THE IMPACT AND POTENTIAL
OF WATER EDUCATION IN EARLY CHILDHOOD CARE AND EDUCATION SETTINGS

October 2008

A Report of the
ROUS WATER Early Childhood Water Aware Centre Program

Report authors **Dr Julie Davis, Melinda Miller, Wendy Boyd, Megan Gibson**

Rous Water
Regional Water Supply

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Institute for Sustainable Resources

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Table of Contents

List of Photographs iv
List of Tables iv
Acknowledgements v
Executive Summary 1
Introduction 3
Background 3
Rous Water's Water Aware Centre Program 6
Methods 9
Quantitative Methods 9
Qualitative Methods 10
Findings 15
Quantitative Data Findings 15
Qualitative Data Findings 16
Discussion 17
Community Educator's Perspective 17
Perspectives of Staff, Parents and Children 18
Social Outcomes 19
Educational Outcomes 21
Environmental Outcomes 23
Economic Outcomes 23
Study Limitations 25
Study Implications 27
Concluding Comments 29
References 30
Appendices
Appendix 1: Example of a water audit proforma 32
Appendix 2: Example of a water audit proforma 36
Appendix 3: Interview/ survey questions for centre staff 37
Appendix 4: Interview/ survey questions for parents 39
Appendix 5: Prompt questions for children's conversation 41
Appendix 6: Summary of Enacted Actions from Centres 42

List of Photographs

Image 1: The community educator in action with a group of young children 6
Image 2: Felt board story and other teaching items 6
Image 3: Rous Water's Barbara Jensen conducting a water audit 7
Image 4: The Water Aware Centre Program's parent display 7
Image 5: A child using newly-learned water conservation strategies 19
Image 6: Children and staff learning together about water conservation 20

List of Tables

Table 1: Summary of surveys and child conversations in 3 research sites 12

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To the staff, parents and children of Jarjum Pre-school, Bangalow Community Children's Centre and Cavanbah Community Pre-school we extend our sincere gratitude for their willingness to participate in this research. In total, data from seventeen early childhood centres in the Rous Water region were collected. All participating centres are to be highly commended for their commitment and efforts to introduce or maintain sustainable water practices.

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Executive Summary

Water consumption and water conservation are significant issues in Australia. In comparison with the many schools across Australia that are already engaged in water education and water conservation programs, the early childhood education sector has been slow to respond to this challenge. One initiative of note is Rous Water's *Early Childhood Water Aware Centre Program*, an education program targeted to child care services (long day care, kindergartens and preschools) located in northern New South Wales.

The study's aim was to evaluate program outcomes. It comprised two parts. The first was a statistical analysis to investigate reductions in water usage in the seventeen centres engaged in the program. The second was a qualitative analysis exploring the 'quadruple bottom line' benefits (social, environmental, educational and economic) that stemmed from engagement in Rous Water's *Water Aware Centre Program*. Qualitative data was obtained from water audits and follow-up reports developed for each of the participating centres as well as from an interview with Rous Water's community educator. Additionally, interviews and surveys were conducted with staff and parents, and conversations were held with children, at three of these centres.

The results of the statistical analysis were inconclusive. From the data available it was not possible to show measurable reductions in water consumption across all centres. This is not to say that reductions in water use did not occur; there were simply too many variables that prevented a valid calculation of reductions. The qualitative findings were compelling in determining the impact of the program. For this reason, these results provide the primary focus for this report.

The qualitative results showed important 'quadruple bottom line' benefits that arose from participation in the program. These included but were not limited to:

- child leadership and advocacy for water conservation (social benefits);
- uptake by teaching staff of sustainability education pedagogies (educational benefits);
- improved water conservation and other resources management practices (environmental benefits); and,
- more efficient use of water resources (economic benefits).

Correlations between awareness and action, and action and consequence were noteworthy in these results, with positive changes to practices, intentions and ideals at centre level transferring to home and community contexts. Also of interest were the efforts of numerous centres to make physical changes to their water infrastructure. For example, some centres undertook large scale redevelopments of centre grounds, while others made substantive efforts to purchase and install water-saving devices. One surprising element of the results was the extent to which children influenced the adults around them in relation to water conservation practices. Both teachers and parents were compelled to make changes to their own water use habits because of the children's advocacy for water-conserving alternatives, a direct consequence of what they had learned in the *Water Aware Centre Program*.

The results of this study reveal that even a relatively small-scale sustainability education program can provide considerable social, environmental, educational and economic benefits. To date, the early childhood education sector has been an 'untapped' resource in addressing sustainability issues of water use and water conservation. This study demonstrates clearly the potential of sustainability education investments in early years education.

Introduction

This study is important for three key reasons. First, issues around water availability are of significant concern in many parts of Australia, particularly in the southern half of the continent. It is increasingly recognised that water use (and over-use) has social, environmental and economic impacts. Second, education is recognised as having an important contribution in assisting communities to become more sustainable. Third, the early childhood education sector has been slow to engage with education for sustainability. This study fills a significant 'research gap'.

This report summarises research findings from an evaluation of an early childhood water education program called the *Water Aware Centre Program* (WACP). This study was undertaken in a number of preschools and long day care centres in the Lismore/Richmond Valley/Byron/ Ballina regions of northern New South Wales and was a collaborative research initiative between Rous Water, the regional water supply authority providing water to councils, and staff in the School of Early Childhood at the Queensland University of Technology.

The overall aim of the study was to determine the effectiveness of this early childhood water education program. An effective program is considered to be one that leads to:

a. reductions in water consumption in participating centres/services; and,

b. changes in knowledge, values and actions that support water conservation strategies, both short and long term.

In line with the above considerations, the research questions guiding this study were:

a. Did participation in the WACP lead to demonstrable water savings in the early childhood settings that undertook the program?

b. What were the outcomes – environmental, social, educational and economic – of participation in the WACP?

Background

In Australia, water consumption and water conservation are significant sustainability issues. According to the federal government's National Land and Water Audit (2000), water use is approaching extraction limits in the southern regions of Australia with over allocation of surface and ground water supplies and increasing competition for water. Careful management is needed to achieve a balance between competing water demands. The *National Water Initiative*, agreed to by the Council of Australian Governments (COAG) in 2004, stresses the need to improve water management in order to sustain economic, social and environmental wellbeing, a view supported by the Business Council of Australia (2006).

It is recognised that education has a role to play in shifting community attitudes and actions about water availability and water use. Many schools across Australia are engaged in a range of water education and water conservation programs. The *Australian Sustainable Schools Initiative* (AuSSI) , for example, supports schools (including some early childhood centres and services) to: work towards the protection and enhancement of biodiversity and natural eco-systems, and to

use natural resources, especially water, in more sustainable ways. The Australian Government Department of Environment and Heritage[1] (2005) National Environmental Education Statement for Australian Schools, *Educating for a Sustainable Future*, also identifies that an important indicator of success for a sustainable school is the 'extent to which water consumption at a baseline date since participating in the initiative has been reduced' (p. 29). At the state level, studies such as the *Victorian Sustainable Schools Pilot Project* demonstrate that the development of 'whole settings' approaches to sustainability have significant positive impacts in terms of environmental, economic, educational and social outcomes.

The early childhood education sector has been much slower to engage with sustainability education than the formal schooling sector. As Davis (2008) comments, education for sustainability in the early years is a significantly under-practiced, under-resourced and under-researched area. This is due, in part, to the fragmented nature of early childhood services across Australia, with a wide range of types of services, governance arrangements and staff qualification levels, which works against the development of coherent, comprehensive programs in early childhood education. As a result, education for sustainability (EfS) programs that are in place tend to be small-scale and piecemeal, an issue first highlighted by Sue Elliott in *Patches of Green* (New South Wales Environmental Protection Agency, 2003), the first national scoping report of early childhood environmental education in Australia.

Recent concerns about issues such as global warming have provided an impetus for the early childhood education sector to engage with the sustainability agenda. For example, in 2007, *Early Childhood Australia* (ECA), the peak national professional association for early childhood education professionals in Australia, updated its Code of Ethics which now states that early childhood professionals will 'work with children to help them understand that they are global citizens with shared responsibilities to the environment and humanity' (Code 1.4). Furthermore, the *National Childcare Accreditation Council*, the accrediting authority for all long day care, family day care and outside school hours care services in Australia, has recently encouraged Early Childhood Education and Care (ECEC) staff to 'close the gap' between the stated 'Indicators of Quality Care' and high level practice (Boyle, 2006). Examples of such practice include undertaking the development of an environmental policy for water conservation and the local environment .

With increasing numbers of children spending time in kindergartens, preschools and long day care centres, there is a ready cohort of potential participants – children, carers, teachers, parents and other community members – who could be educated around sustainability issues. For the young, especially, it is recognised that their earliest years are the most significant growth period. Experiences during this phase influence physical and neurological developments which drive biological, psychological and social responses throughout life. The implications for early learning for sustainability are obvious. In addition, early education centres are typically characterised by close associations with families and their local communities, being community hubs as well as educational settings. Many are also 'for-profit' businesses. Hence, there is potential for the early education sector to model both community education for sustainability and sustainable business practices.

1 Now the Department of Environment, Water, Heritage and the Arts.

As early childhood education for sustainability (ECEfS) is a new field of study, there is no blueprint for the ecological footprint[2] of a 'typical' long day care centre, kindergarten or preschool and no baseline data on water and energy consumption or how much waste is generated. Research and discussion on what education for sustainability might look like in early childhood education is also sparse. A 2004 study into sustainability practices in a child care centre that sought to address this gap was undertaken at Campus Kindergarten in Brisbane (see Davis, Rowntree, Gibson, Pratt, & Eglington, 2005). This research centred on an investigation of the centre's *Sustainable Planet Project*. Amongst other benefits, results showed considerable reductions in the use of a range of resources including energy, water and paper following the project's implementation. However, these decreases were mostly unquantifiable as the centre had been engaged in the project for almost nine years and no starting data had been recorded. The study of the (Sustainable Planet Project) revealed evidence of significant intangible changes too. These included greater understanding of sustainability issues and topics by children and staff and the development of a 'sustainability culture' in the centre that continues to permeate day-to-day thinking and actions. There were also reports from parents that children were influencing environmental behaviours at home, such as demanding shorter showers and requesting less packaging in their kindy lunchboxes.

Achievement of long-term changes in attitudes, knowledge and behaviours around environmental concerns, as well as creating learners with the agency to 'make a difference', are underlying goals of sustainability education. The research into Campus Kindergarten's *Sustainable Planet Project* shows that these goals are also applicable to and achievable in early education settings. The study of Rous Water's *Water Aware Centre Program*, therefore, has a dual role. It broadens and deepens understandings of education for sustainability by exploring the (to date) ignored potential of the early years, while contributing to the sparse research base in early childhood education for sustainability. The section following provides details of the program.

2 The ecological footprint measurement is an accounting tool that calculates the human uses of ecological services i.e. how much 'nature' people use to sustain themselves. Put simply, it estimates the area of biologically productive land and water needed to produce the resources that are consumed and to assimilate the waste this consumption generates. It is usually measured in terms of how many Earths are needed to maintain a particular level of human resource use and consumption (see Redefining Progress: http://www.rprogress.org)

Rous Water's Water Aware Centre Program

The *Water Aware Centre Program* (WACP) is targeted directly to before-school education and care services. The program seeks to enhance the interest, knowledge and skills of children's services, including long day care centres, kindergartens and preschools, and to encourage and guide their practices and policies towards sustainable water use. More specifically, the program aims to:

- foster positive attitudes and values for sustainable water use in young children;
- model sustainable water behaviours to young children;
- work with centre managers to change policy, practices and infrastructure to reduce water consumption;
- connect and engage the parent community about water issues, water management, incentives and programs;
- enhance community capacity for water catchment management and water conservation;
- increase active and informed participation of centre staff in water conservation; and,
- recognise and acknowledge existing sustainable water use practices in centres and services in the region.

The program was conceived and is implemented by Barbara Jensen, Rous Water's community educator, an experienced early childhood teacher and environmental educator. Jensen (2007) reports that in comparison to industry children's services are not big water users. They are potentially, however, big water wasters. Centre-based activities where water savings can be made include: cleaning paint brushes; fixing leaking and dripping taps; outdoor area cleaning; hose and water play; use of single flush toilets and large, old-fashioned washing machines; and lawn and garden watering. Jensen visits each centre for around three hours to deliver four interlinked components of the *Water Aware Centre Program* which, collectively, are aimed at improving water management within the early childhood service. These are:

1. **The Water Education Program:** This is the central component of the *Water Aware Centre Program* and is focussed on the children who attend the centre. The program involves a half-hour interactive educational session about water awareness and conservation. This is delivered through a song about children becoming 'water watchers', and a felt board and 'big book' story presentation. Following the session, each participating early childhood service receives a smaller version of the 'big book', a poster that includes the words of the song, and a CD of the song music, the story and of restful 'water' music.

Image 1: The community educator in action with a group of young children

Image 2: Felt board story and items from the teacher resource bucket

2. **Water audit** and **water conservation action plan**: The community educator undertakes a water audit of the centre to identify areas in which action can be taken to reduce water consumption and wastage. Actions are prioritised as short, medium, or long term initiatives. These are also classified as either behavioural or infrastructural. Water Conservation Action Plans take into account a centre's budget and timing needs. They detail steps for implementation and identify key people responsible for actioning each step. A centre's management committee is encouraged to carry out at least two of the suggested actions as part of their participation in the WACP.

Image 3: Rous Water's community educator conducting a water audit

3. **Parent education:** To consolidate and extend upon the learning generated by involvement in the program, a portable display is lent to the service for one week. This includes material for parents to read 'on the spot' as well as flyers and booklets to take away. The content of the display includes information about the program, water issues and local and regional water management. The display also informs parents about the range of water saving rebates and water conservation incentives available in their region.
4. **Curriculum planning**: Centre staff are encouraged to incorporate water conservation activities into their program planning. To assist in this endeavour, a bucket of educational resources is provided for one week so that staff may further their knowledge on issues related to water use. These materials are intended to support the inclusion of water awareness activities into future program planning. The bucket contains picture story books and teacher reference books about water and water conservation and a bag of illustrative water saving devices such as flow restrictors, and hose nozzles. A folder of early childhood education for sustainability resources is also available on request. This folder includes items such as resource lists, academic papers and articles and information about environmental education networks.

Image 4: The WACP parent display

According to Jensen (2007), action in all four components of the WACP indicates that a centre has initiated, is maintaining, and is committed to strategies to improve water management through ongoing education and the centre's daily operations. Collectively, the four components of the program provide an integrated approach to water resource management to promote actions that reduce water consumption and avoid water wastage, coupled with an awareness of the quality of the water that leaves a service. Such an approach enables a centre to better understand the impact of its operational and educational choices as well as its place in the water catchment. As Jensen reminds us 'no matter where you are in a catchment, your actions will have an impact somewhere else' (2007, p. 13).

Methods

The study investigated whether participation in the WACP resulted in operational and educational changes in water use in centres enrolled in the program. In this evaluation, no one data collecting method was deemed adequate to tell the whole story of the impact of the program. Initially it was thought that quantitative measures might indicate measurable changes in water use in a centre that could be directly attributable to the program. In effect, this was initially conceived as a simple input-output study. However, it soon became obvious to the researchers once they engaged personally with centre staff and with Barbara Jensen that there were significant intangible impacts and changes occurring in the centres that only qualitative data collection methods could capture. Hence, this study used a mixed-method approach – that is, both quantitative and qualitative methods – to evaluate outcomes in seventeen early childhood centres in the Richmond/Byron/Ballina region following engagement with the Rous Water Education Program. A mixed-method approach is endorsed in educational research literature. As Creswell (2003) states, 'to include only quantitative or qualitative methods falls short of the major approaches being used today in the social and human sciences' (p. 4). The following sections outline how the quantitative and qualitative aspects of this study were conducted.

Quantitative Methods

The quantitative aspect of this study involved the statistical analysis of water consumption data; the same data used by councils to calculate property water and rates notices and with which most residents living in a city, town or shire are familiar. The aim was to identify whether there was a statistical difference in water consumption as a direct result of the WACP. Of the seventeen centres that participated in the program, four were long day care centres and thirteen were preschools. Generally speaking, long day care centres have much longer operating hours than preschools, often operating for 10–12 hours per day compared to 6 hours per day for a preschool. Long day care services are also open for more weeks in the year, usually 48 weeks, compared with 40 weeks for a preschool. Furthermore, long day care centres frequently have children under the age of two years, necessitating nappy changes and associated cleaning, and face washing which require the use of water. It is reasonable to expect, therefore, that water consumption for a long day care centre would be considerably higher than for a preschool.

To begin the study, baseline data on water consumption for each of the seventeen centres was accessed by the community educator from Rous Water's database and provided to the researchers. Specifically, this data was an average daily water consumption figure (in kilolitres), calculated over a defined three month period. A per child/per day water consumption rate was then calculated for each centre, based on the number of children for which the centre was licensed. Comparisons were then made between average per child/per day water consumption figures measured before and after participation in the program to compare similar three month periods. For this study, five readings of water usage data were collected for each centre with four taken prior to the WACP, and one recorded after the program had been conducted. Four pre-program readings were required to cover a whole year of water consumption for each

centre. This allowed, somewhat, for seasonal variations in water use to be taken into account and for variations arising from changes in centre attendance, as occurs during holiday periods. Therefore, if a centre's post-program water reading was for March–May, then the pre-program comparative reading was for the previous March–May. The data were then subjected to tests of difference of average daily water consumption per child. The results from the statistical analysis are discussed later in the Findings section of this report.

Qualitative Methods

For the qualitative aspect of the study, multiple sources of data were gathered to provide varied and rich understandings of the impacts of the WACP on educational practices and water conservation strategies in early childhood education services, as well as future intentions. Data were collected using the following methods:

1. Water audit data and post-visit reports for each of the seventeen centres

As part of each centre's participation in the WACP, the community educator conducted a comprehensive water audit using a proforma (Appendix 1) onto which existing water use practices were recorded. Areas where actions for reducing water consumption and waste could occur were also listed. This process was designed specifically to capture the types of water uses that are common in child care settings. A report was then developed for the service managers to adopt and enact.

2. Semi-structured, face-to-face interview with the community educator

A one hour face-to-face, semi-structured interview was conducted with the WACP community educator, also the designer and implementer of this program. As a key informant for the study, the community educator had a deep understanding of the program, each participating centre, and the impact of the program on behaviours, attitudes and curriculum planning. At its simplest, interviewing is about asking questions and getting answers, although for serious researchers, the purpose of the interview is to 'obtain a rich, in-depth experiential account of an event or episode in the life of the respondent' (Fontana & Frey, 2000, p. 646).

The focus of the interview was the impact of the water education program on staff, children and parents at participating centres (see interview schedule Appendix 2). Both tangible impacts (such as the purchase of equipment that reduces water flow) and intangible impacts (such as changes in teaching practices) were sought. This interview allowed for the collection of data that was not recorded in the water audits or follow-up reports.

3. Qualitative survey/interview/conversations with staff, parents and children in three centres.

Indepth qualitative data was also obtained from three early education sites that had participated in the WACP. These three centres were selected in consultation with the community educator because of their high level of engagement with the program. In each of these centres, key personnel (the centre directors) were willing to participate in an interview, as well as facilitate for staff, parents and children to be interviewed via a semi-structured survey or conversation. A contextual overview of the three sites is provided below, followed by a summary of the interview methods employed for each group of participants from these centres.

Jarjum Preschool (Indigenous preschool)

Jarjum preschool is a community-based, non-profit centre, funded by the New South Wales Department of Community Services and Department of Education and Skills Training. At an operational level, Jarjum Preschool is managed by a committee comprising parents and community members. Parent and community involvement is strongly encouraged and is seen to be an integral part of the daily operations of the centre. The program caters for 20 children per day aged three to five years and has a focus on the development of Indigenous cultural identity of the children. Two staff work at the centre during the opening hours of 9am–3pm.

Bangalow Community Children's Centre

Bangalow Community Children's Centre is a community-based, non-profit child care centre, funded and licensed by the NSW Department of Community Services and the Federal Government Department of Families, Community Services and Indigenous Affairs. At the operational level, the centre is managed by a parent committee. All families are encouraged to visit and spend time in the centre which caters for 79 children per day aged birth to five years. The centre has a play-based educational philosophy. The centre is open 7.45am–6pm with 16 staff working a variety of shifts. Children arrive between 7.45am and 10am, and depart between 2.30pm until 6pm. There are no fixed hours for arrival and departures, to suit the needs of individual families.

Cavanbah Community Preschool

Cavanbah Community Preschool is a community-based, non-profit organisation, funded and licensed by the NSW Department of Community Services. A small number of parents are involved at the management level and a larger group of parents contribute to the program on a day to day basis, or as they find time to participate. The program caters for 40 children per day aged three to five years. There are 4 staff present for the 40 children from 9am to 3pm, plus additional staff employed on 3 hour shifts to work with children who have additional needs. After 3pm there are two staff to care for a small number of children who are picked up as late as 5.30pm.

Table 1 provides a summary of the methods used to collect data from these three sites. In total, eight staff (two centre directors, three teachers and three childcare workers) were surveyed, along with three parents. Seven children shared their perceptions of the WACP.

Table 1: *Summary of surveys and child conversations in 3 selected sites*

Centre	Surveys	Child conversations
Jarjum	2 x staff (Director, 1 childcare worker)	3 x children (Staff-led conversations)
Bangalow	3 x staff (2 teachers, 1 childcare worker) 3 x parents	3 x children (researcher-led conversations)
Cavanbah	3 x staff (Director, 1 teacher, 1 childcare worker)	1 x child (Director & researcher jointly led conversations).
	Total: 11 adults (8 staff and 3 parents)	**Total: 7 children**

The data collected by survey and child conversations in these three sites occurred between eight and 11 months after the original WACP visits. The reasons for the time difference between program delivery and data collection were two-fold:

1. The researchers did not become aware of the WACP until after the program had been delivered. Inevitable delays in seeking permission to conduct the research occurred. This included obtaining ethical clearance for the project; and,
2. Some passage of time was required for centre staff to act upon the stimulus of the WACP, especially in respect to the development of water education curriculum materials and the organisation and implementation of water management devices such as the purchase of tanks.

Staff and Parent Survey

Structured qualitative surveys were developed to enable the researchers to gather data from staff (Appendix 3) and parents (Appendix 4) at each of the three centres. The purpose was to gather 'snapshots' of education and water management practices resulting from the WACP and adult perceptions of the impact of the program after several months had elapsed, indicative of longer term benefits. A survey was chosen as the method for data collection because the busy operating schedules in childcare centres make it difficult to readily withdraw staff and parents for interviews. Respondents took between 15 and 20 minutes each to complete the survey. In three instances (with two staff and one parent), the researcher asked the survey questions directly to the respondents to enable data to be collected 'on the run' (Wadsworth, 1991). Participant responses were then recorded on the survey sheet. These researcher-led surveys took between 10–15 minutes to complete.

Selective purposive sampling was used to decide which participants would be invited to complete the surveys. Purposive sampling for 'core' participants allowed the researchers to seek centres in which the processes in which they are interested (namely, changes in sustainability practices, attitudes and curriculum approaches) are most likely to occur. A purposive sample is a non-representative subset of a larger population, and is constructed to serve this specific need or purpose (Creswell, 2005; Patton, 2002). Choosing the purposive sample is fundamental to the quality of the data gathered. As the researchers were not able, on their own, to identify the target group, the surveys were left with the Directors of each of the three centres to make final decisions. In this sense, it was necessary to rely on the Directors' knowledge of child and staff participation in the program and their assessments of parental involvement, availability and interest in being interviewed. All participants who were approached to take part agreed to participate.

Child conversations

The conversations (see Appendix 5 for child conversation 'starters') with the seven child participants (who at the time of data collection were four years of age) took approximately five minutes each. The sensitive nature of data generation involving children requires ongoing ethical consideration and negotiation and high levels of researcher sensitivity (Skelton, 2008). For this study, the researchers obtained written parental consent for the children to engage in these research conversations. Additionally, prior to commencement, each child was asked directly if they wanted to talk about the WACP. All replied in the affirmative.

Additionally, the researcher who facilitated the child conversations had been past Director of *Bangalow Community Children's Centre* and, therefore, had existing relationships with many of the staff and parents and extensive knowledge of the site and its practices. This background provided relatively easy 'entry' to the children at this site, despite not being previously known to the children. At the other two sites, the child conversations were mediated via staff who were well known to the children. Hence, at *Jarjum* the researcher did not converse directly with the children. Instead, she guided a staff member to talk with the children about what they remembered of the WACP and about the water saving strategies they persisted with. At *Cavanbah*, the Director and the researcher conducted the conversation in the form of a three-way 'chat' while the child was playing. These strategies enabled the children to feel comfortable in the presence of known and trusted adults who also had specific knowledge of the WACP and its implementation at the centre.

Qualitative Data Analysis

The starting point for the analysis of the qualitative data was the water audits and follow-up reports. These records were analysed using an iterative process that revealed emergent themes. Such themes or constructs are often 'fuzzy' initially (Ryan & Bernard, 2000), becoming sharper as new data is collected and examined (Huberman & Miles, 1998). Organising the experiences of the research situation into categories becomes a matter of progressive focusing and allows for the identification, classification and refining of themes that emerge from the data.

Data were initially categorised into three action categories. These were:

- 'existing' practices (water conservation practices actually in use in individual centres);
- 'nominated' practices (those nominated by the community educator following the water audit as possible actions); and
- 'enacted' actions (those practices actually implemented in a centre following participation in the WACP).

Further analysis of these categories – an iterative process in which responses were read and re-read to determine recurring themes – revealed sub-categories within the 'existing' and 'enacted' categories. For example, 'existing' actions were refined to include 'indoor' and 'outdoor' water conservation practices, while 'enacted' actions were refined to identify the *types* of changes that occurred in a centre following participation in the WACP. These were identified as: curriculum changes enacted by individual teachers, whole-of-centre changes, operational changes, and actual and intended investments in water conservation devices. Additionally, a category that collated the identified *barriers* to implementation of water conservation in these early education centres was created (Appendix 6 shows this data for eleven of the participating centres).

It was the set of 'enacted' actions that were of most interest to this study because they followed a centre's participation in the WACP and many of these actions, the study revealed, were the direct result of the WACP. This category was further refined using sustainability accounting categories as a guide. 'Triple bottom line' (TBL) and sustainability accounting processes **are becoming the norm for many community and business groups. Created by Elkington in the 1990s, triple bottom line accounting aims to report on an organisation's social, environmental and economic impacts** (Lamberton, 2005)**, and is a metaphor to encourage thinking beyond reporting on the traditional financial bottom line. Recently, additional** 'bottom lines' have been added to the TBL process, creating, for example, the 'quadruple bottom line' (Whitehouse, 2004). Indeed, there can be several additional 'fourth bottom lines' that could be used. 'Governance', for example, is becoming more commonly reported upon, as well as reporting on 'cultural' impacts or outcomes, a category used particularly in New Zealand reporting (Spiller & Lake, 2003). For education services and institutions, a useful fourth bottom line is reporting on educational impacts or outcomes, an approach identified in recent *Sustainable Schools* evaluation reports (for example the *Victorian Sustainable Schools Pilot Project* (2004) and the *Comparative Assessment: Australian Sustainable Schools Initiative Pilot Programme in NSW and Victoria* **(Larri, 2006).** Consequently, the data in the 'enacted' actions category in this study were categorised in terms of their:

a. social impacts;

b. environmental impacts;

c. economic impacts; and,

d. educational impacts.

Following identification and clarification of the above data categories, data from the interviews, surveys and child conversations were then analysed against each of these categories. It must be noted, however, that it was quite difficult to allocate program impacts neatly into these four categories. This is because of the integrated nature of early education settings, in that they are, simultaneously, educational sites for children, sites for social networking and community education, and in some cases, also operate as businesses. Nevertheless, for the purposes of this report, this structure proved useful for data classification and discussion. It is the voices of the participants – the community educator, centre staff, children, and their parents – that provide supporting evidence of the *social*, *educational*, *environmental* and *economic* impacts of the WACP in the form of experiential accounts in the respondents' lives. These accounts give richness and depth to the study.

Findings

Quantitative Data Findings

The study was unable to demonstrate that water usage declined as a result of participation in the WACP (Research Question 1). There were important reasons for this. First, to obtain valid data that would show a change within a participating centre, records of *daily* water consumption for a period of three months leading up to the WACP, and then for the following three months after the WACP was needed. This data was not collected as this evaluation was not planned until after the WACP had already been delivered. Further, there were a range of other factors that reduced the reliability of the data that was collected. These include:

- Long day care centres were open either 10 or 12 hours per day (staff were present for 10 or 12 hours per day respectively, but individual staff work eight hour shifts). Preschools were open to children for six hours per day with staff usually present for seven hours per day. Some preschools run an extended hours program where children stay later with staff, as their parents require longer hours of care. Accurate records of opening hours and attendances/ hour were not available.
- At the time of the study, preschools were suffering declines in enrolment numbers and actual attendance figures at the time of participation in the WACP were not collected. Only the licensed numbers were recorded, not actual enrolment numbers.
- Another complication preventing consistency in water usage data occurred because of the way water readings were recorded. Generally, for all water users of Rous Water, these are taken every three months. However, some centres had no water readings for six months while others had water usage readings that included neighbouring community buildings. This meant that the water usage data for each participating childcare service was not accurate, and therefore unreliable.

As a result of these limitations, the researchers were not able to show that the WACP led to reliable, measurable reductions in water consumption in the participating centres. Nevertheless, although the statistical analysis on the water consumption data did not show demonstrable reductions in water usage, it is likely that usage was actually reduced, as analysis of the qualitative data indicates. This data showed evidence of raised awareness of the need to save water by children, staff and parents and that, indeed, a range of actions were implemented following participation in the program. This data indicates the implementation of immediate and longer term changes across the community in relation to water conservation practices. It is these impacts that provide the focus for the next section of this report.

Qualitative Data Findings

The qualitative data shows that the WACP did impact on water conservation strategies even though, as indicated, the study was not able to quantify these reductions. Immediate changes to water use behaviours included switching to the use of half-flush buttons in the toilets and the purchase of low-cost products such as tap flow restrictors. Additionally, most centres indicated their intention to follow through with further water conservation and water education strategies. Some strategies such as the provision of water tanks are costly for services that rely largely on community grants, fundraising and volunteerism. As such, these measures necessitate strategic, longer term planning and funding. The data showed that several centres, nevertheless, intended to make such plans.

Another significant finding from the analysis of the qualitative data was that the WACP had considerable influence on community knowledge, practices and values around water conservation, even though the community educator felt that she could have done more to reach out to parents. This influence came from two main sources. Firstly, some parents had direct exposure to the program and its resources, and therefore chose to act on what they learned about conserving water. Secondly, many parents were influenced by their children's behaviours and attitudes to water conservation as a result of their participation in the WACP. In other words, the research showed that the children acted as their parents' teachers in relation to water conservation, such that water conservation measures were then undertaken and further reinforced within their homes. These findings are expanded upon in the following section.

Discussion

This section comprises the discussion related to the qualitative data and relates to Research Question 2. First, discussion arising from matters elucidated in the interview with the Rous community educator is presented. This is of interest because it represents a 'macro' viewpoint from the person most intensively involved with all the centres that undertook the program. The second part of the discussion represents the perspectives of program 'recipients' – the seventeen participating centres and, especially, the three centres where staff, parents and children interviews/conversations were undertaken. These discussions have been framed around each of the four accounting themes outlined previously: *social*, *educational*, *environmental* and *economic* outcomes.

Community Educator's Perspective

> *When I rang around at the end of this year, to find out what people had done, I was very encouraged that every centre had done something – even just putting in sink sieves. Even though this isn't about saving water, I talk about the whole water cycle and actions that are going to help water quality in the long term. Most of them had done more than that.*

Of interest to both the community educator and the researchers was the commitment of centres to enact nominated actions or to develop action plans for these to occur. Upon recontacting centres at the end of 2006 for feedback on their progress towards implementing their nominated water conservation actions, the community educator found that all centres reported action following their audit and the WACP visit. The range of actions reported included:

- investigation into possible grants for purchasing infrastructure such as tanks and taps;
- purchase of educational resources for the children regarding water topics;
- monitoring and encouraging ongoing change in children's behaviour with regards to water use especially in bathrooms and outdoors; and
- altering the physical environment to save water.

Regarding this latter point, alterations ranged from inexpensive changes such as enabling greater water efficiency in toilet flush systems through to complete renovations of centre bathrooms. Examples of low-cost options included fitting water displacement devices as simple as a water bottle to reduce water flow through the cisterns, while other centres intended to install dual flush toilets when their budgets allowed them to do so. As the community educator commented:

> *The most noticeable consumption decrease will come mostly from centres that had really old taps and single flush cisterns and changing them over to water efficient devices.*

The area where the community educator felt there had been most change was in water usage in the outdoor environment. Several centres, for instance, implemented a policy of filling the water tray, used for water play, just once per day. Many also indicated that they intended investigating options for obtaining a rainwater tank for use with outdoor play and for gardening. Potentially, the installation of water tanks could significantly reduce reliance on reticulated 'town' water for outdoor activities.

Of ongoing concern to the community educator, though, were the costs associated with implementing recommended changes. While many centres reported that *behavioural* changes in children's water habits were relatively easy to foster, changes that required financial outlays such as installing dual flush toilets, levered taps, and rain water tanks were much more difficult.

> *Nearly all the changes involve a plumber – if they have a willing parent/plumber then this is not so expensive but they are not going to do this ahead of a lot of other priorities. I was very encouraged to see that they took it seriously though because I just thought it would be too expensive and they would lose interest immediately. It was encouraging to see when I rang around that they were all thinking about or trying to make some changes.*

A part solution to this issue was that the community educator became aware that she needed to be better prepared with cheaper options for water efficiency and to provide centres with information about grants so they could access financial assistance to help pay for any works.

The area where the community education officer felt she most needed to implement changes in her program related to parent education. At the time of the WACP visit, each centre was left a hanging display for parents to browse for one week.

> *In terms of the parents actually taking stuff out of the display, that's been fairly poor. So, that's one area I have to re-assess. Reaching out to the parents strengthens the program and the efficiency of water conservation. Maybe parents are too busy, too rushed. Maybe that's not the way to be reaching that group of people.*

She had also anticipated that centre staff would capitalise on the visit and therefore inform parents about the program in more detail. Feedback indicated, however, that parents were not overtly informed about the program via administration and staff channels. In her interview, Jensen noted:

> *While most early childhood staff know how powerful they are with imparting values to children, some staff refuse to take on this issue [of sustainability]. Sustainable education has to work at all levels, not just reducing the waste. It has to get inside people's minds and hearts so that they will just automatically fix the taps, for example.*

In summary, the community education officer identified that the WACP resulted in some important changes in water saving behaviors, understandings and strategies across the centres, although she was less convinced of the parent education aspects of her program. This is discussed further in following sections of this report.

Perspectives of Staff, Parents and Children

In this section, comments of staff, parents and children who had engaged with the WACP are interwoven with discussion around the four outcome categories that emerged from the qualitative analysis. These comments provide evidence and examples of the impact of the program on participants. This discussion also shows how these effects have cascaded outwards from the original sites of impact (that is, the early childhood centres) and have reached new sites and audiences in relation to water conservation. Such a process is akin to the 'butterfly effect' sometimes associated with chaos/complexity theory where (small) achievements are magnified beyond their initial impacts and create broad level change (Dick, 2005; Gleick, 1987).

Social Outcomes

Broadly speaking, social benefits refer to a range of outcomes that add to social capital such as child, staff and community involvement in a program; new partnerships developed with the community; enhanced child leadership and social responsibility; enhanced sense of belonging and ownership of a place, program or idea; improved policy-making; and changes in community attitudes.

Burfoot (2003) comments that 'we ...need to promote young children's participation as a public benefit, something that is going to provide us all with a better place to live' (p. 49). This study has identified that children's participation in water conservation education results in children acting in observable roles as social change agents and co-contributors to creating cultures of sustainability. Elements of these roles include the children not only becoming water savers themselves, but also acting as their parents' teachers about water conservation. Furthermore, these roles are not limited to water conservation; the children extended their learning and advocacy to encompass sustainability issues more generally. This was demonstrated in the following child comment:

> *My mummy told me a bit about looking after the world – she told me to turn off the lights. We talked about balloons at preschool and if we let them go outside they would go right up and end up in the sea and fish would eat them.*

As social change agents, children need to be seen and heard in their communities around social and environmental issues that impact on them. Evidence is growing (see Hart, 1997) that even very young children have the capacity for active participation. As one child commented: ... *maybe I could be the water hero guy and save water.*

Image 5: A child using newly-learned water conservation strategies.

In their interactions with peers and with adults, young children can be contributors to change processes within organisations, families and the wider community. In the context of this study, they have acted as co-contributors to creating cultures of sustainability. They have demonstrated, for example, that they can be effective teachers in relation to water education transferring behaviours, discussions and explanations learnt through their participation in WACP into the home environment. This is exemplified by the following comment relayed by a parent who stated *...I love having long showers – this program really made me change this to shorter showers.* And, *...through our child's involvement in the program we have been taught to be more aware about rinsing dirty dishes, dripping taps, hoses turned off tight, flushing the toilet and things like this.* Staff also reported on the ways in which children transferred their learning to the home environment *...what was interesting was that we got quite good feedback from parents – the children went home and told their parents to buy front-end loader washing machines*!

Participation in the WACP has also enabled some staff members to become sustainability activists and educators as this comment from a staff member demonstrates:

> *I am now more waterwise. This is of particular importance, as it is new to me. We incorporate this into the program ...We don't re-fill the water tray now – just have it filled once a day and the children know that when all the water is gone, that's it.*

Many staff now recognise, too, that reductions in water consumption create significant contributions to environmental sustainability. As the community education officer commented in relation to observed changes in staff attitudes:

> *I suppose the surprising thing was that although I didn't really use the word sustainability I can't think of any centres who weren't thinking about the fact that they should be living lighter on this earth. I think that was really encouraging.*

Image 6: Children and staff learning together about water conservation

In relation to parents, social benefits from participation in the WACP include building stronger, more appreciative partnerships between parents and centre staff and strengthening the parent/centre educative role. Specific examples include:

> *I am really happy that this program took place. I think it should be encouraged (parent).*

> *I would like to explore other issues on drought, climate changes, and weather. We have a parent visiting soon to talk about climate change (staff member).*

For centres as a whole, there have been social benefits associated with enhanced leadership and activism around water education and sustainability issues. For example, in one of the three case study centres, the management committee applied for a water grant and were successful in receiving $28 000 for the installation of water bladders to take grey water from the kitchen and hand-washing sinks, and the laundry, for use in the toilets. In other centres, staff made submissions, as a collective, to their centre management committee for new taps while one presented a detailed action plan for water conservation upgrades. Another indicated that they intended to develop an environmental education policy. Some staff also sought to bargain with their managers for more non-contact time to assist in the preparation of grant applications.

Another area of social benefit was the development of exemplary case studies around water conservation and sustainability to inform other settings, services, organisations and businesses about ways to embed sustainability into their day to day practices. It was reported, for example, that one centre was used as a case study for a new book on outdoor playspaces in early childhood settings. Preparedness to promote their achievements means that other centres have opportunities to learn from 'like' organisations. Additionally, as exemplars of sustainable practice more broadly, early childhood centres have the potential to influence educational settings such as schools, as well as other community organisations and businesses in ways to become more waterwise and sustainable.

Educational Outcomes

Broadly speaking, educational outcomes derived from the WACP were evident as two levels: directly within the participating centres, and indirectly in homes. They have also been demonstrated in the short-term, such as new knowledge learnt through songs and books, as well as in the longer-term, such as changes to policy. Such breadth and depth indicates a broader perspective of education than the simple transference of knowledge and skills to students, a view posited in a recent report of the United States National Academy of Sciences (2006).

In contrast, Barrett, Hart, Nolan, & Sammel (2005) comment that 'education is vital to the development of citizens who are able and willing to take informed action on pressing social and environmental concerns' (p. 505). This is illustrated by the fact that even after a gap of ten months (from the delivery of the WACP and the child conversations) children could still describe the importance of saving water. Excerpts from these children conversations include:

> *I remember we needed to save water in the whole wide world because we need to drink and wash our hands, and showers, and baths.*
>
> *... not to let the taps drip. If we saw a tap dripping turn off tighter and could ask a teacher to help.*
>
> *We only fill up the water trolley once, then we couldn't waste water.*
>
> *...not waste it, and turn the taps off and not leave the hose on.*

Additionally, a staff member at one centre described a child who took the role of 'water watcher' very seriously and who would regularly report on his/her actions related to turning off a tap. Also, a parent commented. In relation to their child's learning from the WACP, a parent commented... *[she] has learnt that water is a resource that is not to be wasted – don't leave the tap running, shorter showers, and the bath not [filled] to the top.*

As a result of their engagement with the WACP, staff in several centres developed new curriculum plans, identified and used new learning resources, and facilitated new outdoor play opportunities centred on water conservation. For example:

> *At this centre, a teacher wrote a booklet of activities to complement the WACP. The teachers revisited the water conversation songs with the children and set up a water 'factory' (this involved pipes and funnels with a water tray underneath to catch the water which the children then bucketed back up to the top).*
>
> *At our centre the children listened to the CD, continued to be water watchers and told the staff if there was a tap dripping.*

There was also a clear educational benefit of the WACP illustrated through staff engagement with, and commitment to, professional learning about water conservation and, more broadly of sustainability. This involved both the learning of new pedagogical strategies and enhancing their own knowledge about water and sustainability issues. Staff responses indicated they had learnt how to operate in a more sustainable manner in their role as an early childhood professional.

[The program] helped to make us (teachers and children) aware of water conservation and to relay this to children, and make kids more conscious about this – especially nowadays. We have to be more conscious about ways to show children how to do this. The program raised awareness for us of ways to make changes.

These centre-level examples demonstrate the capacity of the program to stimulate curriculum renewal and innovation grounded in sustainability principles. These renewed principles have been embedded into play experiences, in learning across the curriculum, and indoor and outdoor learning. The role of the outdoor environment as a child's 'third teacher' (the first two being the parent and the teacher), is a matter gaining critical recognition amongst early childhood educators. Malaguzzi (1998), the originator of the concept comments that early childhood environments often fail to fulfil this role and identifies outdoor, experiential play and learning in nature as significant contributors to children's potentials for learning and development. This study has shown that the WACP has contributed to the promotion of outdoor, experiential learning. In some ways it can be considered an early childhood curriculum (re)development catalyst.

The data also provided examples indicating that the program had positive educational outcomes beyond the confines of the participating centres. While the community education officer indicted some disappointment in its perceived impact on parents, this study found that, impacts were indeed considerable. The following comments from parents (from survey and interview) are illustrative:

I have requested the landlord put a tank in for rainwater.

I love having long showers. It has really made me change to shorter showers.

I have become more economical with washing.

I now put out buckets to catch the rainwater to water the plants.

Furthermore, the WACP strengthened the educative role of parents as co-teachers with centre staff. For example, parents reported, and requested, a range of ways for them to engage in educational activities with their children related to the WACP. These included:

We got a copy of the [Water] song burnt on a CD because J wanted me to sing it but I didn't know how it went. He now dances to it with his 2 year old sister and teaches her the actions. Maybe, if feasible, a website or a CDROM with environmental games they can play ...or photocopies of old fashioned games they can take home and play with their family to get the whole family involved [could be shared].

[My child] came home and shared ideas with us on how to not waste water. We made up some bedtime stories around this theme.

In Summary, educational outcomes from this project include: students being actively involved in learning about the environment and environmental issues; uptake of activist education pedagogies around water conservation; children modelling water conservation principles to their families; children excited and motivated by the program; environmental learning linked to, and driving learning across the curriculum; increased interest and engagement in learning; and the strengthening of parent and teachers educative roles.

Environmental Outcomes

In a broad sense, environmental outcomes include water conservation and improved management of other resources; awareness of water quality improvement; enhanced grounds development and aesthetics; awareness of local environmental issues that affect families, the community and the region; and, awareness of, and taking action to prevent, a broad range of negative environmental impacts. In addition to activities and actions already mentioned, centres also reported the following:

> *We have minimised water play and are recycling more. We turn the taps off while hand washing and water from drinking cups is emptied onto the mulched garden. We learnt a new story recently about rubbish in the drain.*

> *We now put out containers of water in the digging area instead of having the hose running. We use colour-coded spots on the flush buttons. We sweep the play areas around the sandpit instead of hosing. When water is all used up in the water trolley, no more is added.*

> *The WACP complements the active experiential program at this centre. For example, an entomologist has visited the centre as well as the 'Roving Reptiles' incursion, and we have participated in the Indigenous 'Dolphin Dreaming' program.*

Beyond the centre site itself, one centre became involved in a local creek revegetation project. This outcome demonstrates the growing understanding that individual centres are an integral part of a broader water catchments and, as emphasised by Jensen (2007), have a responsibility to consider their actions in relation to water use and their contributions to catchment health. Following are other examples of positive impacts of the WACP that reach beyond the centre:

> *When it rains now, [my child] goes on about how her passionfruit vine will grow. It has made her think about water – where it comes from and that it is not limitless (parent).*

> *At home, parents have reported the following actions: they do not run the dishwasher as often; they take shorter showers; keep a bucket in the shower; no longer use the hose for cleaning paved areas and will instead use a pressure cleaner as it saves water; and the consideration of installing water tanks (staff member).*

> *At one centre, part of parent contributions has been bringing in cleaning products. Since the WACP, the centre is now requesting environmentally-friendly products. This means that there are [fewer] bad things going down the drain (staff member).*

In summary, positive environmental actions, mainly related to water conservation but also including water quality, have been reported as leading directly from the WACP. These have been evidenced at the centre level also in the homes of those who participated in the WACP program.

Economic Outcomes

In a general sense, some of the broad economic benefits that might accrue to individuals and centres that participate in the WACP include: reduced financial costs associated with water use and minimisation of cost increases; reduced costs and consumption of resources including energy, paper and chemicals; enhanced educational, environmental and managerial skills of participants; improved work-environment issues; and increased innovation capability in relation to sustainability practices in centres.

Additionally, there have been unquantifiable economic returns for the local economy, the community, and local industry. Participation in the WACP has meant that centres and families have supported the local economy via the purchase of goods and services including water tanks, taps, landscaping and nursery supplies, hardware materials and tradespeople. Furthermore, early childhood communities in the region have demonstrated self-sufficiency via successful applications for state and federal grants to help fund water conservation measures. A long-term economic outcome is the more efficient use of a scarce natural resource (water).

In summary, the WACP, through directly reducing the use of water in the community, has contributed to reducing the cost of water provision. At the same time, the program has helped to support local providers of goods and services that assist in further reductions of water use. More broadly, engagement with a wider range of sustainability issues, such as energy conservation and waste management, contribute to sustainability, long term.

Study Limitations

This study is heavily dependent on self-report data. However, the use of multiple data sources and the collection of data from the viewpoints of people in different roles and positions provide a measure of credibility and reliability to the study's findings. In this study, document analysis, review of website material, interview, survey and conversation were utilised. Informants included the community educator, centre directors, teaching staff, children and parents. Collectively, the use of these strategies provided reasonable opportunities to triangulate the data.

Study Implications

The findings of this study have implications for a range of individuals, organisations and sectors, with an increased interest in water education program, sustainability education, and early childhood education.

a. For Rous Water's community educator

The parent education component of the WACP was shown to be more successful than was thought. Nevertheless, informal learning by parents can be further enhanced by the:

- Creation and dissemination of a **parent brochure** (based on the existing brochure) for centres that includes a home water audit checklist and action plan for children to complete with their parents.
- Creation of a **'parent information and education' webpage** linked to the existing Rous Water website to help parents 'value-add' to their children's learning in the WACP.

b. For Rous Water

We have shown that investments in early childhood settings make important, if unmeasurable, contributions to water conservation. Strategies to capitalise on these contributions include the:

- Provision of additional funding for the **design and publication of the parent brochure, home audit, and action plan pro-forma**. Funding should enable **ALL** parents whose children attend the centres to receive the brochure, not just those whose children attended on the day of the WACP visit.
- Provision of funding to support the production of **additional resource kits** so that these can be left for longer periods of time in centres (one month is suggested).
- Appointment and training of **additional community education officers** so that more early childhood centres and services can be supported via the WACP.

c. For early learning centres in the region

Early learning centres have the potential to build on their capacities for educating about sustainability issues by committing to future actions including:

- **Collection of baseline data** on water consumption and the **development of realistic consumption reduction targets** (i.e. 25% water use reduction over 3 years).
- **Recording daily water usage measurements** from the centre water meter to measure their effectiveness in water consumption reduction.
- Advocacy within their management organisations for **vision statements, strategic plans and policies** on education for sustainability.
- Gaining support for initiatives by **publicising achievements** in a variety of education/ environmental forums (i.e. conferences/workshops, local media, displays, practitioner newsletters, magazines and websites).

- Actively encouraging education for sustainability by initiating **in-house professional learning** that provides opportunities for staff to critique current practices with a view to learning and creating change.
- **Supporting staff to engage in professional development and networking** in early education for sustainability (i.e. with local educators and environment groups).
- Formation of **collaborative partnerships between centres (clusters or hubs)** to maximise opportunities for professional development/resources/grants/research.
- **Initiating research** into existing sustainability practices within centres. Research has the potential to build partnerships, encourage community participation and capacity building and lead to reputation enhancement.

d. For local government

Local government can show leadership and support, and can generate goodwill in the local community by:

- Providing **financial support specifically for the before-school sector for infrastructure** (e.g. the provision of water tanks especially in light of federal government commitments to provide funds for the installation of rainwater tanks in schools – up to $10 000). Funding is essential in this sector as many centres are not-for-profit organisations relying on volunteers and community support for their viability.
- **Initiating integrated approaches to education for sustainability in the early childhood sector** by employing an **early childhood-qualified** sustainability officer to bring together the disparate efforts and diverse programs of committed individuals and centres.
- Investigating the establishment of an early childhood **'eco-centre' award scheme** (similar to SunSmart) to provide support and credentialing to early learning centres that meet set criteria with regard to sustainability practices and policy. (In New Zealand, an 'eco-kindy' scheme has recently been established under their Eco-Schools Program).

e. For early childhood educators and environmental educators

Opportunities exist for greater liaison, coordination and partnering between these educator groups. Ways to facilitate productive relationships include:

- **Joint projects** in curriculum and resource development, professional development and research around common interests and themes.
- Creating **new networks** that explicitly bring together early childhood educators and environmental educators. Where networks already exist, such as the New South Wales Early Childhood Environmental Education Network (NSW ECEEN), then these should be promoted and utilised.
- Inclusion of **identifiable strands or themes that promote ECEfS in conferences** of the professional associations of each of these educator groups (i.e. education of sustainability strands/themes in early childhood conferences and early childhood strands/themes in education for sustainability conferences.)

Concluding Comments

More than Early Childhood Water Education

In this study, we evaluated a unique early childhood water education program. The research demonstrated that even a relatively small-scale program can provide considerable environmental, social, educational and economic benefits. Furthermore, the benefits extended well beyond an improved knowledge-base about water issues and water conservation. This study showed that the *Rous Water Aware Centre Program* has provided a starting point for deeper and wider changes around sustainability. It has encouraged participants to think about a range of environmental issues (for example, waste management, soil erosion, and habitat protection) and to consider their potential contributions in reducing their ecological impacts overall. The WACP has also led to the creation and/or revision of centre policies and action plans related to water conservation and environmental issues, and new alliances between staff and families to help them work and learn together for sustainability goals.

An identified reason for the positive impact of the WACP is that it was conceived and developed in an integrated and holistic way. The community educator combined her knowledge and experience as an early childhood educator with her knowledge and experience as an environmental educator to create a program that 'works' with and for young children; stimulates centre staff to build on from initial learning; provides centre managers with specific action strategies and plans; and encourages families to engage with the ideas and actions in their homes. She also developed this program within a framework of 'sustainability'. Hence, learning about 'the big picture' informed and reinforced learning about water issues, and vice versa. Additionally, this integrated approach also supported trans-generational learning such that the obvious target audience (i.e. young children) also provided openings for the adults working in centres, and parents, to learn about, and for, sustainability.

In summary, the approach of the WACP:

- Promotes water-saving messages at both the educational and operational levels of a centre. This exemplifies the idea of early learning centres' 'practicing what they teach'.
- Embeds water education into a broad framework of education for sustainability. This has produced secondary sustainability outcomes including the reduction of waste, the use of composting and the prevention of erosion.
- Recognises and utilises the social relationships and networks that are a distinguishing feature of many early education settings and services. Parent engagement in children's care and education is at a peak in the before-school years and the program capitalises on this.
- Recognises the capabilities of young children as agents of change for sustainability. Indeed, the children are helping their parents 'unlearn' water-wasting habits and attitudes.

Finally, the *Water Aware Centre Program* has demonstrated that it is more than just another education program. It has triggered broader social change through education. While the early childhood education sector has been largely ignored as a contributor to changing the ways Australians' use water, this study has shown that such a position is no longer tenable. Children – and the places where they play and learn – have much to offer in helping our communities move towards more sustainable ways of living.

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Appendix 1:

Example of a Water Audit Proforma

Water Audit and Action List

A *Water Audit* will reveal your current water use and management. It will provide basic current information to help develop a list of actions for reducing water consumption and waste. It will also create a starting point from which improvements can be measured. The Audit and Action List will take approximately an hour.

The Audit is done by walking in and through the building and grounds with a nominated Centre Staff member or other person, who has knowledge of the Centre's daily workings and activities. It will note:

- ☐ Where and how water is used, (how often & how many).
- ☐ What water saving devices and water conservation measures are currently in place.
- ☐ The impact the Centre has on the catchment.

This information will form the basis for an *Action List*. That is a list of possible actions that the Centre could undertake to:

- ☐ Reduce water consumption.
- ☐ Use water more efficiently.
- ☐ Minimise the Centre impact on the catchment.
- ☐ And by saving water to also save money.

To assist the audit process, the following information will be required:

- ☐ Water consumption for the last 12 months (ie the water bills).
- ☐ Sewerage variable charge for the last 12 months and discharge factor used to calculate it.
- ☐ Location of the water meter.
- ☐ The average numbers of people at the Centre on any day, (& an idea of yearly variation).
- ☐ An understanding of security and use of water from fire hydrants and outdoor taps.
- ☐ An understanding of outdoor water use eg gardens and lawns, for cleaning and other activities.
- ☐ An understanding of indoor water use eg cleaning, paint disposal, floors, toilet etc.

Please note:
This is an initial and basic audit only. The comments and recommendations are purely a starting point for possible water conservation measures. It is recommended that you seek advice from plumbers and plumbing suppliers or request a more thorough audit from Rous Water or other certified auditors.

Water Aware Centres take action!

As part of the Rous Water, *Water Aware Centre* Program the Action List will be passed onto the Services' Management Committee for adoption and recommendation that at least 2 actions on the list are carried out.

Maintenance		
Procedure	**Reporting**	**Comments**
	Reporting system in place	
	Who and how often	

Survey water use		
Indoors	**Appliances and Methods**	**Numbers and Comments**
Staff Bathroom	Dual/Single Flush Toilet	No Single Dual
	Mixer taps	
	Aerators in taps	
	Other taps	
	Leaks/condition	
	Showers (AAA rated)	
Children Bathroom	Dual/Single Flush Toilet	
	Aerators in taps	
	Spring loaded taps	
	Other taps	
	Leaks/condition	
Laundry	Mixer taps	
	Aerators in taps	
	Other taps	
	Washing machine AAA or front loading	
	Nozzle on nappy hose	
Kitchen	Mixer taps	
	Aerators in taps	
	Other taps	
	Leaks/condition	
	Sink saver	
	Dishwasher (AAA rated)	
	Washing soaps biodegradable	
	Urns	
Drinking	Method for Children	

Education	Stickers or posters on display or available but in storage	
	Books	
	Songs or other	
Other		
Outdoors	**Appliances and Methods**	**Number and Comments**
Taps		No
	Removable handles	
	Spring loaded	
	Other taps	
	Hose nozzles	
	Leaks/condition	
	Tap timers	
Watering	Yes/NO	
	Watering methods	
	Sprinkler use and type eg sprays/drips/timer/manual	
Path clean	Cleaning paved areas – How?	
Garden	Local native plants	
	Mulch	
	Lawn	
	Other surfaces	
Tank	No tank	
	Size	
	What is it used for?	
	No but suitable position and roof catchment	
	Suitable condition of roof & gutters	
Water play	How?	
	Reuse?	
Water Exit point of Centre	Where and what runs off??	
	Stormwater drain?	
Other		

Calculating water use		
Usage	**Average daily use**	
	Average daily cost	
Cost per person	**Centre population**	
	Average daily use per person	
Other		

Service Name:

Written by:

Date:

Action List				
Action	**Steps**	**Who**	**Timeframe**	**Water saving and comments**

Appendix 2:

Interview Schedule for Rous Water's Community Educator

1. What information and resources did you use to inform the development of the program? (e.g. ROUS policy; understandings of environmental education; understandings of early childhood education)

2. What were the principles that underpinned the program? (ie. Why young children? Why early childhood centres? Why reach out to families? What was the purpose of the audit and follow up strategies?)

3. What was your overall experience of this program?

4. What surprised you regarding the program and its impacts?

4. Now that you have been implementing the program in the early childhood sector for nine months, is there anything you would change?

Appendix 3:

Interview/Survey Questions for Staff

This centre has participated in Rous Water's 'Water Aware Centre' program. The following questions relate to this program. We would really appreciate your responses.

1. What do **YOU** think is the main purpose of the *'Water Aware Centre'* program?

2. What have **YOU** learned about water conservation as a result of the program?

3. Have you changed any of your water conservation practices **at the centre** as a result of the program? If so, what?

4. Have you changed any of your water conservation practices **at home** as a result of the program? If so, what?

5. What do you think the **children** have learned about water conservation as a result of the program? Please share these stories with us.

6. What do you think **parents** have learned about water conservation as a result of the program? Please share these stories with us.

7. Have you engaged the children in any **follow-up activities** since the *'Water Aware Centre'* program was implemented? If so, what? Were these successful? How do you know?

8. What **prevents** you from doing more at the centre about water conservation? What other issues/practices related to the environment would you like to explore with young children?

9. What would **help** you to do more about water education at the centre?

10. In general, do you think it is worthwhile doing environmental education with very young children? Please elaborate.

11. Do you have any further comments about the Rous '*Water Aware Centre*' Program?

Appendix 4:

Interview/Survey Questions for Parents

This centre has participated in Rous Water's *'Water Aware Centre'* program. The following questions relate to this program. We would really appreciate your responses.

1. What do you know about the Rous *'Water Aware Centre'* program?

2. What do you think is the main purpose of the *'Water Aware Centre'* program?

3. What do you think your child has learned about water conservation as a result of the program? Please share your stories with us.

4. What has your family learned about water conservation as a result of the program? Please share your stories with us.

5. Has your family changed any water conservation practices **at home** as a result of the program? If so, what?

6. How has your child benefited from being involved in environmental education at their centre? Please elaborate.

7. What other environmental issues or practices would you like to see as part of this centre's educational program?

7. In general, do you think it is important for young children to learn about environmental issues at this age? Why?

9. Any further comments about the Water Aware Centre Program?

Appendix 5:

Prompts for Children's Conversations

Use props such as photos, booklets, the Water Song, to prompt children's memories of their experiences with the WACP.

1. What do you remember about the *'Water Aware Centre'* program?

2. What do you think the characters/songs/stories were saying about water?

3. Do **you** look after water at your centre? Tell me how. What about at home? Tell me what you do.

4. Can you think of other ways to look after water?

5. Today, we have talked about saving water. Can you think of other ways that we can look after the environment?

6. Do you have anything else to say about the environment?

Thank you very much!

Appendix 6:

Summary of Enacted Actions from Centres

Centre	Curriculum Changes	Whole Centre Change	Operational Plans	Actual $ Investments	Intended $ investments	Barriers to Change
Alstonville Baptist Community Preschool		Purchased strainers for all of the sinks.	Presented an action plan to the Building Management Committee.	Purchase of sink strainers.		
Ballina River Street Children's Centre Inc.		The children have been educated about 'half-flush' and on all of the toilets the 'half-flush' toilet button has been marked with nail polish for children to identify.			We have sought a quote for our dripping taps. The centre will install a water saving device in the adult toilet and look at other initiatives (e.g. water tank) We are also looking into purchasing levered taps that shut off completely (we will source a 'plumber parent' to assist with the installation).	Due to the high cost of this work (quote of $5500) the management committee decided not to proceed. The water tank initiative has been reconsidered following safety advice from local council (given to the Director on enquiry about discounts/ rebates). Safety concerns relate to the tank being in a public place and children having access to drink the water. The Public Health Unit advised that there are currently no regulations, but strongly advised not to go ahead unless we could guarantee water 'health'. Regulations are expected to be brought in. Alternatively they thought there was a tank with a special lining that was bacteria resistant (has not been followed up to date). Rous Water's opinion sought on this matter.

Centre	Curriculum Changes	Whole Centre Change	Operational Plans	Actual $ Investments	Intended $ investments	Barriers to Change
Bangalow Community Children's Centre	The Director wrote a booklet of activities to complement the WACP. Teachers have revisited the WACP with the children and set up a water factory (pipes, funnels etc.) in the outdoor area with a water tray underneath to catch water which is recycled by the children back into the top.	Bathroom has been renovated using water efficient devices and sink strainers have been purchased for all of the sinks.	Successful recipients for two grants: small grant from NSW Gould League for a water tank for outdoor play and a much larger one from the Federal Govt's Community Water Grants for big tanks under the centre. Water will be plumbed into the building and onto 'water wise' flora.	Renovation of bathroom and purchase of sink strainers.		
Clunes Community Preschool	The water saving message extends to our outdoor play	We have purchased strainers for all of the sinks. We continue to follow up with all children about turning off the tap and using the 'half-flush' button on the toilet. Centre has been used as a case study for Natural Playspaces, a book by Elliott et al.		Purchase of sink strainers	We are continuing to explore the option of a pump for our 'water race' or installing a water tank.	
Coraki Preschool		The staff have placed milk bottles filled with water into the toilet (on advice from a father plumber). Children have become a lot more aware of turning off the taps in the centre. Installing levered taps over the Christmas holidays as they minimise drips and are easier for the children to turn off.		Purchase and installation of levered taps		
Jarjum Preschool	As part of our curriculum we continued to talk to the children about water conservation.		Have presented a submission to the management committee for new taps and are currently pricing options.	Purchase of a new hose and fitting		

Centre	Curriculum Changes	Whole Centre Change	Operational Plans	Actual $ Investments	Intended $ investments	Barriers to Change
Lennox Head Preschool	As part of our curriculum we continued to raise children's awareness of turning off taps. They also did a weather chart activity from one of the books and this activity has been used as an opportunity to 'tune into the environment'.	We laid turf in the outdoor area to stabilise the ground and avoid water runoff.		Purchase of turf.	We are investigating the option of flow restrictors for all taps.	
Lismore Preschool Program	We purchased 'water saving' resources including big books and books and tapes from the WA Water Board website (Rous Water's suggestion). For curriculum planning, have photocopied the WACP resources left at the centre.	We have put in a garden and we are sensible about the way we use the soaker hose.		Purchase of curriculum resources		
Ocean Shores	As part of our curriculum we are following up on the Rous Water program with the children.					
Sandhills Early Childhood Centre	As part of our curriculum we planned a visit to a 'worm farm'.	We built a compost heap for the centre and purchased strainers for all of the sinks. As a centre project we have made initial changes to the nearby creek to reduce water wastage and we are planning further reconstruction.		Purchase of sink strainers.		
Rainbow Children's Centre			Applied for a grant for water tanks, dual flush toilets and tap restrictors.			

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