and services that could be implemented in Western Australian high schools to reduce waste to landfill and increase recycling activities.

The aim of the research was to:

- Identify which infrastructure or service is easiest or most likely to be adopted by high schools and which will have the largest impact.
- Identify factors which will increase the chances of successful uptake and use of the infrastructure or service (grants, supporting curriculum, leadership opportunities, resources, training and face-to-face support).
- Identify any other factors to be aware of when trialling the infrastructure or service in high schools.

The majority of high schools are interested in improving their waste and recycling systems and acknowledge that there are still areas requiring improvement in their current programs. In summary:

- Most schools acknowledged that waste and recycling is a key problematic area.
- Most schools identified that waste management provides an engagement and learning opportunity for students and staff.
- Most schools have the knowledge, commitment and support of school management (staff and ground staff) for resolving waste management issues and increasing recycling activities.
- 45% of schools have a delegated group for managing waste and recycling composed of teaching staff, students, administration staff and grounds staff.
- 95% of schools surveyed recycle paper and/or cardboard from all areas of the school. Paper and cardboard were seen as the easiest program to implement across the whole school.
- Most schools were satisfied with the management of their paper/ cardboard recycling system in regards to correct usage, time, suitable staff/ students and spacing for the bins.
- 35% of schools surveyed have implemented a mixed recycling program while others expressed a high level of interest in implementing one.
- Implementing mixed recycling can reduce contamination in paper and cardboard streams.
- 50% of the schools were found to undertake some form of food waste recycling. These schools found it easy to implement and was used correctly by staff/ students. Composting worm farms were identified as the easiest recycling program to put in place due to the relatively cheap cost and ease of maintenance.
- 60% of schools either process green waste on-site or have arranged a service provider to collect the material for composting. Most found them easy to manage.
- 70% of schools agreed a food waste service provider for the collection and processing of food wastes would also be useful and would like to know more.
- 85% of the schools surveyed were interested in trialling an electronic composter.

Success factors

The factors that were identified that led to a successful program included:

- Funding and infrastructure donations.
- Early engagement and education across the whole school prior to rolling out new infrastructure. This should include strategies to motivate and engage as well as education on proper use, recycling rosters, locations etc.
- Trialling the recycling program in a specific area of the school (i.e. staff room) prior to rolling it out more broadly.
- Allowing one or more staff members enough time to manage the systems.
- Engaging grounds maintenance staff to assist in monitoring and implementing the program. Waste management could be built into their job description.
- Engaging internal and external groups as well as separating it from normal curriculum activities meant that there was wider adoption of the program and further encouragement and assistance from the broader student community.
- Student led programs where the responsibility for maintaining a system is shared amongst the group.
- Drawing upon the success of a particular program that has been established (i.e. paper and cardboard recycling) to introduce a new system.
- Regular recycling bin auditing and feedback such as assembly talks, bulletins and newsletters to further encourage recycling activities.

Barriers

A number of barriers that were also identified including:

- The absence of, or infrequent, council and service collection providers. This may be a perceived absence for some metropolitan schools.
- The absence of a responsible person or group for managing waste and recycling.
- Strategies for behavioural change to encourage correct usage of recycling systems and avoid contamination.
- For mixed recycling (co-mingled) the following barriers were identified:
 - Lack of infrastructure to collect recyclables,
 - difficulty in organising, and
 - contamination or incorrect usage of the bins.
- For food waste separation the following barriers were identified:
 - Difficulty in food waste separation from general waste,
 - contamination and incorrect usage of the bins,
 - lack of infrastructure and capacity to process the volumes of food waste, and
 - lack of time.

- For green waste, the following barriers were identified:
 - insufficient space,
 - lack of composting knowledge, and
 - a lack of investigation into the possibility of implementing a green waste system.

It was found that smaller schools generally lack the space and infrastructure to implement recycling programs, they have less staff to manage the programs. Smaller schools were more likely to have not implemented a mixed and food waste recycling programs.

Medium and larger schools are more concerned about contamination of the recycling streams as well as time availability and organisation of the recycling programs.

Recommendations for implementing recycling infrastructure and services in high schools

None of the high schools surveyed had a whole-school system for collecting fruit and vegetable scraps and 40 per cent did not manage green waste (or were uncertain if they had a system). WWS should assist schools to implement on-site systems (i.e. electric composters, compost bins, tumbler composter or worm farms) for both food and green waste. There is a good opportunity to divert this material from landfill and reduce waste collection costs, provided the school has enough space and school grounds staff are engaged in the program.

Schools also expressed a high level of interest in electric composters and food waste collections by an external service provider. WWS should trial both and evaluate them in a high school setting.

Early engagement was identified as important to the success of any recycling systems. WWS should develop a structured program for engaging and educating staff and students prior to rolling out a new recycling system across the whole school.

WWS could identify a suitable service provider if schools do not have room for a composting system. This could form part of a broader campaign highlighting all recycling services that are available including potential costs and savings.

A review of each school's recycling systems and available service providers could be undertaken as part of the existing WWS audit program.

Where schools are currently implementing at least one recycling activity, there is an opportunity for the school to leverage off this program by promoting the benefits of good recycling practices. WWS could develop signage for a number of recycling activities which could list the co-benefits such as reduced contamination through one stream by implementing another program.

WWS should develop a recognition program which includes funding for additional infrastructure, resources and support to manage recycling systems.

1. Background

Waste Wise Schools (WWS) engaged Equilibrium to undertake research into suitable infrastructure and services that could be implemented in Western Australian high schools to reduce waste to landfill and increase recycling activities.

As part of the research Equilibrium was also engaged to survey high schools to identify if they would be interested in participating in an electronic composting trial at their school.

Case studies on good waste management and recycling practices within Western Australia high schools were also prepared.

1.1 Purpose of the research

The purpose of the research was to identify factors of success and barriers associated with implementing infrastructure or services into a high school to reduce waste to landfill and/or increase recycling.

The research focused on the following infrastructure and services:

- Commercial size electric composters (processing 10kg or more per day).
- Worm farms and compost.
- Food waste collections by a service provider (off-site processing).
- Mixed recycling collections (comingled).
- Paper and cardboard recycling collections.
- Green waste collections.

Additionally, the research aimed to identify which infrastructure or service is easiest or most likely to be adopted by high schools and which will have the largest impact.

1.2 Waste Wise Schools

WWS is a program of Waste Authority, offering resources and support for schools to plan, implement and maintain waste minimising projects such as recycling, composting and worm farming.

The program helps schools to set up infrastructure and provides resources aimed at changing attitudes and behaviour in regard to sustainable waste management.

There are currently 250 accredited Waste Wise Schools in Western Australia.

1.3 Research methodology

Equilibrium used a combination of desktop (internet) research, follow-up phone interviews and surveys to assess school's waste management and recycling initiatives.

Information relating to the school programs was obtained from a number of sources including school newsletters, annual reports, not-for-profit organisational programs, and state government endorsed accreditation and award programs.

The research was undertaken with approval from the Department of Education and Catholic Education Office

2. Summary of research findings

2.1 Desktop research

Through the desktop research it was found that 38 schools (both primary and high schools) had implemented some level of recycling and/or waste minimisation program.

Programs that were found to have been implemented at the schools included:

- Paper and cardboard recycling and re-use (into note pads or for painting at another local school), used as papier mache mulch or recycling through a commercial program.
- Mixed (co-mingled) recycling and drink containers recycled through commercial programs (including rebates through container deposit schemes – South Australia).
- Organic (food waste, shredded paper, chicken manure and lawn clippings) collection and composting (for school vegetable and other gardens) or re-use as animal feed (off-site).
- Flexible plastic and polystyrene recycling and timber offcuts and sawdust collection (external contractor).
- Batteries, bread clips, corks, ink cartridges, mobile phone and accessories (often collected from the home and bought into the school for recycling).
- Waste free lunch programs to reduce the amount of waste generated and disposed of as a result of food wrappers (such as plastic cling wrap).

A number of these programs were either instigated by year or multiple year levels and were either organised to collect from the whole school or specific areas such as canteens, classrooms, home economic departments or in the case of co-mingled recycling bins placed across the whole school for collection and processing.

Food waste was either collected for composting in worm farms or through mechanical composters in the case of 6 educational institutions across NSW, Victoria, SA and Western Australia (Bunbury Catholic School and Great Southern Institute of Technology).

It was found through the research that funding and infrastructure donations played an important role in the ability to implement new infrastructure as did the ability to apply for accreditation and participate in recognition programs (such as the NSW Sustainable Schools Program and the Sustainability Victoria Resource SmartAwards).

Successful programs were found to be often managed by a single person such as a student, a class of students or teaching staff member which in turn was used to support curriculum subjects or other environmental interest programs across the school or year level.

Bushranger cadets were also engaged to undertake some of the programmed activities such as collecting materials for recycling and managing the compost and worm farms.

It was identified that not all schools have undertaken a waste audit but where there was information relating to participating in awards or accreditation programs, actual percentage reduction statistics were provided indicating high levels of diversion and recycling is achievable within the school environment.

2.2 Follow-up phone interviews

Five schools and one business identified through the desktop research described above were contacted to find out more information about the motivation and drivers behind the waste reduction and recycling program, whether the program has been successful, what barriers or problems were encountered (if any) and how these were overcome. A summary of the findings is presented as follows:

Research into waste reduction infrastructure and services suitable for Western Australian high schools

Of the five schools interviewed by phone:

- one has implemented a paper collection and recycling and comingled system across the entire school.
- four of the five schools are currently using composting worm farms to process food waste.
- one school is using a Closed Loop organics recycling unit.

One Melbourne based restaurant is also using a Closed Loop organics recycling unit to process up to 75 kg of food waste including food preparation scraps and plate scrapings. The processed food waste is in turn used on their farm gardens, in the form of a compost material.

The success of the recycling programs implemented by the four schools varied due to the whether there were strong internal drivers (driven by a particular staff member or student group(s)), participation in an external recognition programs or as a result of receiving funding for the installation of infrastructure and a use for the end product as a resource within the school or as a product that could be sold externally.

Composting worm farms were identified as the easiest recycling program to put in place due to the relatively cheap cost and ease of maintenance.

However, feedback from all four schools who have implemented a worm farm, there were periods when the worm farm was not used due to the staff member responsible for managing the program left. It was also observed from the interviews that without continued internal support (i.e. the staff member was not given enough time outside of normal curriculum activities) there was a higher likelihood that the program would likely stall or remain dormant for period of time.

Where a composting program is supported by an external group (i.e. Bush Ranger group) it was more likely to be successful as the management of the system can be separated from normal curriculum activities. Principal support was also unanimously nominated as a significant factor that greatly contributed to successful programs.

It was also suggested that when maintenance staff are involved in a program (i.e. when written in as part of their job description) this also contributed to its success.

Where it was observed that students had taken up a particular program, this led to increased support from staff members which then led further encouragement and assistance from the broader student community.

Feedback on one program was that it was the most successful in younger year levels (Pre-primary to Year 9), however, there has been improvement in senior school students as they have progressively been involved in the program. With the comingled recycling infrastructure having been implemented for 3 years there has been progressive improvement in recycling outcomes.

One negative aspect identified in one program was where the recycling infrastructure bins were installed in the classrooms for couple of weeks before an official introduction was made (education on proper use, recycling roster, locations etc.). Bad habits were observed to form quickly as the students misused the bins. In hindsight, the staff responsible for implementing the recycling program would have liked additional time to educate students on the bin infrastructure and introduce a roster for managing the waste materials before the bins were installed.

Other supporting programs that were observed to lead to the adoption of a successful recycling (and litter awareness) program included educational signage installed across the school, bi-yearly presentations at school assemblies and excursions to a Material Recovery Facilities to raise awareness on how wastes are managed and processed once they are disposed of. Waste free lunches and regular (yearly) bin audit programs, using student resources, were also identified as beneficial and helped to support school recycling activities.

Research into waste reduction infrastructure and services suitable for Western Australian high schools

Behavioural change was recognised as a barrier and one school has slowly been able to overcome this through continually reminding the students through assembly talks, bulletins and newsletters, especially if littering was observed to be higher on a certain week or period of the year.

One school turned their waste recycling efforts into a resource were able to sell the liquid product from a worm farm at a farmers market and produce scrap writing pads for sale to local businesses.

Once it was identified that a program was successful one school moved onto reviewing paper consumption in classrooms, electricity bills and water usage. The school Business Manager at one school has been given the responsibility of looking at other options to reduce the use of other resources at the school.

Feedback from the one school and business (a restaurant in Melbourne) who have installed a Closed Loop organics recycling unit is that they have generally performed well.

There have been some instances, during the early stages of implementation when the equipment was first installed at the business, where some of the internal components (paddle arms) failed on the CL050 and were vulnerable to breaking. In most instances the components were replaced within a few days and for the past two years the machine has been operating at almost full capacity without any major issues. The unit operates from Monday to Saturday, and is regularly emptied during the week depending on how much food is fed into the machine. The unit is always half emptied on Monday with the outputs used to supplement compost at the owner's farm and as a product that is on sold to other local farms.

The school received the Closed Loop organics recycling unit as a donation. The composter produces approximately 4 to 4.5 kg per day. It is used from Monday to Friday and is left over the weekend to fully process the week's food scraps. It is the preference of the school to leave it on for two full days over the weekend and on Monday's the compost is added to the garden beds. It was suggested that in the future the school may offer the compost for sale.

The school canteen uses the composter for by-products of food waste and left over food items, including bread and sandwiches however when tea bags were introduced, the tag and string, on a number of occasions caused the machine to jam. The unit is now only used to process canteen food scraps where the inputs can be monitored.

Both users mentioned that on some occasions the machine produced some odour but generally did not cause any issues to people working in close proximity to the location of the unit.

The restaurant uses the unit to compost meat bones and after a few hours, when the bones have been defleshed they are often removed. Only small game, lamb and rib bones are added to the unit. Larger bones are left out. The school does not introduce bones into their unit as they don't generate a lot of bone waste.

Other issues that were noted included plastic cling wrap, tea towels and washing cloths becoming entangled within the units that have to be manually removed and when the 'emergency off' button was engaged (as a result of contamination) the food was not processed over the weekend.

Both users agreed that the electric composter needs to be owned by somebody who can coordinate what goes into the unit including removing potential contaminants, how often it should be emptied, how much of the processed material should be removed, where the compost goes (or on occasions where it can be temporary stored) and how it is distributed (in the case of the Primary School which garden's receive the compost).

Both the school and business started with an audit prior to implementing the composting technology and have been able to demonstrate, through this and other identified waste reduction and recycling initiatives, that there are measurable costs savings (by reducing the number of bins) as a result of using the machines rather than paying for the materials to be collected from site and landfilled.

2.3 School surveys

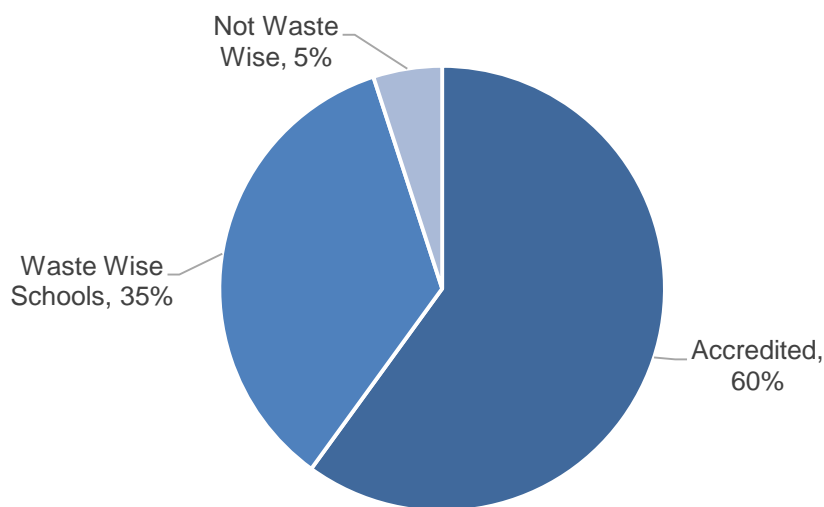
A total of 19 completed and one in-complete response was received from a total of 23 surveys sent out to Western Australian high schools.

The high schools were selected based whether they were located in metropolitan or regional areas, whether they were Waste Wise accredited schools or not and whether a staff member had previously attended a Waste Wise workshop or event.

Of the 20 responses received, 18 schools were located in the metropolitan area and two were located in regional areas.

The breakdown whether the school was Waste Wise accredited or not is shown in the following figure:

Figure 1. Breakdown of the status of the high schools surveyed



Accredited schools have completed a waste policy, plan, audit and have a committee in place and may have received a grant in the past. They have implemented waste reduction and recycling systems.

Waste Wise schools have attended a Waste Wise Schools workshop but may or may not have implemented waste reduction and recycling systems.

Not Waste Wise Schools have never attended a workshop and have not had any contact with Waste Wise Schools. These schools may or may not have implemented waste reduction and recycling systems.

A summary of the findings and trends is presented in the following sections. Please contact Waste Wise Schools for a copy of the survey questions or detailed responses.

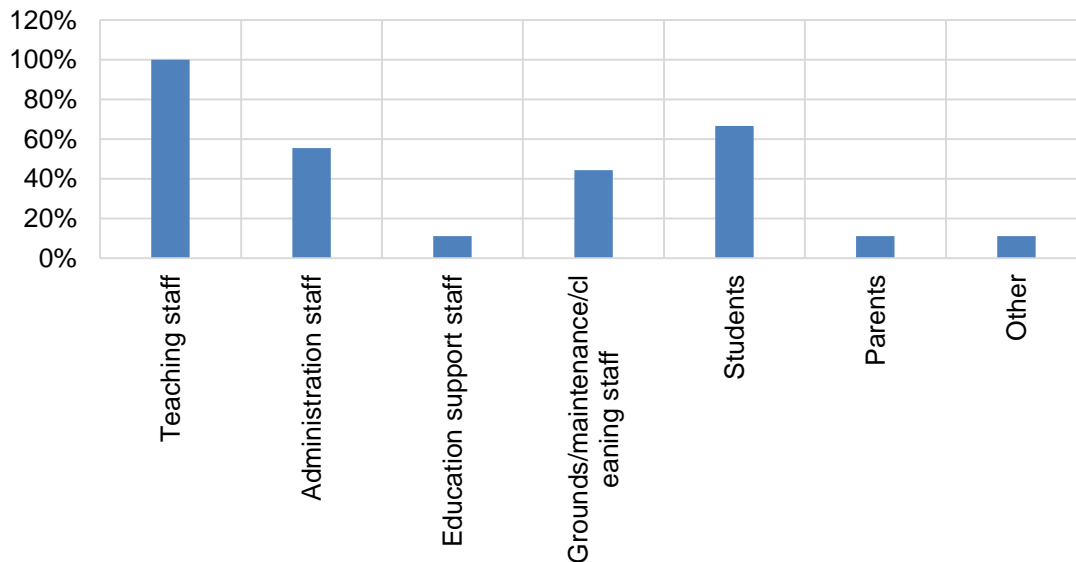
2.3.1 Current waste management and recycling activities

The survey respondents were classified into small, medium and large schools based on the number of enrolled students to identify significant differences between school size and waste and recycling efforts. Small sized schools had an average of 33 staff, medium sized schools with an average of 74 staff and large schools with an average of 155 staff. Overall, the results remained fairly consistent between the school sizes with no significant differences with the exception of minor findings detailed as follows.

Research into waste reduction infrastructure and services suitable for Western Australian high schools

According to the survey, 45% of schools have a delegated group for managing waste and recycling where the majority of these groups are composed of teaching staff, students, administration staff and grounds/cleaning staff. The figure below details the proportion of participants responsible for the waste and recycling management systems.

Figure 2. Surveyed schools' Waste and Recycling Management group participants.



Most respondents have either already achieved or are planning to introduce a new waste and recycling management policy. Furthermore, most are planning to review the waste and recycling management policy, discuss implementation at senior leadership level as well as install recycling equipment in the near future. Many schools have looked into improvements for waste and recycling management between staff and students, however the survey responses suggest they are yet to explore implementing a new recycling collection service.

A large number of schools acknowledged that waste and recycling is not only a key problematic area, but provides an engagement and learning opportunity for students and staff. Most schools have the know-how, commitment and support of school management (staff and ground staff) for resolving waste management issues and increasing recycling activities. However, the findings did not give a clear indication for the participation and support of students in waste and recycling amongst the schools, with the exception that smaller schools found more difficulty in gaining support in this aspect than medium to larger schools.

If assistance was provided, 95% of respondents would be interested in improving their waste and recycling systems and 85% of schools acknowledged there are still areas requiring improvement in their current systems. Particularly, smaller schools indicated that they would require financial assistance for recycling infrastructure investment and ease of system use, whereas medium and large schools see suitable staff for managing and a favourable return on investment as key success factors. Overall, majority of respondents agree that waste and recycling bills make up a small proportion of total operating costs, including the cost of financing paper/ cardboard recycling. Of the schools that undertake mixed recycling, only 15% agreed that financing mixed recycling is covered by waste costs.

2.3.2 Summary of current waste and recycling programs

Paper and cardboard

Currently, 75% of surveyed schools recycle paper and/or cardboard from all areas of the school, 20% collect from certain parts of the school and 5% do not conduct this recycling service. The majority of schools produce adequate volumes of paper/ cardboard to have a service collection and found ease in organising and managing this service, specifically through students and housekeeping/ cleaning staff that undertake the collection process. The most prevalent locations for the recycling infrastructures are within classrooms, aside photocopying machines, main learning areas and staff offices. The majority of schools are satisfied with the management of paper/ cardboard recycling system in regards to correct usage, time, suitable staff/ students and spacing for the bins.

The key barriers for 25% of the schools surveyed that they don't conduct whole-school recycling or at all was primarily due to the absence of or infrequent council and service collection providers and an individual or group responsible for managing the recycling system.

Mixed recycling

Currently, 65% of schools do not have a mixed recycling service, whereas 25% only collect from some areas of the school and 10% collect from all areas of the school. Of those that collect mixed recycling, the most prevalent locations for infrastructure is within the school yard and staff rooms, collected mostly by cleaners or housekeeping/ maintenance staff. The survey findings indicated a high interest in medium sized schools for implementing mixed recycling.

Schools that are currently offering mixed recycling agree that adequate volumes of recyclables are generated to have a service collection, however schools are uncertain as to the ease of managing and organising this. Furthermore, incorrect usage of the bins, time availability and suitability of staff/ students for the management of mixed recycling bins is a key issue for most respondents. Additional comments within the survey have found specific issues regarding:

- Difficulty managing mixed recycling within the Junior school;
- Attempting mixed recycling within staff rooms before proceeding with a whole school approach; and
- The growing need for mixed recycling as a result of contamination within paper/ cardboard recycling.

The key barriers for schools that do not offer whole-school mixed recycling or at all was primarily due to the lack of infrastructure to collect recyclables, lack of a responsible group/ person for managing the recycling system, difficulty in organising and concerns about contamination or incorrect usage. Some minor issues noted was the absence of local council collection services for mixed recyclables for either the school or the whole community, where staff from a particular school would personally drive the mixed recyclables to drop-off locations.

Food waste

Of the surveyed schools, 50% of respondents do not undertake food waste recycling. Of the respondents who did they collect and process food waste from some areas of the school (such as the staff room, canteen and home economics room). Overall, the respondents who were recycling food waste found it easy to organise and manage in terms of correct usage by staff/ students. Time availability and suitability of staff were identified as key contributing factors to a successful program.

Alternatively, the key barriers as why schools either partly collect food waste or not at all was primarily due to difficulty in food waste separation from general waste, contamination and incorrect usage of the bins, lack of infrastructure and capacity to process the volumes of waste, lack of time and a responsible group/ person for managing the recycling systems. A number of schools resorted to collecting from a specific area, such as food classes or home economics rooms, whereas the remainder nominated either the science department/ teachers/ students, canteen staff or grounds staff for the most likely responsible party for managing the food waste recycling system and infrastructures.

70% of schools agreed a food waste service provider for the collection and processing of food wastes would also be useful and would like to know more.

Green Waste

Of the surveyed schools, 20% of respondents compost green waste on-site, 40% have a service provider for the collection of green waste, 25% do not have a system for managing green waste and 15% are currently unsure of the school's green waste management activities. Green waste collection is indicated to be minimal at these schools, in which the primary methods of processing are through compost bins, tumbler composter or worm farms. Most schools that compost green waste have the collections carried out by school gardeners or grounds staff. Overall, these schools have found ease in management and organisation, correct usage of green compost bins, adequate availability of time and staff to manage it, as well as suitable spacing for the green waste systems as successful factors.

Respondents that do not collect green waste are primarily hindered by the lack of a responsible group/person for managing the green waste, sufficient site/spacing, lack of composting knowledge and overall lack of investigation into the possibility.

2.3.3 Key successes and barriers for waste management and recycling at high schools

The majority of respondents found that paper and cardboard recycling was the easiest recycling system to implement, followed by worm farms, mixed recycling, composting systems, electric composters and lastly food waste collection by a service provider. The findings indicate a problem area with the implementation and management of mixed recycling or can recycling within schools, recycling system failures that are a result of cross contamination and lack of staff cooperation and commitment. However, a large number of schools have identified mixed recycling as the most preferred option if incorporating a new waste and recycling system, followed by electric composters and worm farms.

In regards to the progress and development of waste and recycling systems, smaller schools did not partake at all in mixed and food waste recycling, whereas most medium and larger schools participated in all forms of waste and recycling systems, collecting from either all areas of the school or partly. The trending barriers for small schools for not conducting whole-school recycling or not at all was a result of lack of infrastructure and a responsible group for managing the waste and recycling systems. Alternatively, medium and large schools were largely concerned with cross contamination of the waste and recycling systems, time availability, organisation and lack of infrastructure for collection.

2.3.4 Expression of interest to participate in a composting trial

Of the 20 responses to the question whether a school would be interested in trialling and electronic composter 85% (17) were interested indicating that there is overwhelming support for the trial where the school has nominated that they have the capacity to be engaged in the program.

3. Conclusions

The schools surveyed are performing well with respect to waste management, recycling and other environmental initiatives. However, when it came to rating the success or otherwise of a program there were mixed responses about what works well and how it should be implemented.

There were some great examples found where schools approached waste and recycling with innovative responses, including tapping into other revenue streams through the sale of materials that would have otherwise been a waste stream.

Common themes emerged from the survey including:

- The need for specific programs to be supported by not only the principal but other staff so as to gain broader acceptance and therefore successful results.
- Extensive project planning (including starting with a small specific area within a school) and education prior to rolling out a program.
- The need to educate early year levels at the same time as senior students so as to gain momentum and acceptance throughout the school over a longer period of time.
- Staff time and other resources need to be factored into planning, implementing and managing waste minimisation and recycling programs.

When reviewing what is important to a smaller school versus a medium and large school it was found that:

- Smaller schools generally lack the space and infrastructure to implement recycling programs, they have less staff to manage the programs. It was found that smaller schools did not have mixed and food waste recycling programs.
- Medium and larger schools are more concerned about contamination of the recycling streams as well as time availability and organisation of the programs. It was found that the larger schools participated in one or more recycling activities and medium sized schools showed a high interest in implementing a mixed recycling program.

It was found that mixed recycling followed by electric composters and worm farms were the most preferred options to implement. Some barriers to collecting food waste were identified including difficulty in food waste separation from general waste, contamination and incorrect usage, lack of infrastructure and capacity to process the volumes of waste, lack of time and a responsible group/ person for managing the recycling systems.

The lack of knowledge about external service providers who offer a recycling service may be contributing to low recycling rates.

There is overwhelming support for schools to be involved in an electric composting trial. 70% of schools also expressed an interest in food waste collections by an external service provider.

4. Recommendations for implementing recycling infrastructure and services

None of the high schools surveyed had a whole-school system for collecting fruit and vegetable scraps and 40 per cent did not manage green waste (or were uncertain if they had a system). WWS should assist schools to implement on-site systems (i.e. electric composters, compost bins, tumbler composter or worm farms) for both food and green waste. There is a good opportunity to divert this material from landfill and reduce waste collection costs, provided the school has enough space and school grounds staff are engaged in the program.

Schools also expressed a high level of interest in electric composters and food waste collections by an external service provider. WWS should trial both and evaluate them in a high school setting.

Early engagement was identified as important to the success of any recycling systems. WWS should develop a structured program for engaging and educating staff and students prior to rolling out a new recycling system across the whole school.

WWS could identify a suitable service provider if schools do not have room for a composting system. This could form part of a broader campaign highlighting all recycling services that are available including potential costs and savings.

A review of each school's recycling systems and available service providers could be undertaken as part of the existing WWS audit program.

Research into waste reduction infrastructure and services suitable for Western Australian high schools

Where schools are currently implementing at least one recycling activity, there is an opportunity for the school to leverage off this program by promoting the benefits of good recycling practices. WWS could develop signage for a number of recycling activities which could list the co-benefits such as reduced contamination through one stream by implementing another program.

WWS should develop a recognition program which includes funding for additional infrastructure, resources and support to manage recycling systems.

Appendix A – Research summary

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
St Joseph's College, VIC (SV ResourceSmart Awards)	"Cut the Wrap" day	Year 7, 8 & 9	To reduce waste generation by Year 7, 8 & 9	Organic bucket collections provided. All other bins removed from Year 7 & 8 eating area on the day.	Students contributed to online excel system for data collection for participants in each year 7 homeroom	Run as apart of Cool Australia's Enviroweek August 2013. Administered by Kelly Jenkins - Sustainability Coordinator (kellyj@sjc.vic.edu.au).	03 5226 8100	Online newsletter & Annual Report 2015
	Blue 60L box for Paper recycling					Listed as 'other waste initiatives' with no other information.		Online newsletter & Annual Report 2016
	240L bin with yellow lid for Co-mingled recycling bins	Year 10,11 & 12 area	Used to manage waste from Year 10, 11 & 12		This included induction for years 7 & 9 students regarding use of commingled and general waste bins.			Annual Report 2015
	White bucket for Organic waste composting	Situated in yard, targeted in recycling guide for Year 7&8				Listed as 'other waste initiatives' with no additional information.		Annual Report 2015
	Bokashi composting and worm farm	Year 7, 9 and staff room	Used to manage organic waste.	Year 7 homeroom responsible	2014 - trialled Bokashi system for composting and established worm farm. Have collected first batch of fertiliser.			Online newsletter & Annual Report 2015
	Red 60L bin for soft plastic recycling (and polystyrene)	Year 7 & 8			REDcycle program involving the conversion of "soft plastics" into outdoor furniture and signage for Primary schools and Pre-schools. Participating Coles supermarkets in Geelong.			Annual Report 2015
	Recycling system for woodwork offcuts and sawdust					Listed as 'other waste initiatives' with no additional information.		Annual Report 2015
	Purple bin for Batteries, bread clips, corks, ink cartridges, ink toners, mobile phones & accessories recycling	Whole school use, located at school reception				Listed as 'other waste initiatives' with no additional information.		Recycling Guide document
Aitken College, VIC (SV ResourceSmart Awards)	VISY Commingled bins	Whole school use, placed internally (within all classrooms are buckets) and externally across the college		Buckets within classrooms are emptied into Visy bins	Commingled bins introduced to Fairview, Cumberland, Dunellen and Glen Arthur schools.	Christy Herron - Head of Environmental Programs.	03 9333 1866	http://sustainability.ceres.org.au/project/aitken-college-waste-initiatives/

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
	VISY Paper and cardboard recycling bins	All classrooms	For paper and cardboard recycling within classrooms	Environment captains empty bins on weekly basis. They fill a 3m front lift bin with cardboard once a week as well.		Includes Environment Monitors conducting information/education sessions about recycling programs.		
Balwyn High School, VIC (SV ResourceSmart Awards)	Paper and cardboard recycling bins	Whole school use, Located across entire school			Paper and cardboard recycling has increased from (approx.) 2–3 cubic metres per week to 9–12 cubic metres measured through recycling collections	Funding of new recycling bins raised by student body in 2014. Jessica Manning - Director of Student Leadership/Voice	03 9819 7911	Online newsletter (the Lion)
Woorabinda Campus - Somers School Camp, Somers, VIC (SV ResourceSmart Awards)	Worm farms	Whole school use	Used to manage food waste from students on Somers Camp	Each meal time a duty group is assigned to correctly separate food waste which is then transferred to the worm farms	Introduction of five worm farms, as the cornerstone of a food waste strategy, helped to reduce food waste to landfill by 90 per cent.	About 70% of our landfill waste was food from the kitchen/dining room and outdoor eating areas.	03 5167 1458	http://sustainability.ceres.org.au/project/waste-not-want-not-2/
	Recyclables bin	Whole school use	Used to manage recyclables from students on Somers Camp	Not specified	Not specified	After completing a waste audit with the local council, they have some baseline data to work with and have recognised areas that need to change		
Western Port Secondary, VIC (SV ResourceSmart Awards)	Paper and plastics recycling bins	Whole school use (Bins in offices, canteen, home economics classrooms and staff rooms)			The College reduced its waste to landfill by 15 per cent over a period of 5 months. The school increased the number of wheelie bins used for soft plastic recycling from 5 to 12 a week.	Initially there was lack of support by staff and students. Overcame this by speaking to staff at morning briefing, year group and whole school assemblies and weekly announcements. ResourceSmart waste school Sponsored by TechCollect. Helen Smith - Sustainability Coordinator	03 5979 1577	http://www.sustainability.vic.gov.au/services-and-advice/schools/schools-awards/2013-resourcesmart-schools-awards/waste-secondary-school-of-the-year
	Compost	Not specified	Not specified	Created and Managed by Western Port Environment Team with teachers from Malaysian sister school.	Sustainability policy 2013 goal states "To minimise landfill waste to 0.3m3 per student per year and increase the percentage of material that is reused, recycled and composted."	Compost Station' using layers of leaf litter, food scraps, cane straw and manure.		
Ruyton Girls' School, VIC	Green bins for recycling	Whole school use	Used to manage recyclable materials	Operated by SFS (Students for Sustainability). SFS members sort through these bins prior to emptying them into our big recycling bins	Noted a big increase in the rate of recycling after replacing all co-mingled recycling bins. An overall 12% decrease in our waste going to landfill. Ran a 'Rubbish Free Lunch Challenges' which saw a reduction in waste going to landfill of 41%.	Nicole Volkmann - Sustainability Co-ordinator	03 9819 2422	http://sustainability.ceres.org.au/project
	Pink bins for Food waste	Whole school use	Used to manage food waste and reduce landfill waste	Operated by SFS				

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
	Worm farms	Sourced from food waste bins	Used to manage food waste	Operated by SFS		The worm juice is used on our Preps Organic Vegie patch. What is left over is sold to raise funds for the Vegie patch.		
Kaniva College, VIC (SV ResourceSmart Awards)	Recycling bins	Whole school use	Used to separate recyclables and general waste	Paper and cardboard is recycled to Recycling Centre (collection is not specified). Newspapers recycled to local CFA			03 5392 2494	http://www.sustainability.vic.gov.au/services-and-advice/schools/schools-awards/2012-resourcesmart-schools-awards
Clonard College, VIC (SV ResourceSmart Awards)	Plastic bottle recycling initiative	Whole school use	Used to reduce bottles purchased from canteens ending up in landfill.	Sustainability Group at Clonard initiated program			03 5278 2155	http://sustainability.ceres.org.au/groups/clonard-college/
Fintona Girls' School, VIC	Paper, plastic and battery recycling Comingled recycling	Classroom and senior common room paper recycling. Comingled recycling in the staffroom.	Used to manage paper recycling within classroom and senior common room. Used to manage comingled recycling within staffroom.	Not specified.	Not specified.	Future plans include: Continue to work on achieving our Resource Smart AuSSI Vic accreditations, Develop the role of the Environment Captains, Reduce paper consumption, Establish responsibilities for the worm farms and the vegetable gardens.	03 9830 1388	https://www.boroondara.vic.gov.au/-/media/Files/Our%20city/Environment/Schools/Waste%20Smart%20Schools%20Case%20Studies.pdf
	'Hungry Bin' Worm farm	Worm farm and composting located at both campuses, set up in the middle school	Used to manage food scraps collected in pink food waste bins	Not specified.	Not specified.			
	Pink food waste bins	Whole school use, located around school ground	Used to manage food scraps of students around school grounds	Not specified.	Not specified.			
Bulleen Heights School (primary and secondary), VIC	Worm farm	Whole school use, food waste buckets provided in classrooms and staff room.	Used to manage food scraps in classrooms and staff room	Wednesday mornings, students collect buckets from classrooms and staffrooms and empty in Wormfarm. Buckets are washed and returned to original place before lunch.		Worm farm was donated to school. Worm Water is used on plants in garden.	03 9852 1631	http://sustainability.ceres.org.au/groups/bulleen-heights-school/
Bridgetown High school WA	Worm farm		Used to manage paper, cardboard, newspaper waste.	Excess paper, cardboard and newspaper taken to local recycling depot by school gardener. Local shire picks up plastics for recycling.		Jo Bayne is Sustainability Coordinator. Novel use of recycling old refrigerator into worm farm	08 9761 0100	http://www.wasteauthority.wa.gov.au/programs/wws/case-studies/

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
	Recycling bins	Whole school use (year 8-10)			In 2005, Yr 9s surveyed the school on recycling and litter. From this, they designed a bin with separate compartments for paper, plastics, food and other.	School received community support such as funding from Blackwood Valley Landcare for school mulcher.		
Kinross College WA	Paper recycling with SITA	Whole school use (Year 6-10)				Listed as 'other waste initiatives' with no additional information.	08 9306 6000	http://www.wasteauthority.wa.gov.au/
	Toner and printer cartridge recycling box	Whole school use (Year 6-10)	Used to recycle toner and printer cartridges	Planet Ark collects cartridge collection box		Free recycling program called Cartridges 4 Planet Ark.		
	Battery disposal with Tamala Park	Whole school use (Year 6-10)	Used to recycle dry cell batteries, mobile phones, computers etc.	School staff weighs and take batteries to Tamala Park (local waste disposal and recycling facility encase batteries in concrete for safe disposal) once a fortnight.	In 2005, staff and students learned there was no battery recycling facility in the local area. Lobbied to Regional council for help. Now battery disposal program runs at Tamala Park. Negotiation is currently underway for a potential partnership with a local battery store that ships their used batteries to the eastern states for recycling rather than safe disposal in landfill (2010).	Debbie Mullahey, Environmental Coordinator. .		
	Compost and worm farms	Whole school use			Potential community-based system for collection of organic waste	Listed as 'other waste initiatives' with no extra information.		
John Forrest Senior High School WA	Paper recycling bins	Whole school use	Used to manage paper	Bushranger cadets responsible for recycling ~60kg of paper each week, collected from each classroom. External paper recycling company collects it from a skip located at the school.		Recycling program initially instigated by Bush ranger students.	08 9473 4000	http://www.wasteauthority.wa.gov.au/programs/www/case-studies/
	Compost and worm farm		Used to manage canteen scraps	Bush ranger students are responsible for managing compost and worm farm.				
Sevenoaks Senior College WA	Paper reducing and reusing	Whole school use	Used to reduce paper use, textbooks and printing as most courses are conducted through online learning via WebCT	Recyclable paper and cardboard is collected by SITA	Reusable paper is collected by Practical Geography students who pass the paper on to Education Support students who in turn deliver the paper to local primary schools for draft notepads and painting.	Sevenoaks students pay for their own printing, so they always use paper wisely	08 9356 4900	http://www.wasteauthority.wa.gov.au/programs/www/case-studies/
	Worm farm	Small Business Management and Enterprise students	Used to plan and implement sales of castings and fertilizer	Managed by Small Business Management and Enterprise Students		These students also grow and sell seedlings as part of the Men of Trees program with money raised through these initiatives fed back into environmental projects		

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Yanchep District High School WA	Worm farm and chicken farm	Whole school use	Worm farm used to manage paper and lawn clippings from school. Food scraps from school used for chicken feed.	Food scraps collected by parents and teachers for chickens at home.	Lunchtime food scraps were first collected for the school's worm farm back in 1999. Plastic containers, donated by a dog food company, were used to collect food scraps. Chickens off site feed on food scraps from the school.		08 9561 1155	http://www.wasteauthority.wa.gov.au/programs/wws/case-studies/
	Paper and cardboard recycling	Whole school use		SITA collects school's paper and cardboards.	Students collect, weigh, graph and report on the amount of waste collected and diverted from landfill.	Difficulty in initially finding recycling collector as school is located 60km north of Perth and far from recycling centres.		
Margaret River Senior High School WA	Worm farms	Whole school use	Recycling food waste	Managed by Year 8s	Manufactured worm farms from recycled pallets. Vermi liquid and worm castings are sold.	Initiated from BHP grant and used for actively controlling school waste. Through the science department waste quantities are monitored	08 9757 0700	http://www.margaretrivershs.wa.edu.au/special-programs/recycling/
	Composting	Mechanical workshop classes	Used to compost shredded paper, chicken manure and lawn clippings		Developed a design and built a large compost drum on a rotating stand			
	Paper mache mulche	Viticulture class	Used from paper recycling and shredded paper		Viticulture class developed a paper maché mulch to be used under the vines as a water retention aid and mulch. The students were also trialling the addition of organic and non-organic pesticides,	Managed by Mrs Kupfer-Hollis and her Year 8 Class (with help from Ms Hastie and SSEP students)		
	Paper recycling dual box (for paper and any other recyclable paper product)	Whole school use (dual box located in every classroom)	Used to collect paper and other recyclable paper products	Boxes are collected by various groups and introduced to a central location where the paper is sorted. Recyclable paper is boxed up and sent to an external facility via kerbside collection system.	Single sided paper is made into notepads and sold through a vending box in the local shopping centre, given to staff and students within the school and made up into orders for various businesses around town such as the Fish & Chip Shop and Taxi Service	Main focus of school recycling at present. Noted as a sustainable activity from supply of paper, demand for pads and whole school involvement in program.		
Cornerstone Christian College, WA	Colour coded bins for recycling paper and glass	Located throughout school	Used to collect paper and glass from whole school	Year 9 and 10s take the recycling bins to the curb for collection. Collection of paper is free via kerbside collection.	Teacher, students and staff are starting to understand the importance of 3Rs. This is happening due to the organisation and accessibility of the recycling bins, and the Year 9 and 10 students take ownership of the projects	Implemented recycling bins from Waste Wise grant money. Bins for collecting paper were donated by the shire	08 9754 7744	http://www.wasteauthority.wa.gov.au/publications/cornerstone-christian-college
	Worm farm and compost	Not specified	Food scraps are sourced from the canteen	Year 9 and 10 students collect food scraps from canteen for composting		Compost used on garden built alongside the classroom.		
Noosa District High School, QLD (Noosa Shire)	Paper recycling			Collected by Endeavour Foundation (which operates 14 transfer stations and resource recovery centres)			07 5472 2222	http://noosariver.com.au/wastewise/noosa-district-state-high-school/

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Council Waste Wise)	Compost and worm farming			Support Services Department of the school collects food waste.	Compost and worm juice are used in productive food garden within school grounds.	Through the process of composting, planting and selling of the produce, the students learn about biology, maths, self-sufficiency and sustainability. Teacher Rosemarie Emerson and her class are seeking funding support to expand this valuable program. Specifically, they hope to turn the garden more waterwise by installing a rain water tank and a simple irrigation system.		
Pacific Lutheran College, QLD	Compost	Junior college use	Used to manage lunch scraps, paper towels and other organic waste generated.	Not specified	Compost will be used on gardens and excess will be available to the community.	The College conducted an audit to determine how much organic waste staff and students generated each week. The audit revealed that, as much as 70% of the total waste sent to landfill each week is organic in nature. Also installing an on-site composting apparatus	07 5436 7300	http://www.pacificlutheran.qld.edu.au/newsletter/compass-no-407-february-2016
	Separate bins for organic waste, recyclable waste and non-recyclable waste.	Junior college use. All three bin types located in all eating areas. Two bins for recyclable waste and non-recyclable waste in classrooms.	Used in all classrooms and eating areas in school for organic, recyclable and general waste.	Not specified	Not specified – sustainable development goals implemented end of 2015.			
St Andrew's Anglican College, QLD (Noosa Shire Council Waste Wise)	Worm farm and Compost	Canteen use	Used to manage any food waste generated by canteen or by purchases	Not specified	Menu items on-site using fresh produce from our sustainable garden when available and return all food waste back to the garden to be used as both compost and feed for our chickens	Sustainable garden managed by Friends of the Garden.	07 5471 5555	http://www.saac.qld.edu.au/content/snaac-shack
Pomona State School, QLD (Noosa Shire Council Waste Wise)	Recycling and food scrap wheelie bins	Whole school use	Used to manage food scraps of whole school	Eco-volunteers run the recycling program.	School has reduced its waste being sent to landfill by 52%. School fills 6 recycling wheelie bins and 2 organic food waste wheelie bins per week. The school is diverting >300 wheelie bins from landfill per year. 2014 Annual report: Pomona has reduced, re-used, and recycled our school waste by around 500 bins for the year.	Wheelie bins implemented through Noosa Council STARS waste education program.	07 5480 8222	http://www.noosa.qld.gov.au/media-releases/-/asset_publisher/lif6ygeQkN00/content/pomona-state-school-one-of-noosa-council-s-shining-stars

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
St Columban's College, QLD (Moreton bay regional council)	Colour coded bins Paper and cardboard recycling collection program and mixed recycling	Paper and cardboard and mixed recycling located in administration, staff eating room, staff desk areas and outdoor eating spaces. Recycling and general waste colour coded bins also available in every classroom.	Used to manage all paper, cardboard and mixed recycling in staff rooms and outdoor eating areas.	Mixed recycling regime was collected fortnightly.	After 12 months of implementation, recycling diversion rates increased to 23% of total waste stream.	April 2013, Environment Committee of staff and students approached ResourcEd Schools program to improve waste management systems and increase recycling diversion. At this time, college was already diverting 16% of total waste stream. June 2013, committee conducted audit with results: 14,220 litres of waste per week/ equal to 59 wheelie bins to landfill. New colour coded bin systems purchased by college and donated by council.	07 5495 3111	https://www.moretonbay.qld.gov.au/uploaded/Files/common/forms/refuse/st-columbans-case-study.pdf
North Lake College, QLD (Moreton bay regional council)	1.1m ³ bulk comingled recycle bin and 35 MURFE recycling collection crates	MURFE Crates installed into each classroom. Bulk comingled recycling bin for the whole campus use.	Use of MURFE crates and comingled recycling by all students.	Year 8 Honours students with teacher Alfina Lofaro.	After 1 term, recycling diversion rates increased to 13%.	Baseline data (2011) indicated 21,700 litres waste was generated weekly; equivalent to 90 wheelie bins. Annual general waste collection costs were in excess of \$23,000 and only 8% of the waste stream was being diverted to recycling. Waste audit results: 43% of waste stream was recyclable, 6% compostable.	07 3482 555	https://www.moretonbay.qld.gov.au/uploaded/Files/common/forms/refuse/North-lakes-college-state-school-case-study.pdf
St Michael's College, QLD (Moreton bay regional council)	240L yellow-lid recycle bins, MURFE crates for recycling.	MURFE crates installed in every classroom and offices.		Recycling rangers (year 7s) collected and emptied MURFE crates each day. 8 x 240L recycle bins collected fortnightly.	After a few weeks, there was 25% reduction in waste volumes to landfill. College hopes to start organic waste recycling program with the installation of compost bins and worm farms.	Waste audit: of the waste stream, 79% was recyclable and 9% was compostable. College generated 4000L waste per week/ 16.5 wheelie bins. Annual waste collection costs were ~\$5000.	07 5530 2722	https://www.moretonbay.qld.gov.au/uploaded/Files/common/forms/refuse/Case-study-2010-St-Michaels-College.pdf
Tullawong State High School, QLD (Moreton bay regional council)	Compost bins and worm farms	Compost collection bins and receptacles within Home Eco department, tuckshops, staff rooms and offices of the school.	Essentially whole school use based on locations of infrastructure.	Managed by Year 9 SOSE Extension group	210L of compostable materials are diverted weekly from the general waste stream by the tuckshop alone. Aiming to acquire yellow-lidded recycle bins from the Moreton Bay Regional Council in the near future, along with 10 x MURFEE crates for site separation of recyclable materials in staffrooms and offices of the school	Waste audit: of the waste stream, 65% was recyclable and 5% compostable. Generated 10,515L of waste per week/ 44 wheelie bins. Annual waste collection costs >15000.	07 5428 5222	https://www.moretonbay.qld.gov.au/uploaded/Files/common/forms/refuse/Case-study-2010-Tullawong-State-High-School.pdf

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Wavell State High School, QLD	340L yellow-lidded Recycling bins PlanetArk paper bins, Worm form (no further information on worm farm)	Recycling bins - Whole school use, placed around school grounds. PlanetArk paper bins in each classroom, staff area and administration office.	Used to manage recyclables of whole school	Managed and implemented by 'Great Heart' students and SRC members	<i>Ruby, coordinating teacher, hopes to save the school money by using the free council rubbish pick up, rather than paying for waste disposal. She would like to double the amount of recycling bins by the end of the year and further reduce the waste going to landfill. Sees shift in attitude throughout the school – less litter and students more willing to clear up rubbish.</i>	Implemented through EnviroWeek program. Worm farm Donated by Brisbane City Council to support the EnviroWeek	07 3350 0333 the.principal@wavellshs.eq.edu.au	http://www.enviroweek.org/awakening-enviro-consciousness/au
Chevalier College, NSW (NSW Sustainable Schools)	Recycling and organic waste programs				Compost is used on school gardens.	Listed as secondary school case study under NSW sustainable schools. Minimal information through online search.	02 4861 1488	http://www.environment.nsw.gov.au/resources/sustainableschools/studyChevalier.pdf
Goulburn High School, NSW	240L garbage and 240L recycling bins 1100L recycling and garbage tub	10 waste stations consisting of both general waste bin and recycling bin.	240L bins for collecting around school general waste and recycling waste.	Playground bins are emptied into a trolley and the waste is transferred to 1100L bins for collection 1100L recycling tub for storage and collection of recycling. This is collected weekly by Endeavour Industries recycling contractor. Currently, 2 x 1100L garbage tubs emptied daily by Goulburn Mulwaree Council is garbage contractor. During project, one will be removed .	At the start of the project, frequency required for emptying 1100L recycling bin is not known. Initially, it is weekly collections but throughout the project it will be increased as 1100L garbage bin collections decrease.	Recycling developed as apart of SERRG Regional Education program and in school waste initiative (2013). Grant funding is being used to pay Endeavour Industries to collect the recycling weekly. Cost to empty 1100L bin (\$15.50) weekly is cheaper than multiple 240L bins.	02 4821 4022	http://101.0.93.138/~serrgmerg/wp-content/uploads/2014/05/Recycling-at-Goulburn-High-School-Final.pdf
Golden Grove High School, SA	Red general waste bin, Yellow for 10c drink container bin, green for food scraps. Paper recycling box	Paper recycling box in every classroom and office areas. Location of Red, yellow and green bins not specified. Assuming whole school use.	Three coloured bin system used to manage whole school waste, drink containers and food scraps. Paper recycling boxes placed to be made accessible by all students and staff.	Yellow bins regularly emptied and sorted through. Paper recycling boxes are emptied by Landcare class to a larger paper/card skip once a week. School's maintenance officer and Landcare students sort through paper recycling bins to turn single-sided paper into notepads.	Each term, around \$300 is raised and funds go to the school's student council. The rosette system for 10 cent drink containers has proven effective in reducing contamination with food or packaging. 100kg of notepads from single-sided paper are produced a term. Paul Howieson, school maintenance officer and Sue Ruciack, business manager were main contributors to recycling.	2011, WOW Bin Materials audit found >1300L of waste going to landfill per day. 2013, 996L waste going to landfill, 33% reduction. School has application for a recycling centre, which will allow the school to sort and distribute recyclable material. Centre will be used as an educational tool and further reduce the amount of materials going to landfill. Next project may be to establish a food garden for the Home Economics Centre. This could save the school money in the long-term and teach students about growing their own food for the kitchen.	08 8282 6400	http://www.wow.sa.gov.au/uploads/1/9/2/6/19269635/golden_grove_high_school_wow_case_study_2014.pdf http://www.goldengrovehs.sa.edu.au/images/PDFS/OneStepAugust%202015.pdf

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Cornerstone College, SA	Recycling table and shed			'Waste Busters' students and staff help sorting of recyclable waste.		Wipe Out Waste (WOW) initiative.	08 8398 6000	http://www.wow.sa.gov.au/uploads/1/9/2/6/19269635/cornerstone_recycling_shed_2013.pdf
Marymount College, SA	Planning for Coloured Bin system Planning for basketball hoop recycling bins	Coloured bin system in each classroom 3 x Basketball hoop recycling bins to be placed in yard			2012 'Zero Waste to Landfill Achievement Award' as none of the waste generated by the school goes to landfill; instead it is used to generate power for local industry.	Received Zero Waste SA grant in 2009-10 of \$9,964 for Recycling Facility improvements (no further info on this).	08 8298 2388	www.mc.catholic.edu.au/files/f/2603/SEMP.pdf http://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/nrm_education/marymount-college-sustainability-overview-gen.pdf
	Composting station/ Bokashi/Worm farm			Composting station managed by Year 6.		Future plans for composting station: Garden group to look into different options- tumbler, open compost etc. Plan for worm farm: Need to source an old desk and place the bokashi bins and worm farm underneath to keep it in shade and away from the rain		
Encounter Lutheran College, SA	Paper, cardboard and hard plastics recycling	Located within classrooms			85% Reduction in materials to landfill. Classroom wastepaper bins are starting to have little to no waste		08 8552 8880	http://www.wow.sa.gov.au/2015-wow-awards.html http://www.encounter.sa.edu.au/files/f/4169/Term%203%20Week%208%202014.pdf
	Compost					Compost used in vegetable garden		
Sutton Primary School, NSW	CLO'ey food waste composter + Green food waste bucket	Whole school use (green food waste bucket in every classroom)	Used to convert food waste from lunches and 'Crunch&Sip breaks' into nutrient rich compost	Operated by Sutton Eco-Rangers who empty food waste buckets daily into CLO'ey everyday.	Processes up to 4kg of waste per day. Compost used for school gardens.		02 6230 3215	http://suttonps.com.au/students-turning-food-waste-into-compost/
St Columba Primary School, VIC	CLO'ey food waste composter	Whole school use (multi-bin system for reusable material, recyclables and organic food wastes in every learning area)	Used to convert food waste into compost	Organic materials are combined in central sorting stations for teachers and cleaners to collect daily. The Bin Kids are partly responsible. A school parent runs the food waste composter.	Processes up to 4kg of waste per day. Compost used on school veggie patch and grounds, excess is taken home for school families. Students maintain a multi-bin system in every learning area, separating reusable materials, recyclable items and organic food scraps from the waste that goes to landfill	Purchased from Lord Mayor's Charitable Foundation in Our Community Grant	03 9531 6560	http://www.stcolumbasprimary.org/leader-newspaper-meets-st-columbas-new-hungry-green-student/
Bunbury Catholic, WA	CLO'ey food waste composter	Used by the Green Team	Used to convert food waste into compost. Food waste source is not specified.	The Green Team meet during lunchtime on Fridays.	Green Team use composting on the sustainability garden.	Two CLO'eys sourced from grants BP and Coles Junior Landcare	08 9721 0000	http://web1.bunburycatholic.wa.edu.au/cms/data/bcc_media/newsletters/2015/10-June-25-2015v3.pdf

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
McDonald Park School, SA	CLO'ey food waste composter	Not specified- assuming whole school use as current school composting program is already in place. CLO'ey will be based in the school kitchen	Used to convert food waste from school into compost	Not specified	Waste audits conducted on regular basis. Audit revealed a large amount of uneaten food was being thrown out	Donated by Rotary Club of Mt Gambier West. Compost used in kitchen garden	08 8724 9811	www.mcparkr7.sa.edu.au/docs/2014/term3%20week%206.pdf http://www.mcparkr7.sa.edu.au/docs/2014/term%201%20week%205.pdf
Lanecove West Public School, NSW	CLO'ey food waste composter	Whole school use (compost buckets located in classrooms). Located in staff kitchen and canteen.	Used to convert classroom food waste into compost	CLO'ey composters installed in staff kitchen and canteen. Garden gurus (Miss Michiko and Miss Brownyn) and year 6 environment committee oversee the emptying of class compost buckets into Aerobin each Wednesday and Friday morning from 9am.		Purchased two CLO'ey composters using Sustainability Grant from Lane Cove Council.	02 9427 4743	http://www.lanecove-p.schools.nsw.edu.au/cmsresources/lanecove-west-public-school/misc/2015/6/term_2_week_8_final_14_34068024493.pdf http://www.lanecove-p.schools.nsw.edu.au/cmsresources/lanecove-west-public-school/misc/2016/3/term_1_week_8_final_reduced_145818849897_7.pdf
Great Southern Institute of Technology, WA	CLO'ey food waste composter	Assuming use in staff kitchen and cafe/hospitality units. Located in cafe and hospitality kitchens.	Used to manage restaurant/cafe food scraps	GSIT Seeds of Sustainability committee	Not specified, no newsletters or sites provide further information on outcomes.	Sue Dawes at WA Albany campus	08 9892 8888	www.gsit.wa.edu.au/docs/default-source/newsletters/the-gazette-november-2013.pdf?sfvrsn=8 http://www.gsit.wa.edu.au/docs/default-source/newsletters/the-gazette-august-2014.pdf?sfvrsn=6
Greenhouse Perth (cafe) and Brothl Melbourne (restaurant)	CLO'ey food waste composter	Located on rooftop of cafe and restaurant	Used to convert coffee grinds, food scraps, used napkins and anything biodegradable into compost	Owner Joost Bakker and staff responsible for disposing organic waste into composter. Chefs are responsible for emptying the composter.	"What I've found is that the compost seems to incorporate better into the soil"	Small review of closed loop composter in hospitality magazine. Rents the composter for \$600 a month in Perth. All compost in Melb cafe used on 2.4ha garden	08 9481 8333	http://greenhouseperth.com/what-is-the-greenhouse/ http://www.hospitalitymagazine.com.au/Management/Cutting-down-on-food-waste-top-chefs-share-their-t

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Cecconi (restaurant), VIC	CLO'ey food waste composter (50 litre model)	Whole restaurant organic waste	Used to manage whole restaurant food waste (vegetable scraps, bones and fish heads).	Owner Maria Bortolotto. Compost generated is unloaded weekly and transported to the Bortolotto farm and used on their vegetable gardens	Compost generated to immediate use at her vegetable garden at her farm near Lorne. Produce from the farm then goes back to the restaurant where it is dished up to customers. Managed to cut the number of rubbish bins the restaurant puts out for collection from about 12 each week three years ago, to three per week now. Used to pay \$12 for each bin collection, totalling \$600-700 per month. Currently its ~\$200. This equates to about 65% reduction in waste bills and 75% reduction in waste collections. 600kg of weekly food waste converted into 120kg of compost.	Uses 50 litre model, able to generate 150kg of compost over 24-hour period. Average of 70kg of food waste emptied into composter each day.	03 8663 0500	http://www.goodfood.com.au/good-food/food-news/wanted-wasteful-restaurants-for-composting-trial-20130730-2qvv9.html?rand=1407901576504 http://oklininternational.com/video-cecconis-australia/
Degraves Street, VIC	Recycling Facility consisting of food dehydrator (GaiaRecycle system), cardboard baler and co-mingled recycling bins.	Operating from basement of Ross House carpark space in Flinders Lane. Waste materials collected from 78 different buildings. Processes food waste from 30 local businesses.	Used to manage co-mingled recycling, paper/cardboard and food waste from	Comingled, paper and organics collections are managed by Recycling officer- Peter Main.	In first 6 months (2013), 35 tonnes of glass, plastic, aluminium and steel has been separated, 36 tonnes of cardboard has been baled. Another tonne of plastic has been diverted from landfill. Saved 130 tonnes of food waste going to landfill (creating 38 tonnes of fertiliser), saved city of Melbourne \$25,000 in landfill costs and prevented the equivalent of 208 tonnes of CO2 emissions. Recycling facility diverts 180 tonnes of recycling from landfill per year from 78 buildings.	City of Melbourne and MWRRG shared cost of \$550000 of setting up facility. Degraves Street was chosen as the site for the pilot after a 2012 waste audit found that 90% of waste generated in Degraves Street precinct could be diverted from landfill. Waste audit indicated 700kgs of food waste per day.	City of Melb contact: 03 9658 9658 Peter Main- recycling officer	http://www.melbourne.vic.gov.au/news-and-media/Pages/ItseasierbeinggreeninDegravesStreet.aspx http://www.horner.com.au/news/2013/8/20/degraves-street-recycling-facility-project/?6454 http://www.ecoguardians.com.au/blog/from-paddock-to-plate-to-innovation-with-gaiarecycle
Austin hospital, VIC	CLO'ey food waste composter (500 litreveo model)	Assuming whole hospital use of organic waste	Used to convert kitchen food waste into compost	Not specified	Approximately converting 3.5 tonnes of food waste per week into compost. Previously, Austin health sent food organics to an organics treatment facility.	Composting only noted in Sustainability Report 201-11 and 2012-13.	03 9496 5000	http://www.austin.org.au/Assets/Files/Sustainability%20Report%202012-13%20final.pdf http://www.austin.org.au/Assets/Files/Sustainability%20Report%2010-11.pdf
Orana and ADL restaurants, SA	Intention to install CLO'ey			Restaurateur and chef Jock Zonfrillo	Jock's landlord won't invest into the CLO'ey system	Cannot install CLO'ey due to space restrictions. Instead, they go to great lengths to separate waste and rubbish for garbage, recycling and compost.	Orana: 08 8232 3444 ADL: 08 8227 0344	
Mercy Hospital for Women	Food waste composter, not specified if CLO'ey or not.				320-400 kg food waste per week will be converted into compost. Using as compost for Banyule residents	Purchased using Banyule Environmental Sustainability Grant (\$5960). Only mentions "Closed loop system" for composting.	03 8458 4444	http://www.banyule.vic.gov.au/Council/Grants/Environmental-Sustainability-Grants

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools

Organisation	Type of Infrastructure	Proportion of use and location (how widely is it used by school)	Use of infrastructure (used to manage whole school waste or segments i.e. staff/canteen/home economics)	Management of Infrastructure (waste collected and processed by whom, i.e. ground staff or student leaders)	Evaluation/Outcomes	Notes	Contact details	Source
Barwon Health (Food Services Department)	CLO'ey CLO0300	CLO'ey composter installed at Food Services CPU at McKellar Centre.	Used to manage all of Barwon Health's food waste (food preparation and uneaten meal waste from a central catering hub)	Organic waste is collected everyday from up to 6 locations. St Laurence Community Services collects the organic waste weekly for their nursery in Colac.	Generates more than 350kg of food waste per day, which is converted into compost. Estimated 150 tonnes of reduced GHG per year. It is donated to Magic Meadows sustainable farm. Trips to landfill reduced from 7 to 3 per week.	Scott Randall (director of support services) and Bronwyn Aylmer (waste management and cleaning standards coordinator).	03 4215 0000	http://www.closedloop.com.au/case-studies/barwon-health http://www.barwonhealth.org.au/quality-of-care/51-quality-of-care-2012/file

Waste Wise Schools Program
Research into reduction infrastructure and services suitable for Western Australian high schools
