CATHOLIC
EDUCATION
MELBOURNE

Education for Sustainability

in the Archdiocese of Melbourne

Acknowledgments
The design and intentions of this resource were conceived in 2010 by the Ecologically Sustainable Development (ESD) Committee of Catholic Education Melbourne. Its Eco-spirituality Subcommittee took responsibility for an initial draft and then agreed to continue as the Reference Group for the principal writer, Dr Caroline Smith, a senior lecturer in the School of Education, ACU (Victoria). Dr Smith was engaged to transform the first draft to this present document. Her patience, optimism, expertise and erudition in this area of curriculum and school operations over 18 months were essential to the final outcome. Catholic Education Melbourne expresses its gratitude to Dr Smith.

Catholic Education Melbourne wishes to thank members of the Ecologically Sustainable Development (ESD) Committee and the Eco-spirituality Subcommittee for their substantial and sustained contribution to the project over several years. These people are:

Mr Pat Love (Chair)
Mr John Corkill
Mrs Jenny Edwards
Mrs Carmela Theobold
Mr Craig Cleeland
Mr Gerard Hogan
Mrs Maria Minto-Cahill
Mr Chris Morris
Mr Peter Murphy
Mr Matthew Navaretti
Mr Tim Ruyg
Dr Pauline Sharma
Mr Eamon Spillane
Mrs Carolyn Taylor
Ms Shelley Waldon
Mr John Craven (Minutes secretary)

Numerous people were consulted and/or contributed material over the course of drafting this resource, including Tom Kingston, Nathan Leitch, Simon Lindsay and Gwen Michener. The final redactor was Christine Heffernan. Catholic Education Melbourne gratefully acknowledges the insights, expertise and goodwill they contributed.

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ISBN: 978 0 86407 431 7

Printed by Snap West Melbourne on environmentally friendly recycled paper.

Online version accessible at www.cem.edu.au.

From Archbishop Denis J Hart

My friends in Christ,

Catholic schools in the Archdiocese of Melbourne and elsewhere have had a strong history in the sustainability and social justice areas over a number of years. They have recognised the interconnectedness and interdependence of life on our planet, and realise that we are responsible for each other and the earth, our common home. Catholic students, teachers and parents, and their communities are taking heed of Pope John Paul II's call for an 'ecological conversion'.

The planet we live on is a gift from God. It has been given to us freely and we have an obligation to hand it on in good condition to those who follow. The natural world is not only important for its own sake but also, where nature suffers, the poor and the marginalised suffer, too. As Pope Francis warns in his encyclical, *Laudato Si'*, 'our common home is falling into serious disrepair'. We are all challenged to enter hopefully into a new dialogue towards building a better future with the planet. Several popes have spoken on the inherent dangers of 'unchecked human activity' and Pope Francis' encyclical, *Laudato Si'*, sends out a strong call for a more personal, human culture based on care for others and walking lightly on the earth. The Pope explicitly states that *Laudato Si'* is now added to the body of the Church's social teaching.

Education for Sustainability in the Archdiocese of Melbourne is a document produced by educators, and feedback during its production considered that its great strength was the placement of education for sustainability in a Catholic context. It acknowledges and supports the very good work in Catholic social teaching that is already happening in schools and encourages those just starting out on their sustainability journey.

Sustainability can be the basis of a curriculum which explores the realities of ourselves as human beings and our responsibility for the planet, offering practical steps we can take at an individual, local, diocesan, national and global level. Thus may we achieve Pope Francis' beautiful vision for humanity.

I endorse this document from Catholic Education Melbourne which so closely echoes the encyclical *Laudato Si': On Care for Our Common Home*. I urge school communities to continue to respond to the challenge presented by these powerful documents.

My blessing on you all in your work for the children and young people of this Archdiocese.

+ Denis J. Hart

MOST REV. DENIS J HART DD
Archbishop of Melbourne

Foreword

Among many services provided by Catholic Education Melbourne, one is to provide schools and teachers with guidelines that assist them to interpret and respond to societal trends and issues of significant importance to communities. This resource, *Education for Sustainability in the Archdiocese of Melbourne*, addresses the issue of sustainability, which is a key challenge now and for our future.

Importantly, this resource brings together the various strands of thought and action that underpin sustainability within the Catholic faith tradition. There is a clear and strong mandate from the Scriptures, papal pronouncements and theology to guide us to be stewards of God's creation, most recently in the encyclical, *Laudato Si': On Care for Our Common Home,* and the Australian Catholic Bishops Social Justice Statement (2002), *A New Earth: The Environmental Challenge.*

This a rich resource for schools and teachers. It addresses a range of topics related to sustainability and it serves as a key guide for reviewing and re-envisaging a school's day-to-day operations and learning and teaching programs. It offers clear direction for teachers to create and enact their own positive responses in the classroom and beyond. It also presents some marvellous case studies of schools in the Archdiocese that are already doing great work with students and the community in this important area.

Education for Sustainability in the Archdiocese of Melbourne is a document full of hope and confidence in the power of personal transformation and collective action to ensure that there will be 'enough, for all, forever'. I commend it to you with great confidence.

Stephen Elder
Executive Director

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Introduction

O Lord, how manifold are your works!
In wisdom you have made them all;
the earth is full of your creatures.
(Psalm 104: 24)

It is imperative that humanity renew and strengthen that covenant between human beings and the environment, which should mirror the creative love of God, from whom we come and towards whom we are journeying.
(Benedict XVI, World Day of Peace, 2010)

Pope Francis reminds us: *Creation is a gift, it is a wonderful gift that God has given us, so that we care for it and we use it for the benefit of all, always with great respect and gratitude* (Pope Francis' Audience, 21 May 2014). This gift is acknowledged not only by the awe and wonder in children's faces as they experience nature, but in the care and actions of all those showing great respect for the whole of creation.

In his Catholic Social Teaching encyclical (n. 15), *Laudato Si': On Care for our Common Home*, Pope Francis entreats 'All of us' to 'cooperate as instruments of God for the care of creation, each according to his or her own culture, experience, involvements and talents' (n. 14). He reminds us that the forgiving earth, our 'sister', 'now cries out to us because of the harm we have inflicted on her by our irresponsible use and abuse of the goods with which God has endowed her.' *Laudato Si'* (n. 2).

Profound and challenging questions are raised when we experience the destruction of God's creation in any form, but especially when this can be sourced back to the action of one species that has disturbed the ecological balance between all species, including our own. What should our relationship to God's creation be? As Catholic educators, where can we find deep guidance in our faith tradition to help us create a sustainable future and give hope and direction to our students? What does living sustainably mean? How should we live?

As agents of the mission of the Church, Catholic education encourages and empowers school students and their communities to take action towards sustainability for the common good. The good news is that the Catholic faith tradition (particularly Catholic Social Teaching with human dignity at its centre), supported by Catholic Education Melbourne policy and guiding documents, shows clear and coherent pathways for schools to engage in the process of creating a sustainable future and orientating our students to be stewards of the natural world. There is much work to be done.

This resource has been written to assist the Catholic education community in the Archdiocese of Melbourne in our journey to understand and respond actively to the sustainability imperative in all aspects of school life. It is intended that the resource will assist in the design and development of Education for Sustainability (EfS) programs that are deeply rooted in the faith tradition.

The resource draws from a range of sources to support and develop our unique response for Catholic schools, setting out the relationship between the Catholic faith tradition, the relevant science, personal change, health and wellbeing, and curriculum connections and pedagogy that clearly support and benefit from moves to secure our future. Finally, it provides examples of sustainability programs in action in Catholic schools in the Archdiocese of Melbourne and elsewhere.

By being present with and developing deeper right relationships with all of creation, restoring the social and environmental balance, and learning to live sustainably, we are all enriched. By engaging in nature our health and wellbeing flourishes. Most importantly, the Scriptures tell us that by being good stewards of creation, we are actively carrying out God's work. In recognising the need and taking responsibility for the sacredness of God's creation, we engage with the divine. The challenge is indeed complex and difficult, but also hopeful, joyful and exhilarating.

SECTION 1: What is Sustainability?

DEFINITIONS

There are many definitions of sustainability and sustainable development. The most widely accepted comes from the World Commission on Environment and Development (WECD), in *Our Common Future*, often referred to as the Brundtland Report:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs (WECD 1987).

A simpler and more elegant definition, given by an African delegate at the Johannesburg Earth Summit (Rio + 10) in 2002 is, 'Enough for all forever'.

DIMENSIONS

Sustainability encompasses many areas of human endeavour and development – economic, environmental, social and political. In more recent years, much stronger emphasis has been placed upon trying to integrate thinking and action around ecological, social, political and economic systems. Acknowledging the complex relationships between these four systems came to be seen as critical to achieving a sustainable future (Australian Government, Department of Environment and Heritage 2005).

There must be progress in all four systems or pillars of sustainability if development is to be considered sustainable for all for the future, as focusing on just one or two has led to our present situation. These systems of sustainability, adopted by UNESCO and illustrated in Figure 1, are incorporated into the AusVELS organising ideas for the cross-curriculum priority of Sustainability (see Section 6).

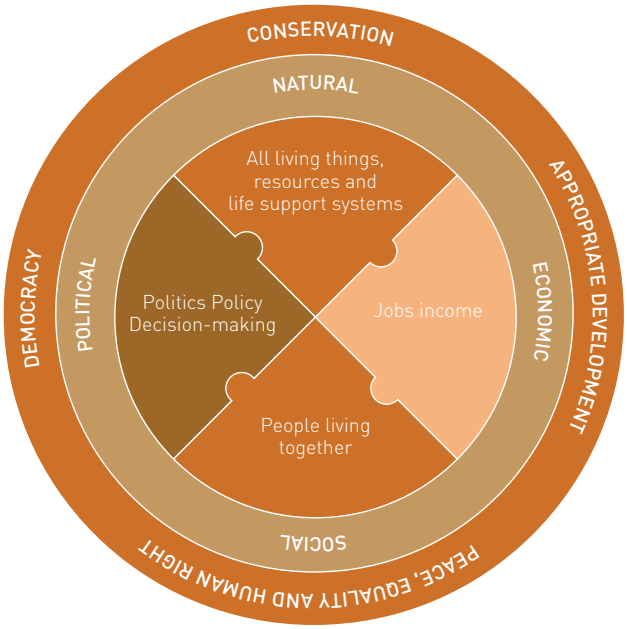

Figure 1: *UNESCO Model of Interlocking Dimensions of Sustainability. Source: UNESCO, Teaching and Learning for a Sustainable Future, Module 4, 2002. <www.unesco.org/education/tlsf>*

The relationship between these dimensions was expressed well at an Education for Sustainability Conference in Wellington, New Zealand, 2004:

> Sustainability is the goal of sustainable development – an unending quest to improve the quality of peoples' lives and surroundings, and to prosper without destroying the life-supporting systems on which current and future generations of humans depend. Like other important concepts, such as equity and justice, sustainability can be thought of as both a destination and a journey (New Zealand Government 2004).

A PRESENT-DAY IMPERATIVE

We are at a critical time in the human journey as we enter the Anthropocene[1] era, a new geological name for the epoch dominated by only one species – human beings – and the extinction of many others. It is the first time in the Earth's history that only one species has such a decisive impact on the future, where the decisions we make determine the future of life on Earth. It is a critical juncture, a time for deep reflection and soul-searching.

Science tells us what we have done to our Earth and what we should do to repair the damage. When we look at human impact on the world, we can easily feel too small and powerless to make a difference, or be overcome by grief for the world and fear for our future. The journey to sustainability is humanity's biggest challenge ever; we are in a place we've never been before in all our history. The Earth Charter 2000 states:

> We stand at a critical moment in Earth's history, a time when humanity must choose its future. As the world becomes increasingly interdependent and fragile, the future at once holds great promise and great peril. With the dangers of war, social and economic injustice and threats to the environment emerging, the human family must determine how to secure a sustainable future (Earth Charter Initiative 2000).

EMPOWERMENT THROUGH EDUCATION

The United Nations Decade of Education for Sustainable Development, 2005–2014, has declared that education is a critical tool for achieving sustainability.

The outward-looking Catholic school of the 21st century is a place where we can make a difference. It is a key agent of change, one which engages with the global as well as the local community.

This document supports and guides schools in this endeavour. By being present with and developing deeper, right relationships with all of creation, by restoring the social and environmental balance and by learning to live sustainably, we are all enriched. The challenge is complex and difficult, but also hopeful. American environmentalist, journalist and author Paul Hawken expressed this eloquently in an address to a graduating class of the University of Portland in 2009:

> When asked if I am pessimistic or optimistic about the future, my answer is always the same: If you look at the science about what is happening on earth and aren't pessimistic, you don't understand data. But if you meet the people who are working to restore this earth and the lives of the poor, and you aren't optimistic, you haven't got a pulse. What I see everywhere in the world are ordinary people willing to confront despair, power, and incalculable odds in order to restore some semblance of grace, justice, and beauty to this world (Hawken 2009).

[1] The term 'Anthropocene' was suggested by Dutch chemist Paul Crutzen in 2000 as a warning to the world. It refers to a new epoch, which Crutzen believes began in the late 18th century when carbon dioxide levels began to rise due to large-scale use of fossil fuels. Other scientists put the beginning of the Anthropocene era at the middle of the 20th century, when the rates of both population growth and consumption accelerated rapidly.

SECTION 2: Sustainability, Spirituality and the Catholic Faith Tradition

While God's self-revelation occurs in many ways He has revealed himself fully in love to humankind in the life, death and resurrection of Jesus Christ (in the gospels and in Church teaching) through whom humanity and all of creation is redeemed. The mystery of God's love can also be experienced in all that is created.

In this section four sources of revelation are explored:

1. God's creation
2. Scriptural and theological reflections
3. Indigenous spirituality and Catholic teaching
4. Papal ecological pronouncements.

Together, these sources point to a sustainable future in harmony with creation and the emergence of a deeper spirituality.

GOD'S CREATION

> Creation is the beginning and the foundation of all God's works... [and] ...reflects the infinite beauty of the Creator (*Catechism of the Catholic Church,* nos 198, 341).

The revelation of God often comes through sublime experiences of nature. St Francis of Assisi, the patron saint of animals and the environment, 'invites us to see nature as a magnificent book in which God speaks to us and grants us a glimpse of his infinite beauty and goodness' (*Laudato Si',* n. 12). For many people, the glories of creation – the forests, the mountains, raindrops on a leaf, exquisite small life forms, the wonder of a rainbow, fossils of ancient life, the stars at night – are a source of God's revelation. People who feel a connection with nature often describe these experiences as spiritual. God speaks to us 'through the visible creation ... light and darkness, wind and fire, water and earth, the tree and its fruit, these speak of God and symbolise both his greatness and his nearness' (*Catechism of the Catholic Church*, n. 1147).

Astronaut Jim Irwin, in his book *To Rule the Night*, writes of his sense of spiritual wonder when he first saw the Earth from space:

> The Earth reminded us of a Christmas tree ornament hanging in the blackness of space. As we got farther and farther away it diminished in size. Finally it shrank to the size of a marble, the most beautiful marble you can imagine. That beautiful, warm, living object looked so fragile, so delicate, that if you touched it with a finger it would crumble and fall apart. Seeing this has to change a [person], has to make a man appreciate the creation of God and the love of God (Irwin 1973).

Thomas Berry, a Catholic priest and renowned scholar of religious cosmology, has written extensively about finding God in the beauty of nature. He says, 'God is in the creative balance of the earth, the centre of the cosmos. If the beauty of the world is destroyed, our possibility of finding God revealed in the world will be almost swept away' (Berry 2000, p. 199). For Berry, to be stewards rather than dominators of nature is critical, for if this sacred landscape is damaged it will have spiritual consequences:

> Without the soaring birds, the great forests, the sounds and coloration of the insects, the free-flowing streams, the flowering fields, the sight of the clouds by day and the stars at night, we become impoverished in all that makes us human (Berry 2000, p. 200).

Berry extends this further by later suggesting 'The Universe Story' as a powerful way to encapsulate the essential need for an integrated relationship with nature in our time:

> The Universe in its full extension in space and in its sequence of transformations in time is best understood as story: a story known in the twentieth century for the first time with scientific precision through empirical observations. The greatest single need for the survival of Earth, or of the human community in the twenty-first century, is for an integral telling of the great story of the universe. This story must provide in our times what the mythic stories of earlier times provided as the guiding and energising sources of the human venture (Berry 2006, p. 145).

The universe story is humanity's story. Humanity is profoundly at home in the universe, not from outside as disinterested observers, but from inside as an intimate participant in its evolution.

SCRIPTURAL AND THEOLOGICAL REFLECTIONS

> The first and foremost message of the Bible is still that the world was created by a loving, personal God (Gen 1:1). The world does not come from an evil spirit at odds with God, and is not itself evil. As God contemplated his creation, he saw 'that it was good' (Gen 1: 13, 18, 21, 26) (McDonough 1995, p. 120).

Scripture is the foundation and inspiration for the universe story. It affirms human beings as God's creatures, part of the interconnected community of creation and interrelated with all other creatures. As people created in God's image (Gen 1: 27), we are called to work with creation, and to do so in such a way as to manifest the love and respect that God has for each creature. We are to be wise and humble stewards before God, called 'to cultivate and take care' (Gen 2: 15) of that which God has gifted to us, and without which we cannot exist.

Stewardship: A Call to Serve

> Creatures exist only in dependence on each other, to complete each other, in the service of each other (*Catechism of the Catholic Church*, n. 340).

Our stewardship of nature flows out of a realisation of our interdependence and oneness with it. Any concept of humanity's superiority over nature, which has led to the destruction of ecosystems and the environmental services they provide, must change.

Australian Catholic priest and theologian Denis Edwards, in his work, *Ecology at the Heart of Faith* (2006), highlights how our understanding that humans are 'made in the image of God' (Genesis 1: 27) is informed by Paul's Second Letter to the Corinthians 4: 4, where Paul speaks of Christ himself as the 'image of the invisible God' and as the one 'in whom all things are created' (Cor 1: 15). In Romans 8: 29, Paul teaches that all humans, through grace, are 'conformed to the image of Christ'. Christ, as the perfect image of God, in his teaching and life, showed a love for all that God had made.

Edwards (2006) elaborates on how Jesus' empathy with the natural world is reflected in the parables, where images come from the whole of life – 'the beauty of wildflowers, the growth of trees from tiny seeds, crops of grain, bread rising, a woman sweeping a floor looking for what was lost ... the birds of the air ...' (p. 51). In his life, death and resurrection, 'the mystery of God's purpose and work in creation is revealed' (p. 85). Jesus as the risen Cosmic Christ, with whom humans can be united to form one Body, continues the work of creation as the galaxies, stars, and evolutionary processes continue to unfold. Jesus is the 'hope and reconciliation of all things, whether on earth or in heaven' (Col 1: 20). He is the model for all human relationships, including the relationship with creation. As Edwards expresses it:

> Precisely because human beings are made in the image of God, they are called to care for every sparrow that falls to the ground. They are called to love their fellow creatures as God loves them, not in sentimental and anthropomorphic ways, but in a way that respects the distinctiveness and otherness of a kangaroo, an eagle or a whale (p. 16).

Edwards' words convey a profound appreciation of the nature of stewardship, and of how God intended humans to have a respectful, holistic and loving relationship with the Earth.

Sustainability as Justice: *A Change of Heart*

The concepts of justice, ecology and peace are seen as increasingly interrelated and important, particularly as understanding grows that social justice and ecological justice are intimately connected. In the words of *Laudato Si'*, 'A sense of deep communion with the rest of nature cannot be real if our hearts lack tenderness, compassion and concern for our fellow human beings' (n. 91). In *A New Earth: The Environmental Challenge,* the 2002 Social Justice Statement of the Australian Catholic Bishops, responsibility for the Earth is the central challenge for those within the Catholic faith tradition, and one which must be woven into all aspects of Catholic life.

> In justice, it is an urgent task for Christians today to be reconciled with all creation, and to undertake faithfully our responsibility of stewardship of God's gifts. To achieve such reconciliation, we must examine our lives and acknowledge the ways in which we have harmed God's creation through our actions and our failure to act. We need to experience a conversion, a change of heart (Australian Catholic Bishops' Conference 2002).

In 2005, theologian and scripture scholar Sean McDonagh made a theological response to the devastation of rainforests in the Philippines and the subsequent loss of life support and human dignity for the T'Boli tribal people of Mindanao, with whom he was engaged in ministry. He reminds us that when land is degraded, there is always a disproportionate impact on the poor. As the effect of climate change becomes ever more apparent with more severe weather events, it is the poor who suffer more than the rich.

We are called, then, to examine closely the consequences of our relationship with nature, to cooperate in this great unfolding of the universe by respecting the processes of the natural world, ensuring that the benefits are equitably distributed.

INDIGENOUS SPIRITUALITY

Pope Francis reminds us, 'Given the complexity of the ecological crisis and its multiple causes, we need to realise that the solutions will not emerge from just one way of interpreting and transforming reality. Respect must also be shown for the various cultural riches of different peoples,

their art and poetry, their interior life and spirituality' (*Laudato Si'*, n. 63). We owe much to indigenous cultures for enriching our understanding of ecological stewardship. Indigenous peoples throughout the world and in Australia have learned how to live sustainably with God's creation. 'They are able to instil a greater sense of responsibility, a strong sense of community, a readiness to protect others, a spirit of creativity and a deep love for the land. They are also concerned about what they will eventually leave to their children and grandchildren (*Laudato Si,* n. 179). The dominant worldview of many indigenous peoples is a participatory consciousness, where nature is sacred, humans and the rest of creation are kin, and identity is found through active relationships with the land (Broomfield 1997). Humans participate directly in the natural world; it is their source of knowledge and wisdom as well as sustenance and healing. It is, in Berry's words, 'our native place' (Berry 1990, p. 1).

Careful observation, experience and adaptive responses to ever-changing conditions are the keys to survival. The times of flowering of plants, the arriving of migratory birds and the changing patterns of stars in the sky have had significance for people long before ecology was named as a science.

This spiritual knowledge and wisdom about the natural world is transmitted orally or pictorially from generation to generation in stories, drawings, rituals, cultural values, beliefs and customary law. It is intimately interwoven into the very fabric of people's lives and their practical means to survival. It provides a coherent worldview that has enabled people to live within their local environments for many thousands of years, and still does for many today.

In Australia, over more than 50,000 years, Aboriginal people believe that they belong to the land and have developed the means of living with, farming and managing the land through the use of sustainable practices. The following reflection is written by Nathan Leitch, an Indigenous Education Officer with Catholic Education Melbourne. He wishes to clarify that these are his own personal thoughts on 'Aboriginal spirituality'. Every Aboriginal person has a different approach to spirituality, and it is impossible to define a universal opinion on the subject, as there are over 500 Indigenous nations.

> Connection to one's own traditional land or country is the basic spiritually-driven emotion that most, if not all, Indigenous people possess. This is not a matter of 'ownership', which is a European ideal. It is in fact a matter of 'belonging'. We, the descendants of the world's oldest living culture, have a responsibility to care for our land in the same way the Old Ones did. There were no fences, lease agreements, or title deeds, only earth and sea, mountain and valley, dusty or luscious. The people knew where their country began and ended, and they cared for every piece of it with advanced methods of agriculture and hunting/gathering.
>
> 'Greed' did not exist amongst Aboriginal communities. A holistic and communitarian ethos was ever-present; all who could contribute, did so. Food sources were never exploited or over-hunted; rather they were carefully harvested in moderation with an extensive understanding of sustainable living. A 'kill to eat' law was common throughout most nations, where animals were only taken for specific meals and never hunted for sport. Almost 100% of the carcass was utilised not only for food, but also for fibres, tools and hides.
>
> The trees and waterways were afforded equal respect to the people, and were often directly connected to certain families. Animals too, were regarded as equal citizens of the land. Our land is tantamount to our spirit; one cannot survive without the other.

During his 1986 visit to Australia, Pope John Paul II made several powerful statements affirming the story of Aboriginal people and their place in this 'Great south land of the Holy Spirit':

> For thousands of years you have lived in this land and fashioned a culture that endures to this day. ... You lived your life in spiritual closeness to the land and touched the sacredness of man's relationship with God. You realised that your land was related to the source of life (John Paul II 1986, nn. 2–4).

He asserted that: 'the Church herself in Australia will not be fully the Church that Jesus wants her to be until you have made your contribution to her life and until that contribution has been joyfully received by others' (n. 13). Could the Pope's statement be seen in the context of the contribution of indigenous people in their profound relationship to the land and the richness and depth of this relationship?

Today we understand that the partnership or shared responsibility we have for caring for the environment crosses cultural and religious boundaries. Respect for each other's traditions is important as schools spread the message of sustainability. Other traditions have much to teach about care for the environment, and listening to all points of view will be important. Opportunities to share our respective traditions are opportunities for collective, joint action to build relationships and understand each other.

PAPAL ECOLOGICAL PRONOUNCEMENTS

Much of the following material has been adapted from the doctoral theses of Dr Patricia Hindmarsh (2008) and Dr Margaret Watts (2009). Their permission is gratefully acknowledged.

The Church provides powerful and challenging teaching on ecological issues. An early teaching was in Pope Leo XIII's 1891 encyclical, *Rerum Novarum*, which stressed the great principles of human dignity and social justice through equitable sharing of the Earth's riches.

In the 20th century, widespread ecological consciousness strengthened following the publication in 1962 of Rachel Carson's work, *Silent Spring*. The first Earth Summit in Stockholm in 1972 and Catholic social teachings reflected and developed many of the themes explored in Carson's work. In 1971, Pope Paul VI's encyclical, *Octogesima Adveniens*, stated:

> Man is suddenly becoming aware that by an ill-considered exploitation of nature, he risks destroying it and becoming in his turn the victim of this degradation. Not only is the material environment becoming a permanent menace – pollution and refuse, new illnesses and absolute destructive capacity – but the human framework is no longer under man's control, thus creating an environment for tomorrow which may well be intolerable (Paul VI 1971, n. 21).

In 1978, Pope John Paul II pointed out in his encyclical, *Sollicitudo Rei Socialis*, that:

> Natural resources are limited; some are not, as it is said, renewable. Using them as if they were inexhaustible, with absolute dominion, seriously endangers their availability not only for the present generation but above all for generations to come (John Paul II 1978, n. 34).

Pope John Paul II and the Ecological Crisis

In his encyclical, *Centesimus Annus* (1991), Pope John Paul II pointed out the clear link between the 'ecological question' and consumerism. During his pontificate, he developed a stronger body of teaching related to the environment and what he termed the 'ecological crisis'.

The 1990 New Year's Day message of Pope John Paul II, *Peace with God, Peace with the Whole of Creation*, is the most powerful and comprehensive of his statements on humanity and ecology and the link to education. He identified the ecological crisis as a moral crisis. He spoke of the 'new ecological awareness' that was dawning and that needed to be developed 'into concrete programs and initiatives'. He constantly related ecological responsibility to world peace and concluded that the ethical values that underpin a peaceful society apply equally to the 'ecological question'. He referred to a growing contemporary awareness that global peace is threatened not only by injustice but also by a lack of due respect for nature, by the plundering of natural resources and by a progressive decline in the quality of life.

This call by John Paul II to a deep and personal conversion was issued again in 2000 at an address in a study week at the Pontifical Academy of Sciences of the Vatican. The address was titled, 'Science or Survival and Sustainable Development' (Pontifical Academy of Sciences of the Vatican 2000). Extracts from this address are quoted in the Catholic Earthcare Australia video, *The Garden Planet* (2001):

> Human behaviour sometimes is the cause of serious ecological imbalance, with particularly harmful and disastrous consequences [and hence] each one is invited to a deep personal conversion in his or her relationship with others and with nature (Catholic Earthcare Australia 2001).

The Call to Ecological Conversion

In his *General Audience Address* of January 2001, Pope John Paul II stated that the role of humans, symbolised in Genesis through God's commission to name each of the created creatures, is not a mission of mastery over nature, but rather 'a work of life and peace', with the responsibility, defined in the Book of Wisdom, to govern the world 'in holiness and justice' (Wisdom 9: 3). When this responsibility is neglected, ecological devastation follows. He went on to declare perhaps the most widely quoted and powerful statement of all; it is a recurring theme in writings of popes, bishops and theologians:

> Unfortunately, if we scan the regions of our planet, we immediately see that humanity has disappointed God's expectations. Man, especially in our time, has without hesitation devastated wooded plains and valleys, polluted waters, disfigured the earth's habitat, made the air unbreathable, disturbed the hydrogeological and atmospheric systems, turned luxuriant areas into deserts and undertaken forms of unrestrained industrialisation, degrading that 'flowerbed' – to use an image from Dante Alighieri (*Paradiso*, XXII, 151) – which is the earth, our dwelling-place.
>
> We must therefore encourage and support the 'ecological conversion' which in recent decades has made humanity more sensitive to the catastrophe to which it has been heading. Man is no longer the Creator's 'steward', but an autonomous despot, who is finally beginning to understand that he must stop at the edge of the abyss (John Paul II 2001, nn. 3–4).

Pope Benedict XVI, Pope Francis 1 and Human Ecology

In his message for the celebration of the World Day of Peace on 1 January 2007, Pope Benedict XVI continued his predecessor's powerful ecological teachings. Benedict XVI further identified the close relationship between nature and humanity, including future generations (the concept of intergenerational justice), seeing regard for nature as essential for a lasting peace. His message declared that:

> Alongside the ecology of nature, there exists what can be called a 'human' ecology, which in turn demands a 'social' ecology. All this means that humanity, if it truly desires peace, must be increasingly conscious of the links between natural ecology, or respect for nature, and human ecology. Experience shows that disregard for the environment always harms human coexistence, and vice versa. It becomes more and more evident that there is an inseparable link between peace with creation and peace among men (Benedict XVI 2007, n. 8).

In recognising the seriousness of climate change and its disproportionate impact on the global poor, Benedict XVI commented on the then 'latest round' of international climate change negotiations in Durban, South Africa, in 2011. He urged the delegates from 194 countries to reach a strong global agreement to address the challenge of climate change:

> I hope that all members of the international community can agree on a responsible, credible and supportive response to this worrisome and complex phenomenon, keeping in mind the needs of the poorest populations and of future generations (Benedict XVI 2011, Catholic Climate Covenant).

Pope Francis's stance on sustainability was flagged when he strongly emphasised protection of the environment at a special Mass marking his March 2013 inauguration:

> I would like to ask all those who have positions of responsibility in economic, political and social life, and all men and women of goodwill: Let us be protectors of creation, protectors of God's plan inscribed in nature, protectors of one another and of the environment … we must not be afraid of goodness or even tenderness (Francis 1 2013, Religious News Service, online).

In the 2015 encyclical *Laudato Si',* Pope Francis brings together dogma, doctrine and authoritative secular information to provide teaching that Catholics are called upon to receive with sincere openness, humble deliberation and deep prayer (US Catholic.org, 20 May 2015).

He calls for a 'broad cultural revolution' to confront the environmental crisis (n. 114) and invites everyone to the heart of ecological conversion which will reshape habits and behaviour. The words of the Australian Bishops are echoed by Pope Francis: 'a healthy relationship with creation is one dimension of overall personal conversion, which entails the recognition of our errors, sins, faults and failures, and leads to heartfelt repentance and desire to change' (n. 218).

Let us all come together in our common call to serve and protect the gift of God's creation.

Note: Appendix 1 provides a list of selected scripture references related to the theme of God's creation.

> *We have an absolute need of the natural world for activation of our inner world … For it is from the stars, the planets and the moon in the heavens, as well as from the flowers and birds and forests and woodland creatures of Earth, that some of the more profound inner experiences take place in children* (Berry 1996).
>
> *I go to nature to be soothed and healed, and to have my senses put in tune once more* (Burroughs 1912).

SECTION 3: Nurturing Stewardship and Wellbeing

INTRODUCTION

In Section 2 we saw that the Catholic faith tradition clearly calls us to be stewards of creation, while Section 4 will cover the background science of sustainability that we need to understand in order to respond to this call. However, it is not enough to keep these ideas in the realm of knowledge alone. To fully embrace stewardship at a deep spiritual level, we also need an experiential dimension in nature "that allows us to develop empathy with the natural world.

Positive nature experiences of the wonder and beauty of the natural world, especially during childhood, represent the single most important factor in developing a sense of stewardship of nature (Chiras 2005; Davies & Elliot 2004; Kellert 2005; Sobel 1996, 1998). If not developed early, the call to stewardship may be difficult to establish later in life.

Adults who feel a sense of stewardship for nature often attribute their commitment to time spent outdoors in childhood or adolescence. They frequently refer to an adult who taught love and respect for the natural world (Chawla 1988; Smith 2000). For Catholic educators, our role is clear. We can help students develop positive relationships with nature so that they see themselves as an intimate part of the web of life, as willing stewards of creation.

LIVING IN RELATIONSHIP WITH NATURE

Developing a relationship with nature should not be difficult. Our need to be with other species is built into our very genome; it helps us thrive and flourish. Humans love to visit natural places, be it the beach, the park, the forest or the mountains. We also have a natural liking for other species, especially our fellow mammals. We have pets, visit zoos, enjoy gardening and have plants in our homes. The healing power of the natural world and other species is well known, such as the positive role of gardens and animals in speeding recovery rates in hospital (University of Illinois, Landscape and Human Health Laboratory website).

If positive experiences in nature are not developed early, children may actually run the risk of developing negative attitudes instead. Educators who work in gardening programs report that children often express disgust at earthworms, slugs, 'dirt' and compost, as well as a fear of flying insects and spiders, which they may even want to kill (Smith 2009). These attitudes are likely to stem from a lack of positive experiences in nature, particularly if the adults around them express similar attitudes.

Richard Louv, in his book, *The Last Child in the Woods* (2005), argues that children's access to nature is under threat, pointing to the trend that young children are spending less time outdoors and so disrupting their ability to connect to nature. This lack of outdoor 'free-play' and other experiences stems from a range of factors, including parental fears, risk aversion, restricted access to natural areas, gardens and outside play areas, and 'look, don't touch' approaches. Increased engagement with digital media is another factor. Sensationalist media coverage and fearful parents have made children scared of playing outside, be it because of fear of nature, or 'stranger danger', or a litigious culture that favours 'safe' regimented sports over imaginative play (Louv 2005).

Sometimes the risk of not doing something may be greater than doing it. In this case, not developing a connectedness with natural environments may have more negative effects on a child than the risk of injury or illness when he or she is playing in the neighbourhood or hiking in the bush.

NATURE NURTURING WELLBEING

As we realise the importance of positive nature experiences, we begin to appreciate that these experiences are not only critical for the development of a sense of stewardship, but also critical for human health, wellbeing and creativity in general.

The good news is that, when we engage in a stewardship relationship with nature, we educate for the whole person. We not only start to heal the ecological damage to our planet, but our sense of wellbeing also thrives and flourishes. The promotion of wellbeing is considered central to learning and teaching (*CEOM Student Wellbeing Strategy*, 2011–2015).

Although Australia generally scores high on international wellbeing scores because of our high life expectancy and levels of material wealth, our ecological footprint is also

very high, meaning that we contribute disproportionately to the erosion of the natural environment. Hence, on the 'Happy Planet Index', Australia is placed only 76th out of 151 countries (Happy Planet website).

NATURE AND SPIRITUAL NOURISHMENT

As human societies become more urbanised, consumption continues to rise and domination of, rather than co-existence with, the land is perpetuated. There are fewer opportunities to engage with nature, as the majority of people live in cities near the coast, and we see 'the bush' as alien. Recent crises in agriculture through industrial approaches, drought, flood and over-exploitation of land are dismissed as only 'rural issues', rather than seeing salinity, deforestation, loss of biodiversity, soil erosion and climate change as the consequence of an increasing desire for goods, high standard of living, and a concern for all humanity. The causes of ecological destruction are generally poorly understood by the public, let alone linked to our lifestyle and worldview.

From one generation to the next, we are losing the ability to 'read the land' and to recognise the signals of ecological distress. It is as if a kind of ecological amnesia takes place between generations, with each generation thinking that what they observe is normal, not realising the magnitude of the losses that have taken place. As Thomas Berry teaches us, the diminishing of our outer world profoundly diminishes our inner spiritual world. Humanity is of the Earth, so the Earth's decline becomes our decline:

> We see quite clearly that what happens to the non human happens to the human. What happens to the outer world happens to the inner world. If the outer world is diminished in its grandeur then the emotional, imaginative, intellectual, and spiritual life of the human is diminished or extinguished (Berry 2000).

Much has been written about the spiritual impoverishment and loss of sense of place that occurs as humanity's footprint continues to grow (Berry 2000; Norberg-Hodge 1992; Suzuki 2010). Al Gore (1992) has remarked that 'the more deeply I search for the roots of the global environmental crisis, the more I am convinced that it is an outer manifestation of an inner crisis that is ... spiritual' (p. 12). This recognition has now reached broader society, with the Ecosystems Services Project (Australia) identifying one of the services provided by ecosystems as the 'fulfilment of people's cultural, spiritual and intellectual needs' (Ecosystems Services Project website).

Recent research from groups such as the *Children and Nature Network* (US), *Get Children Outdoors* (UK), *Play England* (UK) and the Scandinavian *Forest Schools Initiative* is now confirming what many educators have long believed – that positive experiences in nature enhance human flourishing through physical, intellectual, psychological, social, emotional, moral and aesthetic development, as well as providing spiritual nourishment and a sense of meaning, connectedness and belonging. Connection to nature through outdoor play and communal activities enhances community values, deepens and strengthens relationships and provides stronger support networks. These same values and benefits are felt in families if parents and children take the time to foster their connections through shared play and engagement with nature.

The remaining issues addressed in this section draw from the research of the four groups mentioned above, as well as other researchers and organisations concerned about nature experiences and child and adolescent development.

PHYSICAL HEALTH AND WELLBEING

Playing in varied, challenging and stimulating outdoor environments is crucial to the development of a child's physical coordination, helping them acquire agility, balance and fine motor skills. Children who play outdoors have been shown to be fitter, healthier, and more physically confident. Outdoor activity raises metabolic rates, enabling the body to process food more efficiently. It also helps to improve distance vision, and may reduce the effects of near-sightedness as children age. Consequently, the growing trend toward sedentary and inactive lifestyles, as well as inappropriate diets among young children and teenagers, present a danger to their health, their social development and their future choice of lifestyle. In Australia, a quarter of all children are now considered overweight or obese (Better Health Channel website).

Apart from the important physical benefits of outside play, sport and other pursuits, there is a growing body of research showing that our immune systems are bolstered just by being exposed to the natural world. Making mud pies may be a distant memory for some of today's parents, who have been persuaded that keeping their children in a sanitised environment protects them from disease, but it now seems that quite the opposite is true. As many parents know, exposure to microorganisms in the environment during childhood, through playing in dirt, is now thought to help strengthen children's immune systems and protect them from developing allergies and asthma (Asthma Australia website). Studies on the association of farm environments with asthma and allergies have repeatedly observed the protective effect of farming (Depner et al. 2012).

EMOTIONAL AND SOCIAL WELLBEING AND ACADEMIC DEVELOPMENT

It is becoming increasingly recognised that an 'outdoor' approach to play and learning can have a significant impact on the emotional and social development of children, as well as their physical development. The benefits fostered by engagement with natural environments and outdoor play contribute to the continuing development of skills crucial to higher-order thinking, creativity, problem-solving and self-discipline.

Children who play outdoors, especially in groups, feel more confident in social situations, and are able to develop stronger personal and emotional awareness, as well as enhanced ability to communicate, cooperate and engage in teamwork with their peers. They may be more emotionally resilient, less anxious socially, and better at establishing nurturing, protective and lasting relationships with others.

Children have to learn to be more socially adaptable in situations where they have to deal with each other without direct supervision, so playing together in both competitive and non-competitive situations presents opportunities for learning about how to cooperate and overcome conflicts. The ability to join and participate in social activities from an early age, and to see themselves as active participants in a group, can help to prevent children from finding themselves in situations where they feel isolated. They are better able to combat feelings of powerlessness, depression and low self-esteem. All these attributes provide a strong foundation for later academic success (Education Scotland website).

STUDENTS WITH SPECIAL NEEDS

Most educators have been challenged by students who find being confined to a classroom frustrating, and who may resort to antisocial behaviour. Natural play is considered to have a calming effect on children, allowing them to release excess and pent-up energy. This may be a natural way of restoring levels of attention and concentration, and can be effective for reducing stress, aggression and anxiety.

Studies conducted by the Forest Schools Initiative in Scotland have found that many such students benefit from a sustained outdoor program. In particular, they have found that students with special needs such as Attention Deficit Disorder (ADD), Attention Deficit Hyperactivity Disorder (ADHD), Autism and Asperger's syndrome who attended the Forest Schools program in a range of settings experience positive impacts on behaviour, learning, and the ability to build stronger relationships with those in authority (Education Scotland website). Children and young people who may have difficulty forming relationships with peers can often find solace, increased self-esteem and reduction in aggressive tendencies by being given animals to care for. Castano (2012) believes this is also an important step in reducing violence levels in society in general.

The evidence is quite clear that engaging with nature has multiple benefits for the individual and for the planet, and should be a key part of any school program. In its small way, it finds resonance with Pope Benedict XVI's articulation of the link between peace with creation and peace among humans in his message for the celebration of the World Day of Peace on 1 January 2007 (Benedict XVI 2007).

As educators we should be aware that there are developmental stages that we need to be mindful of as we prepare students for stewardship of creation. In 2005, Robert London proposed a framework for identifying three 'eras' of student development, which are summarised below in Table 1 by Smith (2009). These eras represent useful guides as educators respond to the challenges outlined in this section.

Table 1: A Framework for Developing Interdependence with Creation

Three Eras of Development
Era 1: Birth to about 6 years The young child needs to be free to explore the immediate natural world. Young children are fascinated by rather than fearful of nature, seeing it as full of exquisite moments of grace, enchantment, wonder and awe. The role of teachers and parents is critical at this point. If carried out with sensitivity and understanding, the adults in the child's life can provide a rich natural environment to enable this intense, intimate exploration to take place, so that the child is able to enter into a positive, empathic and loving relationship with nature as the manifestation of God's creation.
Era 2: Six to about 12 years This is the time where the child learns though joyful, positive, hands-on pursuits. It is the time when the special intimate bond between children and nature can grow and deepen. Concrete connections with the great cycles of nature can be made through observing the seasons, the changing shadows throughout the day, the life cycles of death and rebirth of plants, insects and other animals. It is a time for wonder and nurturing, for animal care through placing pets in the classroom and chooks in the schoolyard. It is a time for fostering the joys of gardening, harvesting, cooking and eating food grown by the children. At this stage, young people benefit from taking part in local community environmental action and citizen science projects. Active involvement is empowering, providing a sense of being able to make a positive contribution to the future. The educator's role at this stage is critical in sharing a spiritual consciousness through the modelling of a responsible, loving stewardship of the environment, drawing on and re-emphasising Catholic teachings.
Era 3: Twelve to 18 years In this era teachers are able to nurture a more abstract, reflective and philosophical relationship with nature in young people. Students are able to understand more complex sustainability science concepts as well as a deeper reading of key faith teachings. Adolescents often benefit from being in remote, wild places where they may experience a deep and profound joy in connecting with nature and become deeply aware of the interconnection of all life.

Source: The three eras were first identified by Robert London in 2005, in a paper delivered to the OISE Conference, Toronto, 'Strengthening students' connection to nature: A spiritual perspective'. The description above is a summary of the eras, presented by Caroline Smith, Australian Catholic University, in her 2009 paper, 'Reconnecting with the universe: Religious education for ecospirituality', REJA 25 *(1), 17–24.*

SECTION 4: Sustainability Science

Achieving a lasting prosperity relies on providing capabilities for people to flourish – within certain limits. Those limits are established not by us, but by the ecology and resources of a finite planet. Unbounded freedom to expand our material appetites just isn't sustainable. Change is essential.
(Tim Jackson 2009, p. 157)

There are only two kinds of madness one should guard against. One is the belief that we can do everything. The other is the belief that we can do nothing.
(Andre Brink 1968)

INTRODUCTION

The sciences of quantum physics, cosmology, systems theory, chaos and complexity have changed the way in which the organisational principles of the universe are understood. This view of the universe is one of an evolving, dynamic, ever-changing dance of destruction and creation, a 'cosmogenesis'.

Far from denying spirituality or opposing religion, science is instead a great gift, fostering a deeper understanding of the great story of our 13.7 billion-year-old universe – from the first flaring forth of the Big Bang, to the evolution of galaxies, stars and planets, the evolution of life on Earth and the emergence of consciousness. Science gives us a profound appreciation of our place in the cosmos itself, the preciousness of our planet and our responsibility as stewards of creation. It teaches that humanity is the child of the stars, and the universe is one of participation, relationship, adaptability and interconnectedness. This understanding is radically reshaping the human–nature relationship towards an ecological worldview, which sees humans as an intimate part of nature.

In the 21st century we all realise that we need to align ourselves more closely with our planet. As educators, it is our duty to become informed and proactive for all who come into our care. In Section 2 we learned that we have a covenant with God who calls us to respond to the challenges of sustainability. This section outlines the science behind our understanding of sustainability.

Both the Australian and the international science communities support the call to sustainability, accepting the scientific evidence that the Earth is in the midst of a great ecological disturbance. With continued growth in both population and consumption, the now huge footprint of the human species is radically altering the conditions of the Earth's great ecosystems.

Learning about our impact on our planet might seem bleak and distressing, but we need a certain amount of understanding in order to learn how and why to act differently. The good news is that many people are already working on solutions.

Dimensions of Sustainability Science

Sustainability science is an integrated field of science that provides an understanding of ecological systems, including biological and physical systems, and the impact by human systems. It also seeks to provide the vision and means that will lead to restoration of these systems.

Key areas of sustainability science are:

- Energy
- Water
- Materials and Waste
- Biodiversity and Ecosystems.

These are also the module topics for the *ResourceSmart Schools* program, explored in Section 6.

ENERGY

Some form of energy is necessary to drive all systems. The source of energy for the vast majority of natural systems is the sun, whose energy is captured by green plants through the process of photosynthesis. Photosynthesis is the single most important process on Earth, providing the energy base of our great food webs, and driving the cycling of nutrients and water. Currently, 40% of the sun's energy captured directly through photosynthesis is directed to feeding people through agricultural production (FromTheWilderness website).

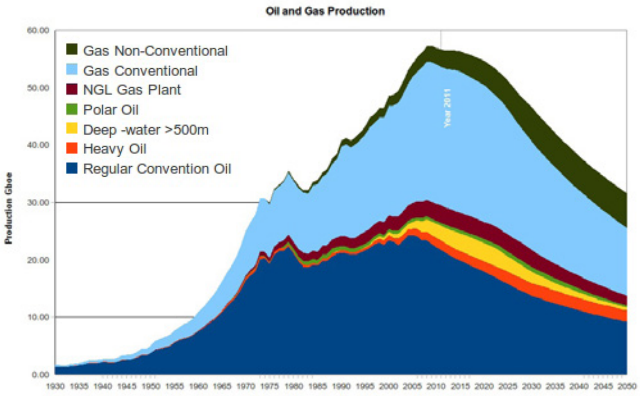

Figure 1: Peak Oil Consumption, 1930–2050. Source: Peak Oil website, an online community exploring oil depletion. Reproduced with permission. <http://peakoil.com/what-is-peak-oil>

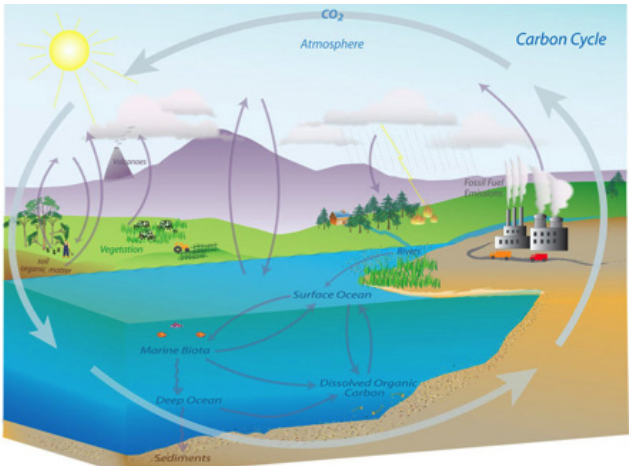

Figure 2: The Carbon Cycle. Source: Data/Image provided by NOAA ESRL Global Monitoring Division, Boulder, Colorado, USA (http://esrl.noaa.gov/gmd/)

Oil, coal and gas are fossil fuels and are all indirect products of photosynthesis. Fossil fuels are the remains of dead animals and plants which became fossilised under extreme pressures and temperatures, typically millions of years ago. They contain high percentages of carbon. Use of fossil fuels enabled the massive growth phase of energy consumption in the 18th century – the Industrial Revolution – and the ever-increasing energy consumption of the 20th century. In the second decade of the 21st century, globally we consume 10 times more energy than during the Industrial Revolution, though this is not evenly spread across the planet, with rich countries consuming far more than the poorest countries per capita (Enerdata website).

Fossil fuels are amazing sources of energy. It has been estimated that one barrel of oil is equivalent to 25,000 hours of human labour, which equates to 12.5 years at 40 hours per week (de Sousa 2008). But not only do fossil fuels provide energy for industrial processes, transport and electricity production; the oil also provides the starting materials for many of the products we take for granted every day. These include plastics and polymers, pharmaceuticals, adhesives and cosmetics. This is another reason to prioritise our use of oil, a finite resource, and consider alternatives.

Eventually, oil production will peak and start to decline as reserves become depleted. Many analysts suggest world oil supply will peak sometime between now and 2020, if it hasn't done so already (Figure 1). In 2004, for the first time ever, demand outstripped supply, resulting in a 50% oil price rise. Eventually a limit will be reached where it will take more energy than is contained in a barrel of oil to extract a barrel of oil (Kimble 2008).

The Carbon Cycle

Most of the Earth's carbon, about 65,500 billion metric tons, is stored in inorganic carbonate rocks. The rest flows from different reservoirs such as the ocean, the atmosphere, plants, the soil, and fossil fuels. Carbon flows between each of these reservoirs in an exchange called the carbon cycle (see Figure 2). Waxing and waning of the continuous flows between one reservoir and others have a variety of consequences or feedbacks. Increasing the amount of carbon-based gases in the atmosphere (mainly carbon dioxide and methane) results in increases in temperatures in the Earth's lower atmosphere, and ultimately its oceans, but decreases the temperatures in the Earth's upper atmosphere.

Climate Change

When fossil fuels are burned, not only is energy released, but the carbon is oxidised to form carbon dioxide gas. As early as 1824, the French mathematician and physicist, Joseph Fourier, concluded that the Earth's atmosphere might act as an insulator and that gases in the atmosphere may contribute to atmospheric warming. This became known as the 'greenhouse effect' (Renewable Green Energy website).

The 19th century physicists, John Tyndall, Arvid Högbom and Svante Arrhenius, are widely credited with providing incontestable evidence of the role of carbon dioxide and the effect of increased levels of greenhouse gases in the atmosphere. Carbon dioxide is measured in parts per million molar (ppm), which refers to the concentration of CO_2 gas in dry air. The 2012 global mean carbon dioxide level was 395 ppm. This level is much higher than the natural range of 172 to 300 ppm that has existed for the past 800,000 years (CSIRO 2010; 2012). The 400 ppm threshold has been an important marker in the United Nations climate change negotiations, with any measurement above this widely recognised as a dangerous level that will accelerate climate change and its impacts, regardless of the cause of the carbon dioxide increase.

The impacts resulting from climate change present challenges for many aspects of human society and industry, such as human health, human settlement, agriculture, rural economies, insurance, water, food security and the natural world. More extreme weather events are predicted, and there is now evidence that there is a shift in the range of plant and animal species to higher latitudes and altitudes. Some plants only previously found on mountaintops have vanished; there are changes in species composition and abundance, and in the timing of many life-cycle events such as flowering and migration. The number of bleaching events on the world's coral reefs has also markedly increased over the last two decades and continues to do so.

Such changes are acknowledged by the United Nations Framework Convention on Climate Change, established in 1994. Member nations recognise that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Member nations cooperate in launching national strategies for addressing greenhouse gas emissions and adapting to expected impacts. They also contribute to the provision of financial and technological support to developing countries.

The impacts of climate change and the usage of peak oil give us good reasons for assessing our lifestyles and working hard to be good stewards of the natural world. For energy, there are two main ways we can become better stewards: energy conservation and using renewable energy sources.

Energy Conservation

We can start to conserve energy directly by being very careful about our energy use in the home and at work, by insulating our houses, and by reducing our dependence on cars and on flying. We can do it indirectly by thinking about how much energy goes into producing something and removing it as waste (its 'embodied energy').

Simple ways to do this are by buying less, eating less meat, buying locally produced and organic products, buying second hand, paying attention to energy ratings on goods – in other words, reducing our consumption in any way we can. We can also reduce our energy use by designing our human settlements to be sustainable. The principles and practice of permaculture can be used to help us design creatively for a lower footprint, whether it be our home, our school or our wider community.

As society's environmental awareness increases, more and more industries and businesses are assessing how their activities affect the environment. Many companies are choosing to move beyond compliance to 'pollution prevention' strategies and environmental management systems that will improve their own performance. By way of example, the life cycle analysis (LCA) of a product is a tool that enables the estimation of cumulative environmental impacts resulting from all stages in the product life cycle. The Australian Life Cycle Assessment Society (ALCAS) undertakes this work and provides information about impacts not considered in more traditional analyses, such as raw material extraction, material transportation and ultimate product disposal.

Renewable Energy

Australia has a long tradition of using renewable energy sources. Water on farms was pumped to the surface using a windmill, and, where enough water was available, hydroelectricity was used to produce electricity. Increasingly, governments around the world are turning to renewable energy to reduce our dependence on fossil fuels.

Australia has an abundance of solar, wind, wave and other clean, renewable energy sources, which are becoming more cost-effective and efficient. Combined with smart grid design and energy distribution, these technologies will substantially reduce our reliance on fossil fuels.

WATER

Water is essential for all life. While humans can go without food for several weeks, without water we are dead within days. Water fills all the cells of our bodies and is the medium for all our metabolic activity. We use water for drinking, washing, flushing the toilet, irrigation, food production, industry and transport. It is essential to keep the natural environment healthy so that rivers flow, lakes are replenished and vegetation flourishes.

Availability of Fresh Water

Our planet looks blue from space because of water, which covers 70% of the Earth's surface. The oceans contain more than 97% of all water on earth, leaving only 3% as fresh water (Figure 3). Of this, about 2.4% is permanently frozen in glaciers and at the polar ice caps, and about 0.5% is in groundwater (The World's Water website).

A tiny 0.007% of all water on earth is accessible for direct human use. To put it another way, if 100 litres represent the world's water, about half a tablespoon of it is fresh water available for our use. This is the water found in lakes, rivers, reservoirs and underground sources that are shallow enough to be tapped economically (The Water Initiative website).

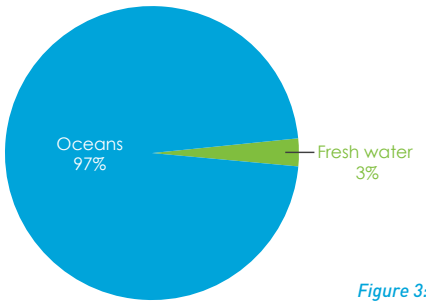

Figure 3: *World Water Distribution*

Australia is the driest inhabited continent, so water planning is of particular importance for a sustainable future. Melbourne's average rainfall is around 650 mm per annum. However, below-average rainfall and drought were experienced throughout much of Australia in 2008–09, specifically south-eastern Australia.

In Australia, agriculture is the largest consumer of water, accounting for around two-thirds of the total water use in Australia. Households are the next largest consumers of water, consuming around 10%. In Melbourne about 60% of the water from reservoirs is used in our homes and about 30% is used in factories, schools, councils and businesses. About 10% of the water in Melbourne is lost through leaks, used by fire-fighters, stolen or is unaccounted for as a result of inaccurate meters (Melbourne Water website).

Climate change predictions of the Bureau of Meteorology suggest that Australia will become hotter and drier in coming decades with an increase in the number of dry days expected across the country. It is also likely that there will be an increase in intense rainfall events in many areas.

The Water Cycle

The water necessary to sustain life on Earth connects land, rivers, lakes, ground water, oceans and the atmosphere into an integrated system. Precipitation (rain), evaporation, freezing, melting and condensation are all part of the water cycle (Figure 4). This cycling of water is intimately linked with energy exchanges between the atmosphere, ocean and land and it has an impact on the Earth's climate. The impacts of climate change and variability occur primarily through changes in the water cycle (NASA Oceanography 2010).

Embodied Water

Like the concept of embodied energy, 'embodied water' is the total amount of water used during the growing, processing and transportation of the goods we use or consume, or the services we use. The amounts can be quite surprising (Table 2).

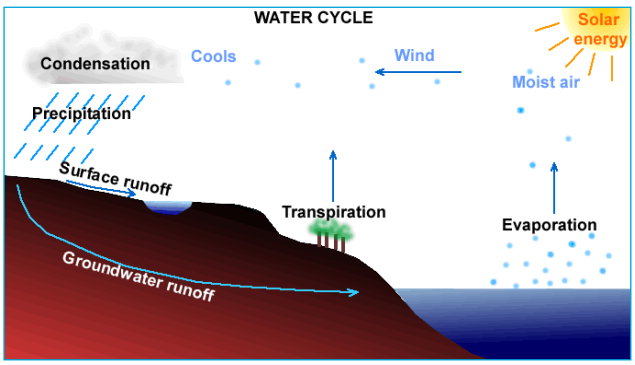

Figure 4: The Water Cycle. Source: Riverina Environmental Education Centre, NSW. Reproduced with permission. <www.reec.nsw.edu.au/k6/page/skills/textsk/wa22.htm>

Table 2: Water consumed in different steps of the food chain

Did you know?
Some volumes of water required to make everyday items:

- Cup of coffee – 140L
- 1L of milk – 1,000L
- 1kg of wheat – 1,350L
- 1kg of rice – 3,000L
- 1kg of beef – 16,000L
- A medium sized new car – 148,000L.

Source: The Water Footprint Network <www.waterfootprint.org>

Water Conservation and Recycling

The good news is that over the past few years, Australians have become very aware of how precious our water is, and have been very successful in reducing water use through conservation and efficiency. The 'Water Account' from the Australian Bureau of Statistics (ABS) reports that, in 2008–09, Australia's total water consumption decreased by 25% from 2004–05. This is significantly below the figures of the late 20th century (ABS website). This figure has increased in subsequent years.

In agriculture – the biggest user of water – some innovative water-saving solutions have been developed to improve water use efficiency and maintain or even increase yields. The use of recycled water in horticulture (urban and rural) and industry, as well as in residential areas has grown considerably over the past decade.

MATERIALS AND WASTE

All the materials we create and use, all the material matter that is in our bodies and in nature, are gifts of the Earth. All 90 naturally occurring elements present on Earth now were there when it first formed over 4.5 billion years ago. While we need a constant input of energy to keep processes taking place, materials are constantly cycled.

In nature, living organisms break down larger molecules into smaller ones, which are recycled into the environment, so there is no such thing as waste. One organism's 'waste' is the raw material for another. But some synthetic ('man-made') materials are unable to be broken down because as yet microorganisms have not evolved to do so. Instead, they accumulate in the environment. Such materials become waste, and some are toxic.

Matter Cycles

All materials are cycled in nature, but the cycling of particular elements through the Earth's systems is critical to maintaining life. The best known of these cycles is the carbon cycle, because of its association with energy and climate change. But equally important are the nitrogen cycle, the oxygen cycle and the phosphorus cycle. Many of these elements are abundant on Earth but all are present in finite amounts, and like non-renewable energy sources,

are also subject to peaking in availability. The increase in agricultural production needed to feed the Earth's growing human population means that phosphorus, for example, is becoming more difficult to obtain. There is evidence that phosphorus availability has peaked, which has serious implications for the world's ability to feed itself (Pincock 2010).

Waste

Waste is any material or substance that is of no further use and has been discarded into the air, waterways or soil. Disposing of waste that could be reused or recycled is also a waste of resources and energy, as energy is required to dispose of it. Household waste that is not recycled goes to landfills, which are becoming full and pose a hazard in natural ecosystems (e.g. in groundwater) if not managed properly.

Waste Reduction

An exciting development in thinking about waste is the concept of 'zero waste'. Zero waste tries to mimic cycles in nature by re-designing and managing the use and reuse of all products to avoid and eliminate the volume and toxicity of waste and materials. It aims to conserve and recover all resources rather than burn, bury or discharge them into our precious water.

Nearly 50% of households are composting their food scraps and garden waste (an increase of 4% from 2009) and our gardens and environment in general have benefited enormously. Paradoxically, the amount of recycled waste from Victorian households has also increased per capita, which means we are still consuming more and not reducing our material consumption (Sustainability Victoria website).

BIODIVERSITY AND ECOSYSTEMS

Biodiversity

Biodiversity refers to the variety of living species on the Earth. It includes diversity within ecosystems, communities and species, as well as the genetic diversity within species themselves. Biodiversity contributes utilitarian ecosystem 'goods and services', as well as cultural, aesthetic and spiritual values and, ultimately, our sense of identity. As such, it is fundamental to human wellbeing.

A real concern regarding our food is that the genetic diversity of food crops has been lost to the pressures of conformity for the market. Loss of genetic diversity means potential loss of genes that protect against disease, or confer drought tolerance and other essential factors needed for feeding a rapidly growing population.

Australia is one of the world's 'megadiverse' countries. Many of Australia's species are unique to this continent and between 7% and 10% of all species on the Earth occur in Australia. Since European settlement, Australia has suffered the largest documented decline in biodiversity of any continent. Data held by the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) indicate that decline is greater in southern Australia than in the north, especially in woodlands and grasslands of the agricultural zones of the southeast and southwest (SEWPaC 2008). Over 90% of Victoria's grasslands have been lost during the past 200 years (Commissioner for Environmental Sustainability Victoria 2008).

Australia has one of the worst mammal extinction rates in the world, with more than 22 mammals becoming extinct over the past 200 years (University of Queensland 2012). While extinctions have always been a regular feature of life on Earth, the Sixth Extinction that we are experiencing now is almost entirely due to human action.

As in other parts of Australia, the choices that Victorians have made about land use have produced a modified landscape over much of the State. Human activities continue to cause declines in the condition of native flora and fauna, and this will be exacerbated by continuing population growth, consumption and climate change (Commissioner for Environmental Sustainability Victoria 2008). Both land and water use impact on biodiversity. Increases in population lead to habitat change through land clearing and urbanisation, hunting and exploitation. Apart from the loss, fragmentation and degradation of habitat, other threats to biodiversity include the spread of invasive species, unsustainable use of natural resources, fire, and changes in and pollution of the aquatic environment and water flows (SEWPaC 2008).

Ecosystems

An ecosystem consists of all the species (the species biodiversity) that live in a particular location and the non-living factors (abiotic) that make up their environment. There are many types of ecosystems, such as alpine, estuary, forest and desert. Human health and wellbeing and our very survival are intimately entwined with the health, wellbeing and survival of the Earth's great dynamic ecosystems.

The Earth's ecosystems are always in a dance of dynamic destruction and creation, at the mercy of disruptions, whether small or momentous. Ecosystems with high biodiversity and more possible interactions among species tend to be more robust and resilient than systems with fewer species. The Earth is capable of extremes, from the hot steamy Eocene period (56–34 million years ago) to the freezing depths of the Ice ages. The great extinctions of the past provided the impetus and opportunity for the evolution of new forms, such as the rise of the mammals after the extinction of the dinosaurs during the Cretaceous-Tertiary extinction, 65 million years ago. Much as we behave to the contrary, humans are not exempt from the laws of nature.

Sustainable agriculture and permaculture use ecological concepts to re-design how humans can live in harmony with natural systems in a productive 'ecosynthesis' – a system consisting of both indigenous and exotic plants and animals. Unlike the high energy–using monoculture deserts (with no species diversity) of industrial agriculture, sustainable agriculture sees the farm as an ecosystem. Not only is sustainable agriculture better for the farmer's health and wellbeing, it can actually produce increased yields at lower input costs. In one of the largest analyses of sustainable agricultural practices in developing countries, an international group of scientists examined 286 completed and ongoing sustainable farming projects in 57 countries. The study reported an average increase in crop yields of around 64% since the 1990s (European Commission 2006).

The services provided by ecosystems play a crucial role in maintaining life on earth, including human life (Table 3). These services are not normally counted within the economic system but without them no life would flourish.

One very exciting project in Australia aimed at reversing the decline in biodiversity is the Biodiversity Corridors Plan, which lays the foundation for a new, collaborative, whole-of-landscape approach to biodiversity conservation based on voluntary cooperation and the existing efforts of communities, schools, landholders, governments and industry (SEWPaC, 2012). This is an example of the movement known as 'citizen science', where ordinary citizens, especially school students, can work alongside scientists to learn about real sustainability issues.

Table 3: Biological Ecosystem Services

Biological Ecosystems Services
• Fulfilment of people's cultural, spiritual and intellectual needs
• Maintenance and provision of genetic resources
• Maintenance and regeneration of habitat
• Maintenance of healthy waterways
• Maintenance of soil fertility
• Maintenance of soil health
• Pest control
• Pollination
• Prevention of soil erosion
• Provision of shade and shelter
• Regulation of climate
• Regulation of river flows and groundwater levels
• Waste absorption and breakdown
• Water filtration.

Source: CSIRO Ecosystems Services Project <www.ecosystem servicesproject.org>

CONCLUSION

Water, Waste, Energy and Biodiversity are four key modules in the *ResourceSmart Schools* program. This program provides schools with numerous practical examples of, and pathways for, mitigating the adverse effects humans have had on our planet. Over 200 Catholic schools have now participated in the *ResourceSmart Schools* program (previously *ResourceSmart AuSSI Vic* program). Some inspiring examples of how different schools approach the program are provided in Section 6.

SECTION 5: Learning, Teaching and Curriculum for Sustainability

KEY FRAMEWORKS

The Victorian Curriculum references the Australian Curriculum 'Cross Curriculum Priority' of Sustainability and continues to place a strong emphasis on interdisciplinary learning and personal and social learning. It offers a unique opportunity for learning to be integrated across disciplines, enabling teachers and students to engage with current sustainability issues in society.

Sustainability content and understandings are embedded in the Learning Areas and Capabilities of the Victorian Curriculum (Victorian Curriculum and Assessment Authority), predominantly Science, Geography, Civics and Citizenship, Design & Technologies and Critical & Creative Thinking and Ethical Capabilities

Horizons of Hope – An Education Framework for the Archdiocese of Melbourne provides an overarching framework for effective learning and teaching in the Archdiocese of Melbourne. The Framework privileges learning that demonstrates empathy for others and making responsible decisions for themselves and the environment. *Horizons of Hope* establishes a direction for learning and teaching where learners actively contribute to peace, justice, and the prospering of the whole of creation. Through the effective design of curriculum, it challenges learners to make a difference in the world, inspired by the gospel, in the face of adversity and threats to our environment.

The Catholic Education Melbourne document, *Charter for Promoting Outward Facing School Communities* (CEOM 2011), builds on *Learning Centred Schools*. It urges school communities to 'look out' beyond the school gate and recognise their role in the community. Through engagement in authentic partnerships with families and the wider community, the outward-facing school can explore learning for sustainability in all its possibilities and make a contribution to the entire community's capacity to learn and take action. The educative purpose of the outward-looking Catholic school of the 21st century, in a world characterised by rapid technological and social change within multicultural and multi-faith societies, is to form a learner:

> ... who is able to inquire about everything and everyone positively and with an open mind, inspired by a profound sense of humanity and by a connection with old and new stories, that can open alternative worlds that can grant ... the Reign of God (Pollefeyt 2006).

In 2009, the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) released *Living Sustainably: National Action Plan for Education for Sustainability*. It describes the rationale and a set of seven principles for education for sustainability (EfS) that apply across all educational sectors. The seven principles are reproduced in Appendix 2 of this resource, with more explanation of EfS presented below.

EDUCATION FOR SUSTAINABILITY (EfS)

> Education for sustainability develops the knowledge, skills and values necessary for people to act in ways that contribute to more sustainable patterns of living. It is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through action that recognises the relevance and interdependence of environmental, social, cultural and economic considerations (Australian Curriculum, Assessment and Reporting Authority 2010).

Education for Sustainability (EfS) is a relatively new educational term and field that provides an appropriate and authentic context for learning for sustainability. The term 'Education for Sustainable Development' (ESD) is often used as an alternative in the northern hemisphere. EfS relates closely to the goals of the UN Decade of Education for Sustainable Development (UN DESD 2005–14). These goals seek to mobilise the educational resources of the world to help create a more sustainable future.

EfS offers students the opportunity to explore and reflect on issues, gather evidence and actively become involved in and empowered to create solutions for a sustainable future. EfS aims to develop the knowledge, skills, values and worldviews necessary to act in ways that contribute to more sustainable patterns of living.

EfS is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence – the four pillars of sustainability.

Through rigorous and relevant learning opportunities within and across disciplines, EfS enables students to come to the understanding that sustainability requires complex, creative trans-disciplinary approaches, particularly as new, diverse and often contested knowledge is continuously generated. EfS connects learners to communities beyond the school and provides opportunities to engage with diverse perspectives, collaborate with others and communicate appropriately across a range of social contexts. This leads students to develop deep understandings about themselves, others and the natural world. Such rich and powerful learning experiences enable students to take responsibility for themselves and commit to authentic and just action as they cultivate a continuous search for truth and for understanding.

SUSTAINABILITY EDUCATION AND THE CURRICULUM – FOUNDATION TO YEAR 10

In 2010, DEWHA released a document titled *Sustainability Curriculum Framework – A Guide for Curriculum Developers and Policy Makers*. The importance of sustainability education was reinforced in the Australian Curriculum, where it was designated one of three cross-curriculum priorities. Cross-curriculum priorities are embedded in all learning areas; they have a strong but varying presence, depending on their relevance to the learning area (Australian Curriculum, Assessment and Reporting Authority 2010). This model is the one adopted for the Victorian Curriculum.

A second cross-curriculum priority, Indigenous perspectives, aims to ensure that all young Australians have the opportunity to learn about, acknowledge and respect the history and culture of Aboriginal people and Torres Strait Islanders. An important part of this learning priority is understanding Indigenous peoples' connection to land and their approaches to caring for the land.

Each of the cross-curriculum priorities is organised into key concepts, with those for Sustainability being 'Systems', 'Worldviews' and 'Futures' (see Appendix 3 for equivelent expansion of ideas from AusVELS). These key concepts incorporate and develop the four pillars of sustainability – environmental, economic, social and political development.

The curriculum documents for the different learning areas incorporate sustainability and the other embedded cross-curriculum priorities and explicit links can be made between learning areas.

Currently the content descriptions for learning areas provide the opportunity to address key sustainability concepts. Many teachers already have their own examples of rich questions and projects which attend to these. The Australian and Victorian Curriculum also provide 'Elaborations', which are further examples of what can be done.

In primary schools, sustainability can be readily embedded and integrated across a number of learning areas within the curriculum. Sustainability learning lends itself perfectly to the inquiry processes currently used by many schools. The inquiry process develops sustainability goals through hands-on learning and projects that are designed to make connections with the home and the wider community.

In secondary schools, the curriculum provides a number of areas where sustainability may be addressed. In **English**, sustainability concepts can provide powerful opportunities to develop students' abilities in listening, speaking, reading, viewing and writing. English can also be a vehicle for students developing the skills necessary to investigate, analyse and communicate ideas and information related to sustainability, and to advocate, generate and evaluate actions for sustainable futures. The content in the language, literature and literacy strands in the Victorian Curriculum is key to developing and sharing knowledge about social, economic and ecological systems and worldviews that promote social justice.

Mathematics offers opportunities for students to develop the proficiencies of problem-solving and reasoning, essential for the exploration of sustainability issues and their solutions. Mathematical understandings and skills are necessary to measure, monitor and quantify change in social, economic and ecological systems over time. Statistical analysis enables prediction of possible futures based on findings, and helps inform decision-making and actions that will lead to preferred, sustainable futures.

Students can apply spatial reasoning, measurement, estimation, calculation and comparison to gauge local ecosystem health and can develop cost-benefit analysis of proposed actions for sustainability, such as use of renewable energy technology.

In **Science**, sustainability concepts provide authentic contexts for exploring, investigating and understanding chemical, biological, physical and Earth and space systems, and the men and women who are involved in science as a human endeavour. By investigating the relationships between systems and system components and how systems respond to change, students develop an appreciation for the interconnectedness of the Earth's biosphere, geosphere, hydrosphere and atmosphere. Relationships including cycles and cause and effect are explored, and students develop skills in observation and analysis to examine these relationships in the world around them.

Students appreciate that science provides the basis for decision-making in many areas of society and that these decisions can impact on the Earth system. They understand the importance of using science to predict possible effects of human and other activity and to develop management plans or alternative technologies that minimise these effects. They may engage in 'Citizen Science' projects to explore these in a real-world, authentic context.

History provides a context for developing students' understanding of the forces that influence continuity and change. History also provides content that supports the development of students' worldviews, particularly in relation to judgments about past social and economic systems, and access to and use of the Earth's resources. It provides opportunities for students to develop a historical perspective on sustainability.

Change, environment and sustainability are concepts prominent in the **Geography** curriculum. These concepts involve the study of the processes and interrelationships that form and change the biophysical environment and help students to explain the present and forecast possible futures. Through an understanding of environmental change and management students are able to investigate sustainability issues, design policies and evaluate existing policies for managing the impact of these issues and ensuring the sustainability of resources. Geography helps them explore problems and look for explanations at different levels, for example local or regional.

Making decisions about sustainability to help shape a better future requires an understanding of how the past relates to the present, and needs to be informed by historical trends and experiences. In this learning area, students develop understanding, for example, of the changes in environments over time, the role played by individuals and communities in protecting environments, the emergence of farming and settled communities, the Industrial Revolution, population growth, the overuse of natural resources and the rise of environmental movements.

Based on creation, the Scriptures, the lives of the saints, papal pronouncements and theological interpretations, **Religious Education** offers educators numerous opportunities for exploring sustainability within the Catholic faith tradition and fostering stewardship.

SUSTAINABILITY IN THE POSTCOMPULSORY YEARS

In the Victorian Certificate of Education (VCE), the studies **Biology**, **Chemistry**, **Environmental Science** and **Geography** include much of the scientific knowledge underpinning sustainability science, as well as skills related to research, modelling and using scientific evidence to evaluate and argue claims.

Other studies such as **English**, **Mathematics** and **Economics** provide opportunities to develop critical literacy skills, ethical decision-making and an understanding of economically sustainable development, including consideration of access to and use of natural resources. **Outdoor and Environmental Studies** offer students experiences in nature that help them reflect on their relationship with the natural world.

The Victorian Certificate of Applied Learning (VCAL) provides the opportunity for students to participate in applied learning activities that strengthen their connections with the community and its members. Through partnership approaches to program planning and delivery, VCAL helps to link students with the broader community, enabling them to participate in a range of community based projects, including projects related to environmental sustainability.

Students undertaking VET programs as part of their senior secondary certificate (VCE or VCAL) may engage in specific training related to environmentally sustainable work practices, assisting to further develop their skills and knowledge in this area. These programs include Animal Studies, Building and Construction, Agriculture, Horticulture, Conservation and Land Management, Laboratory Skills, Furnishing, Integrated Technologies, to name just a few.

For Catholic schools, the studies of **Religion and Society** and **Texts and Traditions** offer rich curricula for exploring sustainability and the Catholic faith tradition. Victorian Catholic teacher Margaret Watts has provided an in-depth study of how she explored and developed curriculum based on scriptural and papal ecological teachings for her Year 11 Text and Traditions VCE class (Watts 2009).

CURRICULUM, SUSTAINABILITY AND CATHOLIC EDUCATION

In the Catholic school context, Catholic educators draw on the teachings from the Scriptures and papal pronouncements to provide a deep foundation for their teaching. Engagement in the contemporary world through a commitment to action is developed within the framework of the school's vision, which inspires compassion, social justice and service. Now, commitment to sustainability is part of this framework through developing a sense of stewardship towards creation. As educators we heed the Pope's call that sustainability education 'seeks ... to restore the various levels of ecological equilibrium, establishing harmony within ourselves, with others, with nature and other living creatures, and with God' (*Laudato Si'*, n. 210).

Key resources and programs for Catholic teachers in Victoria that draw explicitly on issues of faith, and social and ecological justice are:

- ***Laudato Si': On Care for our Common Home:*** In his encyclical Pope Francis tells us there is a nobility in the duty to care for creation through little daily actions, and it is wonderful how education can bring about real changes in lifestyle (n. 211). Good education plants seeds when we are young, and these continue to bear fruit throughout life (n. 213).
- ***Catholic Earthcare Assisi Program*** **(see Catholic Earthcare Australia website):** The ASSISI (A Strategic, Systems-based, Integrated Sustainability Initiative) model of Learning Communities aims to provide a foundation for and a pathway to best practice in achieving ecological sustainability in Catholic schools, parishes, Church agencies and organisations across Australia. It describes ecological sustainability as a lifelong process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness of all creation, and to know of creation as a gift from God which requires equitable sharing and right relationship. It also entails practice in decision-making for living a life that is ecologically and ethically sustainable.
- ***On Holy Ground: An Ecological Vision for Catholic Education in South Australia*** **(see Catholic Earthcare website):** 'On Holy Ground' is a foundational document, an ecological vision statement, which provides a foundation, a framework and a suite of resources for schools and the education system as a whole to become sustainable.
- **EarthSong programs and resources (see EarthSong website).** EarthSong Educational Project is sponsored by several religious congregations in south-eastern Australia, each of whom has a strong tradition in education. Seminars, workshops, retreats and programs for adults and senior students comprise its main focus, and the *EarthSong Journal* offers Australian reflections on issues of ecology, spirituality and education.

Whichever curriculum areas teachers choose to address, sustainability should always be approached from the perspective of positive action and empowerment. Guilt, despair and hopelessness are possible reactions to learning about the state of the Earth's ecosystems if inappropriate negative and frightening images of dysfunctional human relationships with nature are all that are presented. Education for sustainability needs to provide students with a sense that they can make a difference by their actions, and that they are part of an inspirational and increasingly influential global movement of millions of people who are working to create a sustainable future. 'Yet all is not lost. Human beings, while capable of the worst, are also capable of rising above themselves, choosing again what is good, and making a new start' (*Laudato Si'*, n. 205).

For Catholic schools then, the challenge is to develop life-affirming approaches to learning, teaching and curriculum that invite and support students to discover God's presence in their lives. Such approaches challenge and engage students in interpreting and making sense of the world in which they live through a worldview founded in the Scriptures and the traditions of the Catholic community – its stories, its worship, its experiences and its teachings. Learning experiences in this context are designed for ongoing transformation as a way of flourishing, of creating meaning in life, of developing human potential, and of liberating and empowering individuals to be responsible for their own lives as they become willing stewards of God's creation.

With excellent, committed and informed teaching and learning for sustainability within and beyond the school gate, the Catholic community can make a significant contribution to the journey to a sustainable future in the Archdiocese of Melbourne and beyond.

SECTION 6: Applying Sustainability – School Projects and Operations

INTRODUCTION

To develop and flourish as a sustainable Catholic school within the Archdiocese of Melbourne, schools need to show leadership in actively bringing together all aspects of sustainability. This can be achieved through a whole-of-school and wider community approach, with care and effort taken to ensure an alignment of curriculum, teaching and learning incorporating relevant teachings from our faith tradition, and overall wellbeing programs.

The key challenge for schools is to develop a consistent and clear approach which models good practice at all levels. Lights left on, dripping taps and lack of waste recycling sit uneasily alongside messages to be good stewards of the Earth.

In the previous section we focused on curriculum documents and resources available to help teachers create rich learning experiences in sustainability. We now move to a focus on current and highly effective operational programs in our schools, with the expectation that these programs will generate ideas, direction and even inspiration for schools which aspire and commit to best practice in sustainability education.

EXAMPLES OF SCHOOL PROJECTS

In the Archdiocese of Melbourne, there are an impressive number and range of sustainability initiatives that Catholic schools are implementing and maintaining. Some examples are described here.

- St Joseph's School, Crib Point, has been involved in Community Garden, Wetlands and Mangrove Regeneration programs and won a 2012 *Tidy Towns – Sustainable Communities Award* in the Protection of the Environment category.
- Over two decades, St Jude's School, Langwarrin, has been vigilant and highly effective in bringing to life its sustainability vision, titled 'Sustainability, care of all people and all things in creation, be it natural or human resourced'.
- St Louis de Montfort's School, Aspendale, has achieved some exceptional outcomes in sustainability awareness through school and wider community campaigns and these were recognised in the winning of the Education category of the Premier's Sustainability Awards in 2014. The school has also won the Water and Biodiversity Primary ResourceSmart Awards (and been a finalist in several other ResoureSmart categories over several years) as well as receiving the Kevin Heinze Perpetual Award for school garden excellence in the School Gardens Awards.
- Ongoing environmental sustainability activities at St Mary's School, Williamstown, include regular Waterwatch sessions and water quality monitoring at the Jawbone Reserve wetlands. These sessions have been showcased at the Melbourne Water 'Kids Teaching Kids' Conference and at the International River Conference. They have also been shared with the Indigenous community in Djarindjin-Lombadina, Western Australia.
- Over many years, Whitefriars College Inc., Donvale, has facilitated a wide range of environmental projects, including wetlands development, Landcare challenges, bush regeneration and programs to increase environmental awareness amongst students.
- Penola Catholic College, Broadmeadows, is a school that has been at the forefront of environmental action from 1996. The college currently has a Year 9 program, 'Source to Sea', which is an integrated Year 9 project focusing on environmental sustainability.
- Clonard College, Geelong West, sees taking responsibility for human impacts on the environment as part of their long tradition of focusing on social justice and encouraging all to take responsibility for our actions and behaviours. The school has many sustainability features in both its infrastructure and programs. At Year 8, there is a Student Sustainability Team and a program that focuses on the environment and water use. Students are also involved in projects with the Conservation Volunteers.

Catholic Education Melbourne recommends two main approaches to developing a whole-of-community sustainability approach – the Catholic Education Melbourne Sustainability Rubric and the national Australian Sustainable Schools Initiative (AuSSI), with its adjunct in Victoria, *ResourceSmart Schools*. These are discussed below.

THE SUSTAINABILITY RUBRIC

The Sustainability Rubric is presented in full in Appendix 4 of this resource. In essence, it is a tool that assists schools to assess their current position on a range of sustainability dimensions. It also provides direction in progressing towards good practice, using the indicators of 'starting out', 'challenging and discovery', 'transforming' and 'sustaining'. For each dimension there is guidance on sustainability aspects of Social justice and Catholic Mission; Vision and Policies; Learning and Teaching; A Whole-School Approach; Networks and Partnerships; Leadership and Management; Resource Management; and Physical Surrounds.

AUSTRALIAN SUSTAINABLE SCHOOLS INITIATIVE (AuSSI) AND RESOURCESMART SCHOOLS

The *ResourceSmart Schools* initiative provides a comprehensive pathway for the Sustainability Rubric (Appendix 4) to be achieved. Catholic Education Melbourne has made a long-term commitment to this program and designated it the preferred pathway for Catholic schools to implement sustainable practices in their teaching and learning programs, school operations and partnerships with the wider community. While it is the preferred pathway, schools involved in other sustainability programs are also supported by Catholic Education Melbourne. A full description of the program is accessible from the Victorian Government's Sustainability Victoria website.

ResourceSmart Schools provides schools with the opportunity to demonstrate continuous improvement in their sustainability journey. Students are involved in a range of projects that provide hands-on experiences that are integrated into curriculum and school programs.

Schools are able to follow a path to achieving 5Star rating by completing a 'Core Module' and then each of four 'Resource Modules' – Water, Waste, Energy and Biodiversity. In this process, schools must achieve and maintain benchmarks, usually assessed over many years. Schools demonstrating leadership in EfS and maintenance of actions in the modules are awarded the status of a 5Star school. CERES was a founding partner, with the Gould League. These organisations provide support for schools and professional learning for teachers wishing to develop the *ResourceSmart Schools* programs in their schools (see CERES website, ResourceSmart information).

Over 200 Catholic schools have now participated in the program. Some inspiring examples of how different schools approach the program are provided here, and others can be found on the CERES website. These examples describe only some of the many activities being carried out in these and other schools.

SCHOOL STORIES – RESOURCESMART SCHOOLS MODULES

The Core Module

The Core Module is designed to be an integral part of a school's strategic planning process for a whole-school approach to sustainability. It involves:

- the building of whole-school daily operations, learning and teaching programs and community engagement
- collection of baseline data of resource use and biodiversity to provide a snapshot of the current state of a school. This is entered on an online database which can produce comparisons and reports
- professional learning for staff about education for sustainability and strategic planning
- recognition of prior achievements and opportunities for improvement
- the development of a Strategic Environmental Management Plan (SEMP)
- the setting of goals and targets for each module
- the creation of a sustainability vision and policy to support EfS and sustainability practice.

St Paul's School, Monbulk, has developed its sustainability program through a staff commitment to evaluate and develop the school's sustainability practices. Using the Core Module, senior students were engaged in an inquiry unit that required them to investigate and then innovate changes towards a more sustainable school.

Our Lady of Lourdes School, Bayswater, used the Core Module to provide staff professional development, led by a CERES facilitator and the school's Sustainability Leader. As a result, staff were able to monitor water, gas and electricity usage. They established a Sustainability Student Action Team, who helped to drive sustainable initiatives within the school.

The Waste Module

The Waste Module takes schools to the next level by assisting them to manage their materials and waste. It supports schools to create waste management systems to reduce litter, landfill waste and associated disposal costs, in particular by reducing waste and increasing co-mingled recycling, paper recycling, composting and electronic waste recycling. The Waste Module also helps schools to explore how they can use more environmentally friendly products and provides real-life learning experiences for their communities.

St Aloysius College, a small secondary school in North Melbourne, responded to a call for action on 'Eco-justice' from the Sisters of Mercy. A staff presentation on *ResourceSmart AuSSI Vic*, facilitated by the Catholic Education Commission of Victoria Ltd (CECV) Placed Teacher at CERES, provoked the Social Justice Group coordinators to explore what could be done about the widespread consumption of single-use plastic water bottles among students. They subsequently established a throw-away 'bottle free' zone by using a grant from City West Water to buy reusable, 'college branded' water bottles for each student.

Our Lady of the Pines School, Donvale, monitored their paper use for the school newsletter and found that every year the whole school uses 86 reams of paper for this publication. As a result, action by the students has encouraged parents to view the newsletter online.

The Energy Module

The Energy Module supports schools to reduce their energy use. Schools are able to create energy reduction systems and install energy-efficient infrastructure. The module has three main themes:

- Energy conservation
- Air quality
- Greenhouse gas reduction.

St Therese School, Torquay, has had 48 solar panels installed, funded through the National Solar Schools Program. The school collects data on the panels to monitor the energy produced and the energy savings made. These data provide a catalyst for generating discussions in curriculum areas such as Maths, Science, Literacy and Religious Education.

A Year 3/4 student at St Bernadette's Catholic Primary School, The Basin, reported: 'Our school is very good in trying to save energy. We have recently had sensor lights put into our toilets so that we don't have to worry about turning off lights. We also have solar panels to save energy and use the sun's energy. Our teacher makes us turn off computers at night and lights off at play times and lunch times'.

The Biodiversity Module

The Biodiversity Module supports schools to design and plant their school grounds with indigenous plants and, where possible, to create local wildlife corridors that will provide habitat for native animals. The module includes the development of a school grounds master plan, inclusive of outdoor spaces for learning and teaching. Many schools also include the development of organic vegetable gardens, fruit trees and chicken runs, if space permits. These teach children gardening skills and care for plants and animals.

The module has four main themes:

- Conservation of land and ecology
- Ecology and habitat
- School ground development.

Students at Holy Spirit Parish School, Manifold Heights, worked in partnership with the CECV Placed Teacher at Melbourne Zoo to grow specific plants for use by animals at the zoo. These 'Browse Plantations' produced much-needed materials to improve the welfare of the animals, connected students to the conservation of animals, and provided other valuable learning for students.

Holy Spirit students are also involved in the Barwon River Revegetation Project, and they work with school families who have available land to restore habitat by planting indigenous species. These planting sites work towards offsetting emissions from some Catholic education conferences and events. Holy Spirit's close links with a school in the Philippines has also led to an exchange of information about the two countries, including about endangered species.

The Water Module

The Water Module helps schools create water management systems to reduce water usage, increase the use of tanks and other water-saving infrastructure, and plant drought-resistant gardens. The module focuses on behaviour change and building a whole-school approach through daily operations, learning and teaching, and school community engagement. The Water Module has three main themes:

- Water conservation
- Storm water quality and management
- River health, waterway protection and coast care.

5Star Achievement

St Macartan's Primary School, Mornington, is an outstanding example of a school that has achieved 5Star rating through the integration of all the modules. The school has a Sustainability Centre that consists of a kitchen, bush tucker produce, herb gardens and a fruit orchard. The school keeps small animals such as chickens, guinea pigs and miniature pigs. It also maintains a compost, worm farms and a hot house for propagation.

The garden beds and fences have been constructed using reclaimed, locally sourced materials to minimise waste and energy use. Through the Gardening Club, student volunteers are trained in all aspects of horticulture, from seed-raising and propagation to composting and animal husbandry. These students have important roles in transferring their knowledge to others in the school community, acting as mentors for the students in Years F–4 who visit the garden each day. In April 2013, the school was featured on the ABC's *Gardening Australia* special on Waste (see ABC website).

All these inspiring examples, whether the schools have already established holistic sustainability programs or are just starting out, provide students and the wider school community with a sense of purpose, learning and commitment to becoming active stewards of Gods' creation. In the process they are doing God's will through developing the whole person and contributing to the wellbeing of themselves and of our Earth.

SUSTAINABLE SCHOOL DESIGN

The design of a school can respond to environmental considerations in its statement of purpose, formulation of designs, and selection of materials and functional aspects. The site, orientation, prevailing weather and the wellbeing of occupants are major considerations and challenges to be overcome at every step of the design process.

The use of sustainable materials and the educational, functional and architectural requirements of school buildings should be weighted equally within the design process. The provision of healthy, non-toxic learning environments ought to be a key priority. Natural ventilation, use of ceiling fans and light levels need to be considered at every stage of the design process.

The design and use of a building with respect to sustainability can be an explicit and implicit part of a child's learning. Likewise, the provision of sophisticated landscaping which facilitates strong connections between the natural world outside and the world inside the classroom is crucial to developing a sense of connectedness and stewardship in students.

The final influence of good building design is reflected in the learning outcomes and wellbeing of the occupants and the overall environmental footprint of the building's use and construction.

Including students and their families in aspects of the design process provides a rich and practical application of EfS principles. Such inclusion also builds a sense of pride and ownership in the school.

Conclusion

We live in challenging times. In the 21st century, humanity finds itself at a turning point as we recognise and understand our often-destructive impact on our precious Earth. Through continued growth in population and consumption, the human footprint is radically compromising the conditions for the continued flourishing of life. There is an intimate connection between God and all beings. We need to listen, and respond more readily to the 'cry of the earth and the cry of the poor' (*Laudato Si'*, n. 49). The future depends upon humans making the decision to act as wise stewards of God's creation. We are confronted with profound and fundamental challenges to our way of thinking, behaving and working.

The daunting but very exciting news for education is that schools, teachers and the wider education community have a critical place in meeting this challenge. Teachers are charged with designing and implementing high-quality, learner-centred experiences that empower students to make positive and joyful contributions to sustainability.

Catholic Education Melbourne's *Education for Sustainability in the Archdiocese of Melbourne* provides clear direction for teachers to create and enact their own positive responses in the classroom and beyond. The resource brings together the various strands of thought and action that underpin sustainability within the Catholic faith tradition. There is a clear and strong mandate from the Scriptures, papal pronouncements and theology to guide us to be stewards of God's creation. The science of cosmology has underscored this mandate through its gift of a profound appreciation of our intimate place in the cosmos itself, the preciousness of our planet, and our responsibility to creation. By seeing ourselves as an intrinsic part of the great unfolding and evolution of the universe, the universe's story becomes humanity's own story.

We learn that while there is clear consensus within the science community that human actions directly threaten the Earth's ecological systems that support all life, science and technology also provide many of the exciting practical and conceptual tools we need to navigate a different path. As well, there is a range of curriculum documents now available to help teachers create rich learning experiences in sustainability. There are also excellent operational programs, such as *Resource Smart Schools*, that lay out a clear pathway and offer many inspiring examples from which to draw.

Catholic Education Melbourne recognises the huge challenge and responsibility that teachers face to bring together all these elements. This resource provides sufficient background and direction for teachers to feel confident to develop new and inspiring programs for their students, to develop further professional learning in their schools, and to educate their wider communities to make a real and vital contribution to a sustainable future.

We recognise that humanity is at a turning point. The future of creation for the first time depends upon humans making wise, life-giving decisions to live and act as stewards of creation. Education for sustainability is a critical part of this. Catholic Education Melbourne's unique response in *Education for Sustainability in the Archdiocese of Melbourne* provides clear direction for teachers to develop their own responses in the classroom and beyond.

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APPENDICES

Appendix 1: Selected Scripture References Related to Creation Themes

SCRIPTURE REFERENCE	TOPIC INTRODUCED
Genesis 1: 26–28	Dominion over the Earth
Genesis 1: 27	Humans made in God's Image
Genesis 9: 8–17	The covenant between God, humankind and every living creature (stewardship)
Leviticus 25: 4–7	The Sabbath of the land
Psalm 19	God's story shown in creation
Psalm 104	God as Creator
Wisdom Books	
Sirach	Wisdom present at creation
Job	The majesty of creation
Gospels	
Matthew 7: 28	Imagery of the lilies of the field
Matthew 13: 1–23	The parable of the sower
Mark 1	Jesus relates to the creation
John 1	Jesus as 'Word', present at the beginning of creation
Luke 13	Jesus compared to the mother hen
John 10	Respect for life
John 15	Jesus as the true vine
Pauline Literature	
Colossians 1: 13	Jesus as image of God and wisdom
Romans 8: 22	Christ as Saviour of the whole of creation
Corinthians 1: 15	Jesus as image of God and Creator

Adapted from the doctoral thesis of Dr Patricia Hindmarsh (2008), currently Director of Tasmanian Catholic Education Office.

Appendix 2: Principles of Education for Sustainability

1. **Transformation and change**
   Education for sustainability is not simply about providing information but involves equipping people with the skills, capacity and motivation to plan and manage change towards sustainability within an organisation, industry or community.

2. **Education for all and lifelong learning**
   Education for sustainability is driven by a broad understanding of education and learning that includes people of all ages and backgrounds and at all stages of life and takes place within all possible learning spaces, formal and informal, in schools, workplaces, homes and communities.

3. **Systems thinking**
   Education for sustainability aims to equip people to understand connections between environmental, economic, social and political systems.

4. **Envisioning a better future**
   Education for sustainability engages people in developing a shared vision for a sustainable future.

5. **Critical thinking and reflection**
   Education for sustainability values the capacity of individuals and groups to reflect on personal experiences and worldviews and to challenge accepted ways of interpreting and engaging with the world.

6. **Participation**
   Education for sustainability recognises participation as critical for engaging groups and individuals in sustainability.

7. **Partnerships for change**
   Education for sustainability focuses on the use of genuine partnerships to build networks and relationships, and improve communication between different sectors of society.

Source: Australian Government (DEWHA) 2009, *Living Sustainably: National Action Plan for Education for Sustainability*, p. 9).

Appendix 3: Organising Ideas for the Sustainability Cross-curriculum Priority (AusVELS)

Each of the cross-curriculum priorities in AusVELS has organising ideas, those for sustainability being Systems, Worldviews and Futures.

1. **Systems**
   - The biosphere is a dynamic system providing conditions that sustain life on Earth.
   - All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.
   - Sustainable patterns of living rely on the inter-dependence of healthy social, economic and ecological systems.

2. **Worldviews**
   - Worldviews that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.
   - Worldviews are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

3. **Futures**
   - The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.
   - Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.
   - Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.
   - Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments.

Appendix 4: The Sustainability Rubric

This Rubric has been developed to guide Catholic schools as they move towards a sustainable future. As schools identify their position for each criterion within the grid, the Rubric will provide ideas for progress towards the goal of a sustainable future.

	STARTING OUT (Where are we at?)	CHALLENGING AND DISCOVERY (What needs to be done)	TRANSFORMING (Action)	SUSTAINING (Ongoing commitment)	LEADING PRACTICE (Celebration and acknowledgment)
Social Justice & the Catholic Mission	Is the school aware of the Catholic context for sustainability? Is the school community aware that Catholic Social Teaching calls on us to respect, care for and share the resources of the earth, which are vital for the common good?	Become familiar with the values and framework within the reference document, *Education for Sustainability framework in the Archdiocese of Melbourne*, and commit to its principles. Do school policies, programs and resources promote care for the earth and its resources?	Develop the school's response to the *Education for Sustainability framework in the Archdiocese of Melbourne*. It has implications for the school's policies, curriculum, leadership and management, operation and resource management.	The values and principles inherent in the *Education for Sustainability framework in the Archdiocese of Melbourne* underpin the school's programs, initiatives and partnerships with the Church and the broader community and are reflected in the Social Justice program of the school.	There is evidence that the school has adopted a whole-school approach, which may include programs such as *ResourceSmart Schools*, and which intersects with the reference document, *Education for Sustainability framework in the Archdiocese of Melbourne*. Achievements are celebrated within their Social Justice network and with the broader Church community.
Vision & Policies	Does the school vision statement include/refer to sustainability? Is there any documentation in the school that the school board has considered a policy on sustainability?	The school community has a common understanding of sustainability and identifies opportunities to explore current research in the *Education for Sustainability framework in the Archdiocese of Melbourne* and other documents to help develop school policies.	The vision statement includes EfS, a policy on sustainability is being developed and policies are aligned with the *Education for Sustainability framework in the Archdiocese of Melbourne*. A formal process for implementation is being developed.	The formal process adopted enables constant referral to the Reference Document for implementation.	There is evidence that the vision statement and policy is implemented and reviewed.
Learning & Teaching	Is education for sustainability incorporated into the school's curriculum and relevant documentation? Is there a shared understanding of its place in the school community?	Explore and become familiar with the key document, *Education for Sustainability framework in the Archdiocese of Melbourne*, and others such as Educating for a Sustainable Future, IB-MYP, Victorian Curriculum and associated VCAA sustainability resources.	A scaffolded curriculum is developed with sequential learning that reflects EfS. Teachers, through appropriate professional learning, improve their knowledge of EfS for application throughout the curriculum. Students are actively participating in sustainable actions as part of everyday practice.	The curriculum incorporates a set of knowledge, skills and behaviours which reflect sustainability and innovative practice. This incorporates contemporary learning and teaching.	Schools have adopted curriculum programs that emphasise sustainability in all aspects. Ongoing EfS practices are evident, shared and celebrated within the school and wider community.
A Whole-School Approach	Who in this school community is engaged in sustainability?	A knowledge and skills audit is undertaken for the whole school community.	The work of the school community (Parish Priest, Principal, leadership team, board, teachers, parents, students) embraces sustainable practices.	Establish a leadership structure to maintain the sustainable practices.	Sustainable practices are evident and consistent across the school community.

Appendix 4: The Sustainability Rubric (continued)

	STARTING OUT (Where are we at?)	CHALLENGING AND DISCOVERY (What needs to be done)	TRANSFORMING (Action)	SUSTAINING (Ongoing commitment)	LEADING PRACTICE (Celebration and acknowledgment)
Networks and Partnerships	Does the school engage with: • the Church community • the broader community • sustainability organisations • other schools about sustainability?	Determine possible sustainability organisations and schools for partnerships within the local community.	Create or join existing clusters of schools or community organisations for the purpose of establishing partnerships, professional learning and benchmarking.	Grow the sustainability network broadly to ensure access to valued expertise and resources, including funding.	Celebrate partnerships through community activities and sharing ideas and resources beyond the partnerships. The school receives acknowledgment and invitations to present to other schools and groups.
Leadership & Management	What is the understanding of EfS within school leadership? Are there any committees, structures or procedures in place to support EfS and practices?	The leadership team undertakes professional learning activities as a group to develop shared understanding and appreciation of appropriate structures for the school.	Creation of professional learning activities and teams.	The school has a suitable structure to enable discussion and planning of ideas. Suitable professional learning activities are occurring for the school community.	The school is acknowledged as a model in leadership and management to support EfS and practice.
Resource Management	Are there systems in place to monitor or regulate the use of resources in the school? Key elements are: ecological footprint, water, energy, waste, biodiversity.	Systems are being investigated to monitor and regulate use of resources in the school. The school measures its ecological footprint.	The school determines internally and externally how it will respond to the ecological footprint calculation. Targets are set and systems developed to monitor and regulate use of resources. Formal learning occurs in response to the plan.	The school community is actively engaged in monitoring and reviewing the targets.	The school regularly reports to and shares results with the school community, the local community, Catholic Education Melbourne and other schools. The school is acknowledged as a leader in sustainability and there is evidence that the ecological footprint has been reduced.
Physical Surrounds	What are the physical signs that this is a sustainable school? Are there opportunities to maximise the natural habitat and infrastructure of the school grounds for EfS purposes?	Investigate how other schools use their school grounds to promote EfS.	Audit the school site in terms of the sustainability of its physical surrounds. Develop a strategy to optimise the site's natural habitat and opportunities for EfS. If necessary, review the school's master plan after the school review.	Implement the site strategy and review when appropriate. The school's maintenance plan incorporates principles of sustainability.	The school is recognised as a resource of good practice and teachers, staff and the school community are using the site particularly as a learning environment.

**EfS = Educating for Sustainability*

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