

# LOW CARBON BUILDING GUIDE

A resource for building and renovating  
churches and parsonages



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The Methodist Connexional Property Committee (MCPC) is tasked with providing Conference approval for Parish and the wider Church building projects which require building or resource consents.

Please see the information leaflets dealing with the Church approval processes and legal requirements for undertaking Church projects: [www.methodist.org.nz/administration\\_division/resources/information\\_leaflets/church\\_property](http://www.methodist.org.nz/administration_division/resources/information_leaflets/church_property)

*The listed contractors and advisors are for information only. The MCNZ does not endorse or warranty the performance of any individual contractor or consultant.*

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# DECISION-MAKING CHECKLIST

TOPIC	DETAILS & ACTIVITIES	<input checked="" type="checkbox"/>
<b>Theological preparation</b>	Teaching, learning, sermons	<input type="checkbox"/>
	Rituals	<input type="checkbox"/>
	Resources	<input type="checkbox"/>
<b>Engage community &amp; Synod</b>	Parish meetings	<input type="checkbox"/>
	Community meetings	<input type="checkbox"/>
	Funders and resource	<input type="checkbox"/>
	Create a building and resource use vision	<input type="checkbox"/>
<b>Site assessment &amp; potential</b> <i>The Church requires that plans are prepared by an appropriate design consultant</i>	Orientation to sun and light and shelter	<input type="checkbox"/>
	Landscape design, veggie gardens, fruit trees	<input type="checkbox"/>
	Native habitat planting	<input type="checkbox"/>
	Water: runoff, rainwater collection, wastewater	<input type="checkbox"/>
	Access to transport	<input type="checkbox"/>
<b>Building materials</b>	Recycled materials	<input type="checkbox"/>
	Low carbon construction and cladding	<input type="checkbox"/>
	Advice on low carbon products, durability, lifecycle of products, toxicity	<input type="checkbox"/>
	Locally produced materials	<input type="checkbox"/>
<b>Indoor environment</b>	Lighting	<input type="checkbox"/>
	Ventilation	<input type="checkbox"/>
	Acoustics	<input type="checkbox"/>
	Beauty and aesthetics	<input type="checkbox"/>
<b>Energy use</b>	Passive solar	<input type="checkbox"/>
	Insulation	<input type="checkbox"/>
	LED lighting	<input type="checkbox"/>
	Energy on site: Photovoltaics (solar panels), high storage batteries	<input type="checkbox"/>
<b>Water conservation</b>	Rain water collection and storage	<input type="checkbox"/>
	Systems for using rain water and re-using water	<input type="checkbox"/>
	Grey water recycling	<input type="checkbox"/>
<b>Operations &amp; management</b>	Project management inclusive of parish	<input type="checkbox"/>
	Involve operational and maintenance personnel from the start	<input type="checkbox"/>
	Design for low maintenance	<input type="checkbox"/>

# Dialogue between faith, church and earth

The Methodist church is on a pathway of contributing to a low carbon economy – reducing emissions and showing leadership in the careful use of resources.

The mission of the church includes stewardship responsibilities for the wellbeing of households and the resources on which they depend. In the 21st century the changing climate is throwing our stewardship role into bold relief as we come to terms with the prospect of unraveling the fabric of life as we know it.

Stewardship draws us to the stories of creation and of covenant and the evolving understanding of the role of humankind as a keeper of the garden. In Genesis 2:15 ‘the Lord took the man and put him in the garden to cultivate and keep it.’ Formerly the idea of caring *for* creation came from the idea of dominion, or lordship. Now that the serious impact of human ‘dominion’ is revealed and industrial societies recognize the destructive effects of polluting the atmosphere, a move is taking place towards understanding our interdependence *with* creation.

Those from among you will rebuild the  
ancient ruins

you will raise up the age-old foundations  
and you will be called the restorer of  
streets in which to dwell.

*Hebrews 11.10*



‘Keeping’ is closer to partnering, and expresses the potential for divine union between God and humankind.

Partnering comes from the idea of humankind being created in the image of God. It suggests human sharing with God in the governance of creation, and in safeguarding the integrity of creation and the sacred balance enfolded in a ‘woven universe’.

All peoples have traditions of stewardship; in industrial, Western economies stewardship is often relegated to environmental conservation interests. Damage to the planet’s ecosystems comes from industrialization combined with human population growth. The living heritage of indigenous peoples of the Pacific, recognizes interdependence and custodianship, with systems which join social, environmental and economic interests. Māori building and architecture and Pacific architecture offer inspirational design for gathered communities and ecological resilience.

This change from assuming we have an oversight or dominion role to understanding human life as embedded in all of creation means we participate in sustaining life in its forms – the life of forests and waters, the birds of the air and fish of the seas. The changing climate has brought greater recognition of the interdependence of life and, with it, a world view and a faith view that is both ancient and new, a way of life that takes account of the source of life.

For the people of God in the Exodus the daily provision of manna was about taking enough for the day; we can expand on that understanding for today. Participating with God is also contributing to the stability of creation. A holistic and integrated view brings the opportunity to be diligent in the way we use the resources of creation to build; this includes the way we design buildings.

Our use of materials and systems for energy and light express our stewardship values.

Across all time churches use light to evoke reverence and enhance spirituality. Now light is also warmth and energy so building design with technology to maximize sunlight for energy gives a legacy of low carbon and

You have been entrusted with the gospel, so we speak not as pleasing to men, but God.

*1 Thessalonians 2:4*

long-term lower cost. It may involve more investment now with the benefit of reduced power bills and the additional legacy is lower cost on the planet.

Church buildings express who we are as communities of faith for members and users and they communicate to the wider world. Inside they offer the spirit of gathered community and outwardly they speak of how the church relates to communities.

A shared vision is vital for bringing everyone on board. The first steps for building need to be taken with the community. Firstly, involve the church community and share ideas for building who could share in the benefits of a low carbon church: schools, businesses, community services, local Council etc.

In our time new buildings and renovations offer the chance to go deeper in laying foundations. Designing structures and systems to minimize the use of energy and water and to use low impact materials is foundational work. In the well-known story Jesus commends the one who, 'like a man building a house, digs deeply and lays the foundation on rock' (Luke 6:49). In today's world, we are building for a climate responsive future; in practice this means working with eco-wise advisors, do research on materials and design and involve congregations and communities in the work.

Stewardship comes from the premise that people and their communities are made up of social, economic and environmental systems that are constantly interacting and must be kept in harmony or balance if the community is to continue to function for the benefit of its inhabitants— now and in the future.

Stewardship is an ideal toward which to strive and against which to weigh proposed actions, plans, expenditures and decisions.

## **Construction/rebuilding**

All projects need timely referral to the Methodist Synod strategy and Synod Property Advisory Committee. All building projects must proceed through the Church approvals process [Information Leaflet No. 40](#).

All building projects are subject to local authority requirements for building and resource consents. Google your local council; for example [Auckland Council](#), [Christchurch Council](#). See ‘The Church and Building Law. [Information Leaflet No. 52](#).

The main objectives of stewardship construction are:

- reduce and avoid depletion of critical resources: energy, water, raw materials;
- prevent environmental degradation caused by facilities and infrastructure throughout their life cycle;
- create buildings that are liveable, comfortable, safe, and productive.

While ideas for building design constantly change, six fundamental principles persist.

1. Optimise Site Potential
2. Optimize Building Space and Material Use
3. Enhance the Indoor Environment
4. Optimise Energy Use
5. Protect and Conserve Water
6. Optimize Operational and Maintenance Practices



# Dialogue with parish and wider communities

Building together is the first principle of the building enterprise. The first step is therefore to create a dialogue between those responsible for building decisions, including the funders, and the parish.

It is best to begin with finding a common vision. Building is a big undertaking and a shared vision will help sustain support for the long journey.

Possibilities for discussion include stewardship, hospitality, kaitiaki, manaakitanga considerations. Working with the parish community must be part of the built design and the social and spiritual outcomes.

Ensure that there is consultation with the Synod Property Advisory Committee from the early stage of concept development.

The vision needs to encompass the uses for the building both current, and potential users and visitors.

- What resources do we have and what further resources are needed?
- What further sources of funding partners are available. For example in Wellington and Lower Hutt Dwell Housing (formerly Wellington Housing Trust), provides funds to build on church land as long as housing is included.
- Paying for the cost of low carbon materials and renewable energy now, taking account of loans for capital costs with less ongoing costs, versus paying for mainstream systems over time.
- Who will manage the resources?
- What expertise do we have, and who further shall we talk to?
- What cultural dimensions of design do we wish to include? See references in this resource to Māori architects and Pacific designers.

If we walk in the light,  
as He is in the light,  
we have fellowship  
one with another

*1 John 1:7*

- What has been the experience of the Matanikolo housing project? Watch a video.
- Who else to involve in the community? Your local Marae?
- Review together issues re site, design, structure, solar, water, lighting, materials, energy performance
- Who else in the community shall we speak to?

Invite Council representatives and those responsible for parks and facilities, businesses, social services.

Which NGOs are working in your area? Groups like 350.org and Generation Zero and Enspirai are youth organizations developing ethical businesses and working on transitions to low carbon.

Preparations for the parish and developing a dialogue with all those who have a current and future interest in the church will bring the benefits and challenges of working together and sharing knowledge. Working with the parish community and other partners and stakeholders means an ongoing dialogue that is critical to bring the users and the funders along with you and allow them to buy-in and input.

Working with the Minister on a theology of stewardship will enrich the enterprise and ensure spiritual, cultural, economic, social and environmental dimensions are included.

Sermons, readings, rituals and gatherings are all part of growing a theology of stewardship, drawing on community wisdom and creating a community in dialogue with earth and each other.

# Optimise site potential

Creating sustainable buildings starts with evaluating the site, the surrounding influences, including wind, soil and sun and waterways. The reuse or rehabilitation of existing buildings can be considered. The location, orientation, and landscaping of a building affect local ecosystems, transportation methods and energy use.

Whether designing a new building or retrofitting an existing building, design of the site must integrate with the overall building design to achieve a successful project outcome. (Approved consultants will need to be appointed, for major renovations and buildings a registered architect will be most acceptable.)

## DISCUSSION POINTS

### Building and site relationship

Consider energy implications and carbon emissions in site selection and building orientation. Orientating a building for maximum solar exposure can greatly reduce heating cost in winter while providing shading in summer (louvres, eaves or deciduous trees) can minimise the need to use mechanical cooling. With new builds, take advantage of natural ventilation and prevailing wind patterns and maximise daylight use and solar gains with increased glazing. When renovating/retrofitting an existing structure, consider adding glazing to the north and planting deciduous trees to shade areas of the building that get more sunshine.



Berm with food plants.

## **Urban Agriculture**

Direct access to fresh vegetables and fruit through urban agriculture onsite can improve food security and food safety. Furthermore, Urban agriculture is known to encompass a number of interests, from traditional activities associated with the production, distribution, and consumption of fresh food, to a diversity of other benefits such as recreation and leisure; individual and community health and well-being; landscape beautification; and environmental restoration and remediation.

## **Site Planting**

It is possible to restore the health of degraded sites by improving the habitat for native species through growing appropriate native plants and climate-adapted plants. Linking natural areas in the adjoining community creates contiguous areas that allow undisturbed wildlife movement, which creates wildlife corridors and/or pollination paths. Suitable plants such as flaxes are able to control erosion on steeper sites.

Using organic/non-toxic methods of pest management will reduce water pollution from pesticides. All plants help offset carbon so consider incorporating green roofs or walls into the project where feasible.

## **Water on site**

The site of a sustainable building should reduce, control and/or treat storm water runoff.

On larger sites, the use of rainwater cisterns, vegetated swales, constructed wetlands and other onsite storm water storage is able to reduce run-offs. (A swale is a low tract of land, especially one that is moist or marshy. It is often used to manage water runoff, filter pollutants, and increase rainwater infiltration).

Installing rainwater tanks to collect roof water is an ideal and simple form of water conservation. Harvested rainwater in tanks can be plumbed to bathrooms for toilets and showers, and can be used for gardens.

When landscaping, use pervious paving material to prevent water pooling around the building.

## Transportation

The use of a site can encourage alternatives to traditional car commuting by incorporating transportation solutions that acknowledge the need for bicycle parking, carpooling, and proximity to public transport.

## Security

Siting for physical security is a critical issue in optimising site design, including locations of access roads, parking, vehicle barriers, and perimeter lighting.

## BUILDING ADVISORS

### General Information

- Refer to Methodist Church approval processes by Synod and MCPC
- [Living Future Institute](#) – Living Building Challenge
- [New Zealand Green Building Council](#): The Council awards ‘stars’ for energy and water use, waste, ventilation, health, and environmental qualities to support healthy, efficient and productive buildings.
- [Design Tribe](#): Includes Māori architectural design and sustainable habitat construction. Watch out for Rau Hoskins’ Nano Whare!
- [Airedale Property Trust](#): Property management and holistic approaches, partnering with Lifewise, working with Lotofale’ia for the Matanikolo housing project

### Landscape Design and Gardening Help

- [Sustainable Gardening](#)
- [Permaculture NZ Design](#) ‘creatively use and respond to change’ working with holistic and integrated garden systems

# Optimise building space and use of materials

Growing populations effect resource uses and pressures on sourcing building materials. As populations continue to grow (the world population is predicted to be over 9 billion by 2050), natural resource use continues to increase and demand for additional goods and services creates stress on available resources. It is critical to achieve an integrated and intelligent use of materials that maximizes their value, prevents upstream pollution and conserves raw resources. A sustainable building design will use and reuse materials in the most productive and sustainable way across its entire life cycle.

Council consents will require compliance for earthquake resilience and many insulation features and safety requirements. The options to go zero carbon energy and careful resource use are optional, and the many possibilities have to be balanced against cost and investment for long term benefits.

## Principles of stewardship

1. Custodianship
2. Responsibility
3. Accountability
4. Cultural principles
5. Reward

You have been faithful with a few things; I will put you in share of many things.

*Matthew 25:21*

## DISCUSSION POINTS

### Building space

In new buildings, adjust the building size to reduce the overall materials used. This can be achieved by configuring individual spaces to accommodate several complementary functions. Avoid unnecessary circulation spaces.

## Materials

The materials used in a sustainable building must minimise environmental impacts such as global warming, resource depletion and human toxicity. Environmentally preferable materials have a reduced effect on human health and the environment.

There are a number of labels in New Zealand that enable environmental decisions when selecting construction materials. These include ECNZ (Environmental Choice New Zealand), Declare, Carbon Zero, Energy Star, Green Guard, Green Star, Green Tick, FSC (Forestry Stewardship Council), etc.

All these labels have different criteria so it pays to research the information behind the labels. (The term ‘greenwashing’ is commonly used to describe products that have unsubstantiated and misleading green characteristics. It is a challenge to determine the validity and relevance of environmental claims.)

Double glazing is clearly an important investment for heat retention and energy saving. A new light transmitting material that is insulated is available, with products such as politec modulit (shown in photo), polycarbonate and plexiglass.



Light transmitting material.

## Consider the life cycle of a product

The life cycle of a product includes sourcing of raw materials, manufacturing, packaging, transporting, distributing, retailing, installing and using the product and managing the product when it is no longer needed (through reuse, repair, upgrade, recycle or safe disposal). All these processes have a carbon footprint associated with them.

Favour products with lower encapsulated carbon footprints, energy requirements and with higher recycled content.

Give preference to locally produced materials with low embodied energy content to stimulate local economies, while reducing transportation burdens and greenhouse gas generation.

Consider the overall environmental impact when making sustainable choices (this includes, global warming, resource depletion, indoor air quality, waste streams, toxicity, local sourcing, carbon footprint, waste etc.). That is, look at the overall impact rather than simply shifting problems from one to another.

Where possible, avoid materials not compatible with reuse and recycling.

## **Durability**

Consider the effects related to moisture, heat, sunlight, insects, material failure, ozone and acid rain, building function, style and natural disasters. Plan to use materials that age gracefully and select materials that are easily refinished, repaired or are partially replaceable to ensure a long lifespan.

## **Waste**

Ensure buildings are designed to minimise cut-offs and waste. While purchasing, do a quantity survey to prevent excess materials from arriving at the job site.

Use products and assemblies that minimise disposable packaging and storage requirements.

Encourage the use of recyclable assemblies and products that can be easily “de-constructed” at the end of their useful lives.



## Toxic materials

Eliminate materials that pollute or are toxic during their manufacture, use or reuse.

Always use materials and assemblies with the lowest level of volatile organic compounds (VOCs). Eliminate the use of asbestos, lead and PCBs in all products and assemblies.

There are many other chemicals used in the building industry that are known to be toxic, carcinogenic and cause health problems. These include – but are not limited to – CFCs (Chlorofluorocarbons), SCCPs (short-chained chlorinated paraffins), fluorotelomers based on C8 or higher fluorocarbon chemistries, benzidine and benzidine congener-based dyes etc. Where possible give preference to products that openly disclose the substances used in the manufacture of the product and substances comprising the final product.



Zero energy house in Point Chevalier, Auckland.

## MATERIALS ADVISORS

- [Zero energy Eco house](#), Auckland has interesting videos for materials and decision-making
- [Declare Materials](#) (Toxin free)
- [Forest Stewardship Council](#) (FSC) – sustainable timber

# Enhance the indoor environment

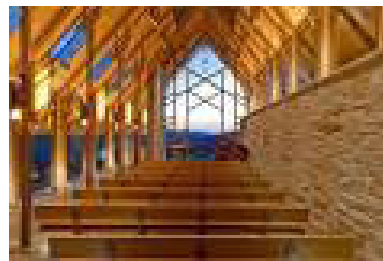
The indoor environment of a building has a significant impact on occupant health, comfort and productivity. Among other attributes, a sustainable building maximises daylight, has appropriate ventilation and moisture control, optimises acoustic performance and avoids the use of materials with high-VOC emissions. Facilities should be constructed with an appreciation of the importance of providing high-quality, interior environments for all users.

In paths that they  
have not known  
I will guide them.  
*Isaiah 42:16*

## DISCUSSION POINTS

### Indoor air quality

To ensure the best indoor air quality, limit the use of volatile organic compounds (VOCs) in such products as cleaners, paints, sealants, coatings and adhesives. Also avoid products containing formaldehyde, for example, carpet, wall panels and cabinetry.



Ensure maintenance procedures are in place to remove all rubbish and recyclables from the building on a regular basis rather than storing them within the building for prolonged periods of time.

Ban smoking inside the building.

## Lighting

Use daylight for ambient lighting wherever feasible and supplement natural light with integrated, high-performance lamps, fixtures and controls.

Use task/ambient systems that provide reduced levels of diffuse, general illumination and supplement this with task lighting. Most people do not need lighting in excess of 300 lux.

Provide dimming fixtures where possible combined with appropriate task lighting so that occupants can reduce light levels to their preferred lumens. Dimming the lights will save electricity. Often the lighting levels are designed to the most demanding user; all other occupants are forced to adapt to levels that are higher than desired.

Then shall the  
light break forth  
like the dawn and  
your healing shall  
spring up speedily.

*Isaiah 58:8*

## Ventilation

When designing the building envelope, consider external conditions – for example, the prevailing wind – that will impact on thermal comfort.

It is important to provide windows in all occupied spaces for view and natural ventilation. Windows that are easy to open and window treatments allow occupants to control thermal and light exposures from the sun.

If an HVAC system is required, ensure air intake is away from roads, loading zones, idling vehicles and other pollutants. The best place is usually on the roof.

## Acoustics

Minimize excessive noise by controlling reverberation times in larger spaces. Install absorbent materials to prevent sound from reflecting.

The level of absorption is measured in NRC where 0 is purely reflective and 1 is completely absorbent.

Where privacy is required between spaces, select high sound transmission loss walls, floors and ceilings (the system is only ever as good as its weakest link).

## Beauty

Design spaces around basic human needs, ancient preferences and connections to the patterns of nature and the mind. Buildings and indoor spaces should be consciously integrated into their natural and man-made context.

Value aesthetic decisions, such as the importance of views and the integration of natural and man-made elements.

### Interior Building Advisors

- **Acoustics** – [T & R Interior Systems](#), Interior Acoustics consultant
- **Lighting** – [EECA lighting tool](#)
- **Insulation** – When seeking information on insulation check that material is Volatile Organic Compounds (VOC) and formaldehyde free. VOC's vaporize at room temperature. [Advice is available](#) on chemical free insulation. Check for wool, cotton, hemp and recycled non-inflammable insulation.

# Optimise energy use

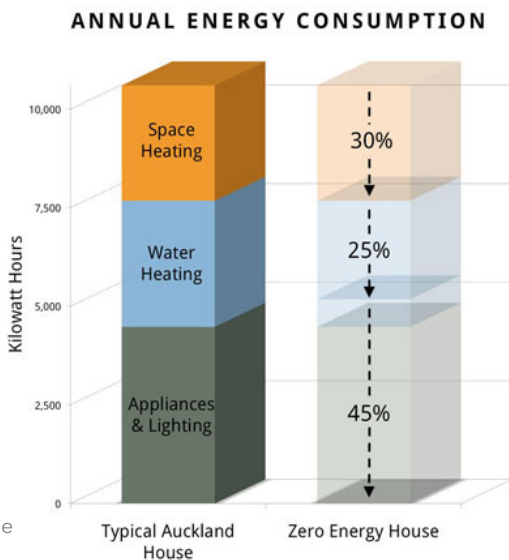
With the continually increasing demand on the world's fuel resources, the need for energy independence and security continues to increase. It is essential to find ways to reduce energy load, increase efficiency and maximise the use of renewable energy sources.

Energy independence can be achieved, in part, by minimising energy consumption through energy conservation, energy efficiency and by generating energy from local, renewable sources, such as wind, solar, geothermal etc.

## DISCUSSION POINTS

### Passive Solar Heating

Successful low energy buildings typically combine passive solar principles that work with the on-site environmental assets. (This is directly related to the site optimisation principle.) Sunlight and solar heat, prevailing breezes and the cool of the earth below a building can provide natural lighting during the day and stable indoor temperatures with minimum mechanical intervention. Well-designed buildings optimise solar heat gain and shading, in conjunction with thermal mass to stabilise 24-hour temperature variations throughout the day.



Zero energy house uses a quarter of the energy of a standard Auckland house.

## Solar Benefits

This example is on the Kapiti Coast

- A 5.5 kilowatt (kW), 21 panel photovoltaic (PV) solar system cost \$18,000.
- This is capable of producing 7200 kW per year. Annual household consumption is about 8000 kW.
- Alternatively a 3.3 kW photovoltaic costs \$13,000.

These installation are a long-term choice. Switching to PVC meant the power bill dropped to \$160 per month, which included all heating, cooking and hot water.

Source: *Christchurch Press*, [Is solar worth the cost?](#)

## Insulation

One of the most important steps to reduce the energy required for heating and cooling is to use high-performance building envelopes; walls, roofs and other assemblies based on long-term insulation, air barrier performance and durability requirements.

For retrofitting and renovation, there are a number of ways to insulate existing walls and ceilings. Most heat is lost through the ceiling so the roof should be the first priority, followed by the floor, the walls, the windows and doors. It is also important to fill cracks to minimise draughts.

## LED lighting and other low energy alternatives

Appliances, HVAC systems and lighting solutions should always be selected according to their energy efficiency.

Hot water run on solar power is beneficial because heating water uses a lot of energy.

## Solar Cautions

Currently New Zealand has no policy for regulating the price that electricity companies pay for power, so prices range from as low as 3.5c per kWh to 25c per kWh.

- **Buy-back prices:** Contact Energy is the best with a buy-back rate of 17.28c excl GST. Meridian buys solar electricity at 25c for the first 5kWh generated and 10c after that.
- A 3kW system would produce 4800kWh of electricity, of which 1800kWh would be exported to Meridian and the rest used by the house. The gain is about \$1400 per year.
- Calculations from Solarzone show that customers supply electricity to themselves for 12c kWh for 25 years, which is the time of guarantee for the panels.

## Energy Storage

New batteries are coming on the market.

Tesla is producing a car battery for plug in electric cars that will run for 400 kilometers.

A battery for home electricity will be available for \$3000 with enough energy to take a home off the grid.

## Generating Energy on site

All the technologies needed to create buildings that operate 'off the grid' are available to consumers. The options include photovoltaics, wind turbines, solar thermal and geothermal energy where applicable.

Photovoltaics require investment now for the longer term gains of no or low power bills and minimizing use of fossil fuel energy systems.



## ENERGY ADVISORS

- **Energy Efficiency** – [EECA](#) – Energy Efficiency and Conservation Authority - General Information
- **Solar Power** – [Photovoltaics](#) (EECA). Also search for information and advice in your area.
- **Wind** – [Energywise Wind](#) (EECA)



Solar Hot Water system –  
Solarcentury solar roof tile.

One company will install photo-voltaics free as long as you undertake to sell them power.

Although they may be an expense upfront, over their lifetimes they will easily pay for themselves.



# Protect and conserve water

In many parts of the world, fresh water is an increasingly scarce resource. The pumping, transporting and treatment process of delivering drinkable water to taps consumes enormous amounts of energy. Often potentially toxic chemicals are used to make water potable. The environmental and financial costs of sewage treatment are significant. Piping is included in considerations; for example Aquatherm piping was used in the zero energy house at Pt Chevalier.

A sustainable building should use water efficiently and reuse or recycle water for on-site use (when feasible).

Then the angel showed me the river of the water of life, bright as crystal, flowing from the throne of God and of the Lamb through the middle of the street in the city.

*Revelation 22:1-2*

## DISCUSSION POINTS

### Using Water Efficiently

Incorporate water conservation in construction specifications by using high efficiency plumbing fixtures and appliances. Ideally taps should have sensors that turn them off automatically.

Any leaks should be fixed immediately. Furthermore caulk around pipes and plumbing fixtures and conduct annual checks of hoses and pipes.

For water efficiency, design the landscape using native plants that have adapted to local soil and rainfall conditions. When watering is required, reduce evaporation through controlled scheduled irrigation at dawn and dusk.

### Rainwater Harvesting

An excellent system for backup storage, toilets, bathrooms and gardens, with the installation



of water tanks to collect rainwater. Plumbing can be done to use this water instead of mains systems.

## **Greywater recycling**

Greywater use can significantly reduce the amount of drinkable water needed for landscaping irrigation, toilet flushing and other non-drinking water applications. Commercially manufactured systems that treat greywater to a standard for toilet flushing and/or irrigation are available in New Zealand.

## **Protecting water resources**

Control the substances that are flushed down toilets and sinks; any paint, oils or other form of pollutants should be avoided. Where applicable, all cleaning products, washing powders and beauty products used in the building should be environmentally friendly (free of toxic ingredients).

Avoid using pesticides and fertilisers on site that aren't organic.

### **WATER CONSERVATION & MANAGEMENT ADVISORS**

- **Water Conservation, Management and Supply & Treatment Systems** – City Councils and Regional Councils provide information on water systems and water conservation. Examples [Waitakere Council](#), [Auckland Design Manual](#)
- Check [Green Star Buildings](#)
- Search for Grey Water treatment suppliers in your area

# Optimise operational and maintenance practices

Consider the building's operating and maintenance issues during the preliminary design phase. This will improve the working environment, increase productivity, reduce energy and resource costs and prevent system failures.

I am establishing my covenant with you and your descendants after you, and with every living creature that is with you, the birds, the domestic animals, and every animal of the earth that is with you...

*Genesis 9:8*

Encourage building operators and maintenance personnel to participate in the design and development phases to ensure optimal operations and maintenance of the building. Designers can specify materials and systems that simplify and reduce maintenance requirements. This can include designing for less water, energy, and toxic chemical use.

## BUILDING ADVISORS

- Living Future Institute's [Living Building Challenge](#)
- [New Zealand Green Building Council](#)
- [INT&RIOR Systems](#)
- [System Design and Communication Services](#)
- [EpeCentre Research](#)

# References

[INT&RIOR Systems http://www.tr-interiorsystems.co.nz/](http://www.tr-interiorsystems.co.nz/)

[Jo Woods, Zero Energy House. jo@zeroenergyhouse.co.nz](mailto:jo@zeroenergyhouse.co.nz)

[Methodist Church Connexional Property Committee \(2015\) \*The Church and Building Law\*. Information Leaflet No 52. www.methodist.org.nz/administration\\_division/resources/information\\_leaflets/church\\_property](http://www.methodist.org.nz/administration_division/resources/information_leaflets/church_property)

[Methodist Church Connexional Property \(2009\) \*The Church and Property\*. Information leaflet No. 40. www.methodist.org.nz/administration\\_division/resources/information\\_leaflets/church\\_property](http://www.methodist.org.nz/administration_division/resources/information_leaflets/church_property)

[Methodist Church Connexional Property Committee, and Synod. Advice July 20115.](#)

[Norcross. B. \(2006\) \*Building a Firm Foundation\*. National Council of Churches USA, Eco-Justice Program Office http://www.ctucc.org/resources/pdfs/ToolKit\\_4P.pdf](http://www.ctucc.org/resources/pdfs/ToolKit_4P.pdf)

[Institute for Faith, Works and economics. Four Principles of Stewardship. \(adapted\) http://blog.tifwe.org/four-principles-of-biblical-stewardship/](http://blog.tifwe.org/four-principles-of-biblical-stewardship/)

[System Design and Communication Services http://www.sdcs.co.nz/](http://www.sdcs.co.nz/)

[Warwick Silvester, Chartwell Co-operating Parish, Hamilton](#)







