

RAIA ENVIRONMENT POLICY – SUPPLEMENTARY DOCUMENT

SUSTAINABLE DESIGN STRATEGIES FOR ARCHITECTS

This Note is a back-up document to the RAIA Environment Policy. It is also intended for use as a checklist and prompter of ESD issues that should be considered during the creation and use of buildings.

INTRODUCTION

The RAIA Environment Policy states an objective to implement sustainable design practices. In order for architects to meet the objectives they should consider the four following inter-related tenets of environmental sustainability at all stages of a building's life:

- bio-diversity – protect and restore ecological diversity, health and functionality
- resources – optimise their use, especially non-renewable resources
- pollution – minimise pollution of soil, air and water
- quality of life – improve the health, safety and comfort of building users.

To assist in making appropriate sustainable design decisions, the following specific design strategies and actions are recommended. They do not form a comprehensive list, merely a prompt for the most commonly encountered issues. They do not all offer solutions, sometimes just raising issues to be considered. Any recommendations are contingent upon current knowledge and technology and are therefore subject to change over time. The architect must, as always, ensure that professional advice offered is based on all relevant and available information (refer to the other Environmental Design Guide [EDG] notes for detailed information).

In the context of these strategies, 'sustainability' always refers to 'environmental sustainability'; and ESD means 'Ecologically Sustainable Development'.

1. Pre-design

If possible, influence site selection and briefing for the project.

Design strategies	Actions/examples	EDG references
1.1 Brief client on potential of ESD opportunities.	1.1.1 <i>Ensure client is appraised of all ESD opportunities, and the broader benefits of taking such actions.</i>	GEN 2, GEN 6, GEN 13, GEN 18-19
	1.1.2 <i>Actively participate in client briefing to ensure space and services in buildings will efficiently provided for the foreseen end use.</i>	DES 1, DES 5, DES 34
1.2 Evaluate appropriateness of building project and site.	1.2.1 <i>Use instruments such as Environmental Impact Statements.</i>	GEN 16, DES 18
	1.2.2 <i>Check availability of public transport.</i>	DES 16
	1.2.3 <i>Negotiate with local government authorities to improve sustainable opportunities and outcomes.</i>	GEN 17, GEN 36
	1.2.4 <i>Evaluate 'no-build' or 'non-structural' options, or re-use of existing facilities.</i>	DES 11, DES 26, DES 31, DES 38, DES 39, PRO 9
	1.2.5 <i>Consider the nature of subdivisions, which can greatly effect sustainable design options for individual sites or buildings.</i>	DES 8, DES 9
1.3 Adopt an inter-disciplinary integrated approach to design.	1.3.1 <i>Ensure selection of consultants with sustainable design credentials.</i>	DES 1, DES 36
	1.3.2 <i>Encourage a suitable fee structure.</i>	GEN 38

2. Siting and planning issues

Develop an understanding of the opportunities and constraints of the site and utilise this knowledge to appropriately plan at the macro level.

Design strategies	Actions/examples	EDG references
2.1 Evaluate site and local ecosystems to ensure they are maintained and enhanced.	2.1.1 <i>Preserve vegetation and topsoil as much as possible</i>	GEN 32, GEN 37
	2.1.2 <i>Rehabilitate and restore habitat corridors.</i>	GEN 39, DES 18, DES 40
	2.1.3 <i>Minimise construction practices which encourage erosion.</i>	DES 18, DES 26, DES 29
2.2 Maximise re-cycling of existing building stock.	2.2.1 <i>Evaluate opportunities to adapt and/or utilise existing buildings, facilities, infrastructure, etc.</i>	DES 11, DES 31, DES 38, DES 39
2.3 Appropriately site with regard to microclimate.	2.3.1 <i>Position buildings on site to allow for optimum passive design opportunities - consider prevailing winds, solar access, water supply, etc.</i>	GEN 12, DES 3
2.4 Appropriately site and design with regard to effects on natural and built surroundings.	2.4.1 <i>Consider effects on adjacent natural features such as bushland and watercourses.</i>	DES 8, DES 9, DES 41
	2.4.2 <i>Maintain or provide solar access to adjacent sites.</i>	GEN8
	2.4.3 <i>Maintain and protect lifestyle and amenities of neighbours.</i>	
	2.4.4 <i>Avoid visual and noise pollution for neighbours.</i>	GEN 24
2.5 Facilitate pedestrian and non-motorised forms of transport.	2.5.1 <i>Consider proximity to public transport and people as part of site selection.</i>	GEN 17, DES 16
	2.5.2 <i>Design in pathways and cycle-ways.</i>	GEN 17
	2.5.3 <i>Ensure secure storage facilities for transport other than cars.</i>	
	2.5.4 <i>Provide shower and change facilities.</i>	
	2.5.5 <i>Design to allow for future changes to cars fuelling – e.g. electric re-charging.</i>	
2.6 Recognise, respond and design to support the local social context.	2.6.1 <i>Provide or utilise local community and business facilities which minimise the need to use motorised transport.</i>	GEN 17

3. Concept design

Employ well considered knowledge about environmentally responsive design to appropriately plan and design at the micro level.

Design strategies	Actions/examples	EDG references
3.1 Design to maximise building and siting orientation opportunities.	3.1.1 <i>Consider appropriate building orientation with regard to micro- climate.</i>	GEN 12, DES 32
	3.1.2 <i>Consider appropriate orientation for different zones of the building.</i>	DES 2
	3.1.3 <i>Consider appropriate orientation for external areas.</i>	
3.2 Design for appropriate solar access through all seasons and for specific climate and location; maximise passive solar design strategies.	3.2.1 <i>Consider how the form of the building will effect the solar access for internal and external areas.</i>	GEN 8, GEN 12
	3.2.2 <i>Design to maximise sun penetration and minimise sun shading in winter (except in tropical climates).</i>	DES 6
	3.2.3 <i>Design to minimise sun penetration and maximise sun shading in summer.</i>	
	3.2.4 <i>Design to allow for flexibility during intermediate seasons and unseasonal weather.</i>	
3.3 Determine appropriate building form to maximise natural lighting and ventilation for specific climate and location.	3.3.1 <i>Consider window sizes, spacing, details such as light shelves and devices such as atria and courtyards to optimise natural lighting.</i>	DES 6, DES 20, PRO 3, PRO 19
	3.3.2 <i>Consider building depth and location, operation of openings in external walls to optimise natural ventilation.</i>	TEC 2
	3.3.3 <i>Consider building form and amount of external wall area to optimise thermal performance of the building envelope.</i>	TEC 10
3.4 Consider integrated sustainable systems at concept stage rather than during detailed design.	3.4.1 <i>Design for integrated energy, water and waste systems.</i>	GEN 29, GEN 30, DES 4, DES 14, DES 36
3.5 Ensure building design supports and encourages ecologically sustainable lifestyles.	3.5.1 <i>Connect users to external environment in a meaningful and educative manner.</i>	GEN 12, GEN 23, DES 19
	3.5.2 <i>Ensure building systems are easy to understand and operate.</i>	
	3.5.3 <i>Design for ease of recycling of all wastes by users during occupation.</i>	

4. Resources – Material selection

Consider all issues regarding the life cycle of materials in order to ensure most appropriate and least damaging selection and design.

Design strategies	Actions/examples	EDG references
4.1 Select 'renewable' resources in preference to finite resources.	4.1.1 <i>Protect old growth forests - avoid specifying old growth timbers; check timber sources.</i> 4.1.2 <i>Support agro-forestry timber forestry and milling techniques.</i>	PRO 10, PRO 11, PRO 15, PRO 21
4.2 Minimise the use of new materials in buildings and construction processes.	4.2.1 <i>Consider adaptive re-use of existing buildings.</i> 4.2.2 <i>Design for minimal material use through reduction in overall size of building and interior installations.</i> 4.2.3 <i>Design for minimal waste through modularisation and appropriate sizing for specific materials.</i> 4.2.4 <i>Use recycled and recyclable building elements and materials where possible.</i>	DES 38, DES 39 TEC 1 GEN 29, PRO 22 DES 31, PRO 9
4.3 Design for appropriate levels of durability and re-configurability.	4.3.1 <i>Use the concept of 'loose fit' to ensure adaptability of buildings over time.</i> 4.3.2 <i>Recommend the use of materials and equipment with the potential for longer lives and the capacity of reuse or changed use.</i> 4.3.4 <i>Specify appropriate levels of quality and finish to avoid future replacement.</i> 4.3.5 <i>Design for component update, particularly in areas of rapidly developing technologies and changing environmental standards.</i> 4.3.6 <i>Design for integrated physical solutions rather than chemical pest control.</i>	DES 31 PRO 16 DES 31 PRO 23
4.4 Select materials with appropriate properties for the application.	4.4.1 <i>Consider thermal mass to moderate temperature variations.</i> 4.4.2 <i>Appropriate levels of insulation – more insulation for extreme climates.</i> 4.4.3 <i>Consider durability.</i>	DES 4 PRO 7, PRO 8 PRO 16
4.5 Evaluate and select materials and products with lower embodied energy.	4.5.1 <i>Use life-cycle analysis techniques to evaluate embodied energy.</i> 4.5.2 <i>Consider selection of materials with regard to proximity of site.</i>	GEN 22, DES 35 PRO 1, PRO 2
4.6 Select materials and products with low toxicity and off-gassing; consider pollution caused during extraction of raw materials, production, transport, installation, in-situ and removal.	4.6.1 <i>Consider impact of selection of following:</i> <ul style="list-style-type: none"> • <i>paints</i> • <i>varnishes, polishes etc</i> • <i>glues, adhesives</i> • <i>upholstery and treatments</i> • <i>particle and other board products</i> • <i>carpets, underlays</i> • <i>PVC products.</i> 4.6.2 <i>Consider material characteristics:</i> <ul style="list-style-type: none"> • <i>low absorption</i> • <i>discouragement of micro-organisms</i> • <i>ease of cleaning with benign processes and materials.</i> 	GEN 15, PRO 4, PRO 5, PRO 6, PRO 13, PRO 14, PRO 20
4.7 Design for minimal energy use during construction.	4.7.1 <i>Consider impact of different building technologies on machinery requirements during construction.</i> 4.7.2 <i>Consider how size and weight of material components will impact on machinery requirements during construction.</i>	PRO 1, PRO 2

5. Resources – energy

Ensure the detail design, selection of appliances and energy sources results in a reduction in the building's operational energy impact across all seasons.

Design strategies	Actions/examples	EDG references
5.1 Encourage reduction of power consumption through design.	5.1.1 <i>Passive solar design.</i>	See Section 3
	5.1.2 <i>Improve thermal performance of buildings.</i>	See Section 4
	5.1.3 <i>Design for efficient building use.</i>	DES 2, DES 17, DES 21, DES 22, DES 23
	5.1.4 <i>Re-evaluate accepted comfort standards.</i>	See Section 8, GEN 15, DES 12, GEN 20
	5.1.5 <i>Provide natural clothes drying facilities.</i>	
5.2 Select energy efficient appliances and operating systems.	5.2.1 <i>Select high efficiency lights and sensor systems for operation.</i>	GEN 14
	5.2.2 <i>Select high efficiency equipment – especially for heating and cooling – throughout.</i>	DES 7, DES 37, TEC 3
	5.2.3 <i>Zone equipment systems for appropriate settings and more responsive occupation usage.</i>	
	5.2.4 <i>Employ smart building management systems to minimise energy requirements.</i>	DES 36
5.3 Encourage use of alternative and low impact power sources.	5.3.1 <i>Encourage inclusion of appropriate renewable energy forms:</i> <ul style="list-style-type: none"> • <i>active solar design – solar panels, hot water systems</i> • <i>geothermal</i> • <i>wind power</i> • <i>co-generation</i> • <i>mini hydro.</i> 	DES 10, DES 28, TEC 4, TEC 5, TEC 6, TEC 7, TEC 8
	5.3.2 <i>Encourage use of gas in preference to electricity.</i>	

6. Resources – Water and others

Understand and acknowledge the opportunities to sustainably harvest, use, re-use or recycle on-site resources during the life of the building.

Design strategies	Actions/examples	EDG references
6.1 Practise on site water conservation.	6.1.1 <i>Collect and use rainwater.</i>	DES 13, DES 14
	6.1.2 <i>Use water cycle management techniques.</i>	DES 19, DES 24, DES 27
	6.1.3 <i>Use grey water reticulation systems.</i>	
	6.1.4 <i>Utilise water efficient technologies, e.g. composting toilets.</i>	
	6.1.5 <i>Use water efficient appliances.</i>	
	6.1.6 <i>Avoid specifying water-hungry construction techniques.</i>	
6.2 Design landscape to minimise water requirements.	6.2.1 <i>Select plants appropriate to climate.</i>	GEN 9, DES 40
	6.2.2 <i>Incorporate landscaping features such as swales and dams to reduce additional water input required.</i>	DES 13, DES 14, DES 19
6.3 Practise land and soil conservation.	6.3.1 <i>Recommend building on and rehabilitating already disturbed and degraded land.</i>	GEN 32
6.4 Design to facilitate recycling of waste.	6.4.1 <i>Design for easy access to recycling facilities and separation of materials on site.</i>	
	6.4.2 <i>Allow adequate storage space for recycling materials on site.</i>	
	6.4.3 <i>Where appropriate design for on site recycling of organic waste.</i>	

7. Construction management

Ensure that the ESD initiatives included in the design process are actually implemented during the construction stage, and that the Contractor undertakes best work place practices.

Design strategies	Actions/examples	EDG references
7.1 Ensure all ESD requirements are clearly set out in specification and contract documents.	7.1.1 Use a 'green' specification.	PRO 17, PRO 18
	7.1.2 Refer to appropriate standards and procedures.	DES 26, DES 29
7.2 Restrict tenders to include contractors with appropriate ESD credentials.	7.2.1 Check contractors' position and track record prior to inclusion on tender list.	
7.3 Specify for on site environmental control.	7.3.1 Ensure storm water run-off controls are put in place.	DES 18, DES 29
	7.3.2 Stage work and employ appropriate site management techniques to preserve top soil, flora and fauna.	DES 26
	7.3.3 Require all contractors and subcontractors to engage in non-polluting construction techniques.	DES 30
7.4 Specify for on site waste minimisation.	7.4.1 Require all demolition material to be recycled.	DES 30
	7.4.2 Ensure contractors and sub-contractors sort on-site waste for recycling.	
	7.4.3 Give preference to suppliers who take back and recycle off-cuts and wastes.	

8. Building operation and management

Ensure that the ESD initiatives of the design and construction stages are properly understood and utilised by the users of the building over its lifetime.

Design strategies	Actions/examples	EDG references
8.1 Incorporate delivery of Building Operations Manual as part of standard service.	8.1.1 Directly report to building users on best way to manage building.	
	8.1.2 Manual to include easily understood diagrams and words demonstrating how the passive design aspects of the building and equipment work.	
	8.1.3 Ensure that Manual is included as part of the settlement documents if the building is sold.	
8.2 Ensure building performance is able to be easily monitored and managed.	8.2.1 Separately meter various aspects of building systems to ensure performance of each can be understood.	DES 36
8.3 Work with client to formulate suitable maintenance strategy.	8.3.1 Set up regular maintenance schedules to ensure all materials and equipment properly cared for.	
	8.3.2 Work with client to employ appropriate cleaning methods for carpets, fabrics, timber, etc.	
	8.3.3 Determine ongoing pest management system.	PRO 23