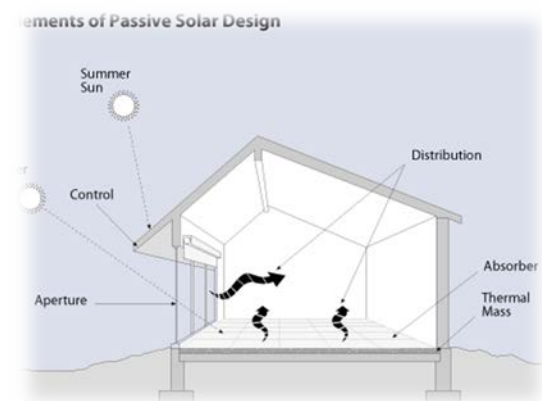
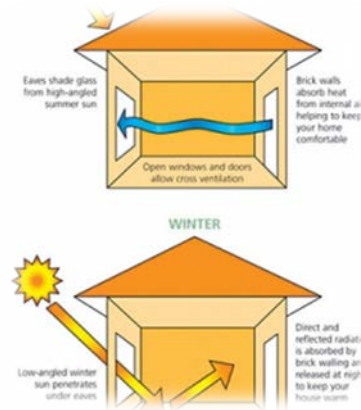
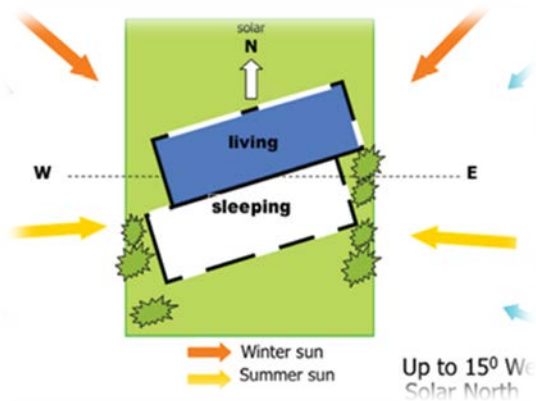




# Passive design in site and subdivision planning

Brought to you by Wodonga Council's planning team



# Outline

- Why is this important?
- Orientation
  - Principles and benefits
  - Orientation and flat sites
  - Orientation on irregular sites
  - Orientation on sloped sites
- Ventilation
  - Principles and benefits
- References

# Why is it important?

## Common myths of sustainable design

- If you can't design it perfectly there's no point doing it at all
  - Incorporating any element will make a difference, for example, more winter sun less heating needed
- Good design costs more
  - Good design in many cases can cost less than bad design, for example, smart use of space, materials
- Sustainable designs are 'weird looking'
  - Passive solar principles can be applied to any design

# Why is it important?

## Increased promotions with The Government

- Not a new concept, but a set of well established and tested design principles



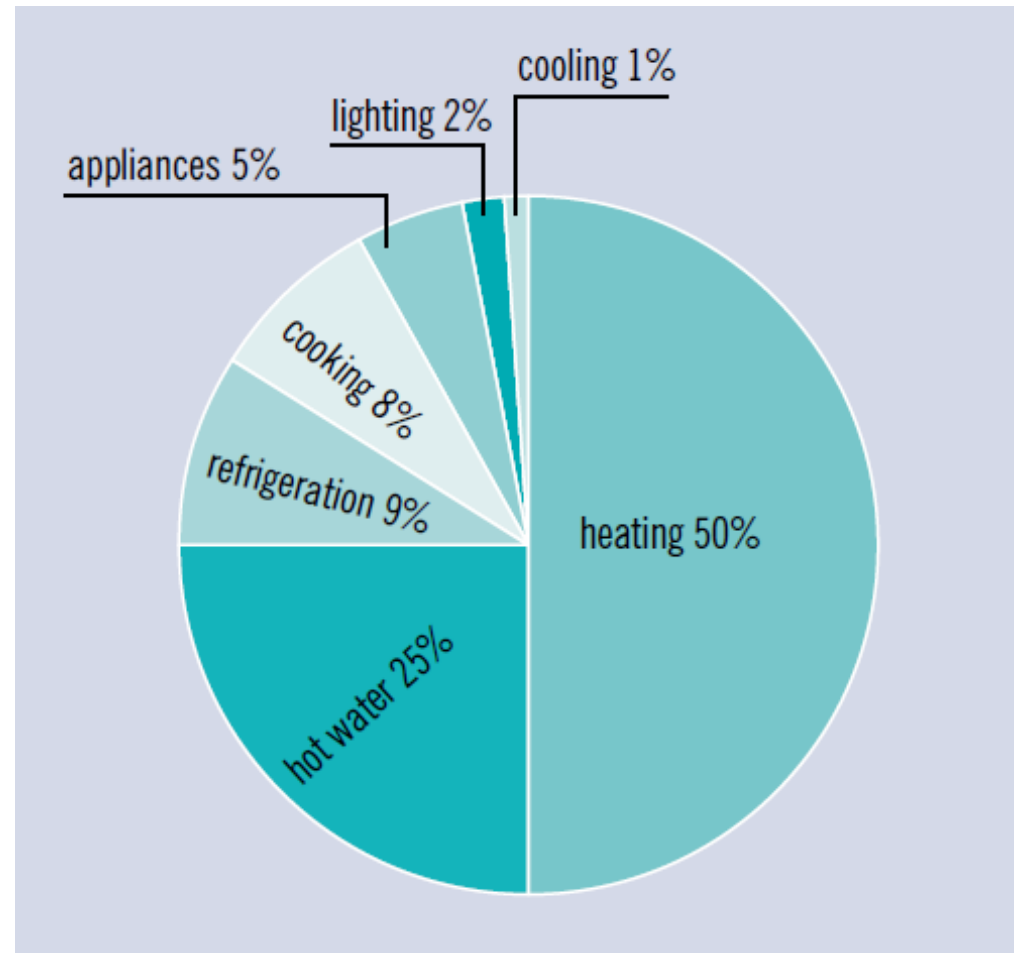
- Energy saving and low running costs

**Consumers' awareness and expectations for their properties (demand and supply)**

# Why is it important?

**Energy consumption reduced: Better long term investment yield higher property value**

- Anticipated rising demand for relevant products

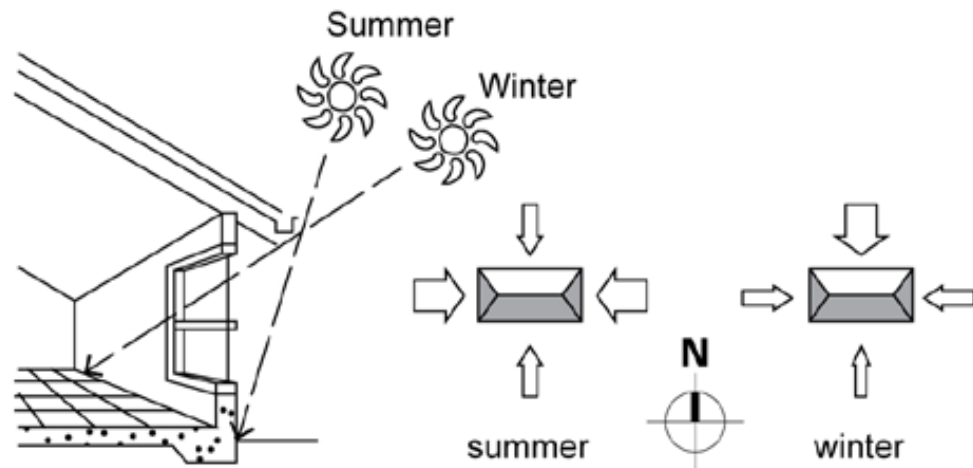
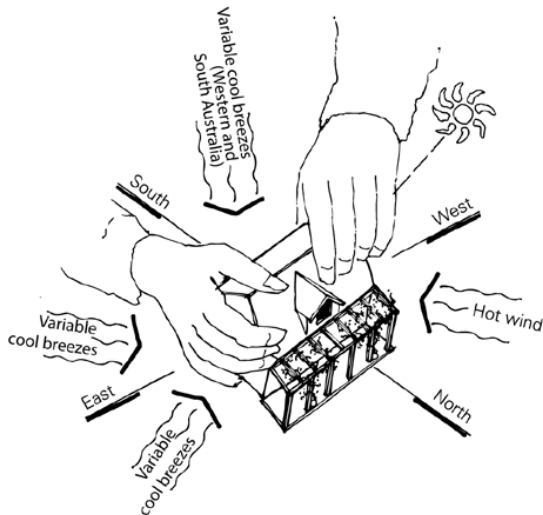


Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria

# Orientation

## Principles

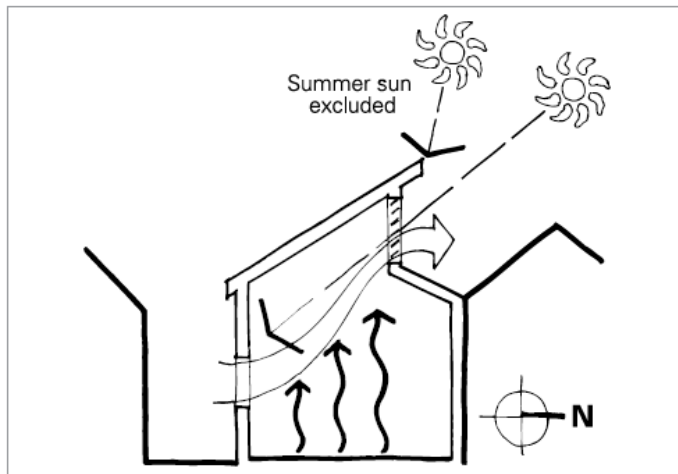
- Positioning of a building lot in relation to seasonal variations in sun's path as well as prevailing wind patterns



# Orientation

## Benefits

- Good orientation can increase the energy efficiency of homes, making them more comfortable to live in and cheaper to run



High level openable windows capture winter sun and create cooling currents in summer.



# Orientation

## Benefits

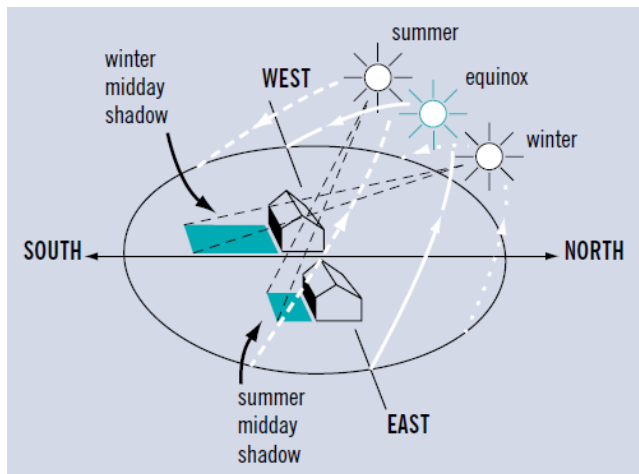
- Passive heating
- Passive lighting





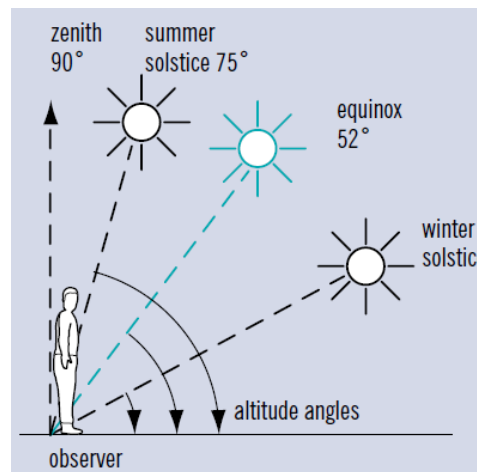
# Orientation

## How to achieve good orientation in Wodonga

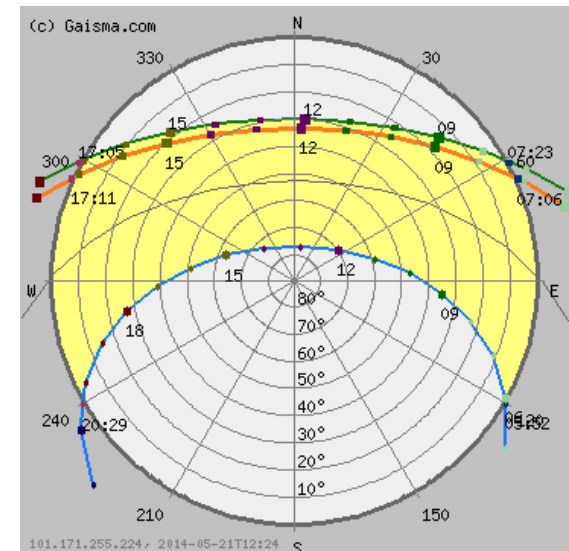


Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria

### Solar noon altitude angles for Wodonga



### Sun paths of Wodonga



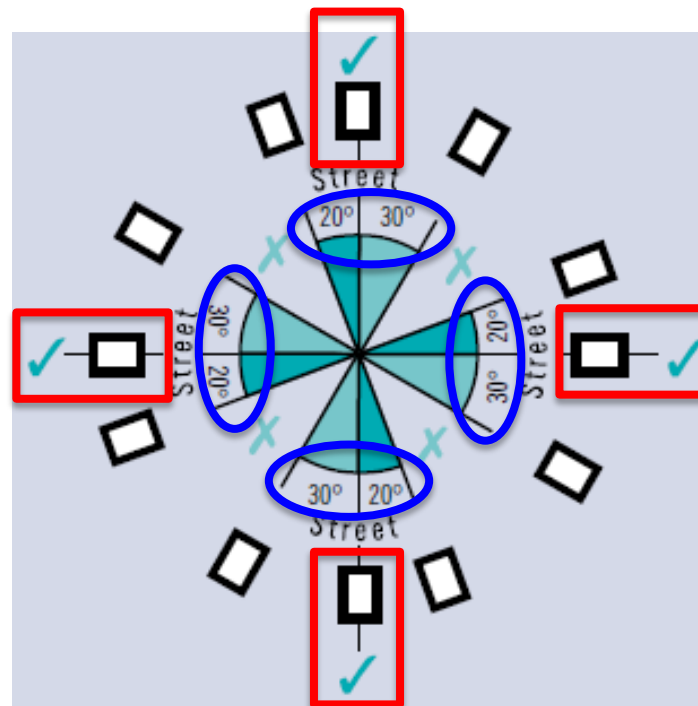
Source: gaisma.com

# Orientation

## Orientation on flat sites – for best passive solar performance at minimal cost

- N-S gridded street layout, rectangular lots

Orientation does not have to be precise, there is a degree of flexibility

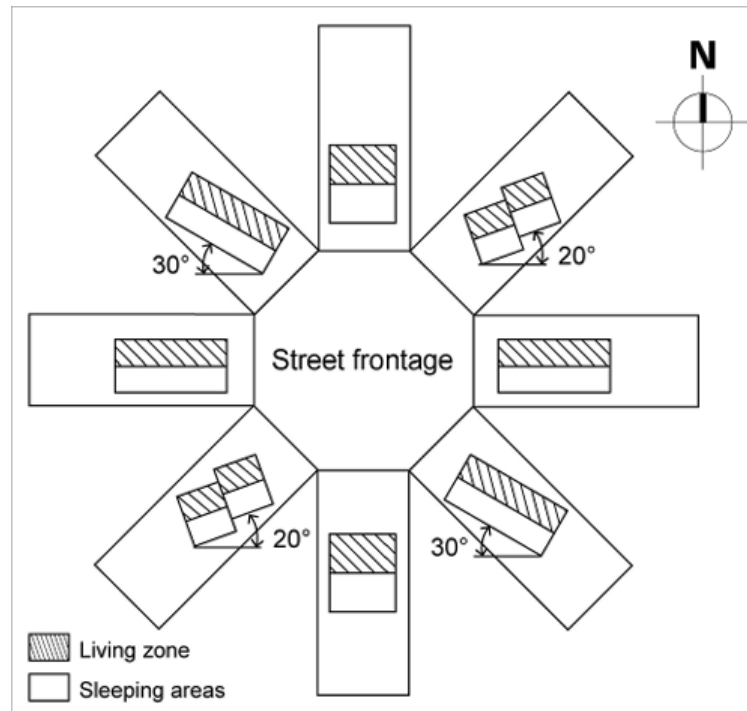


Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria

# Orientation

## Orientation on flat sites – for best passive solar performance at minimal cost

- Siting: Living areas on the northern side of lots

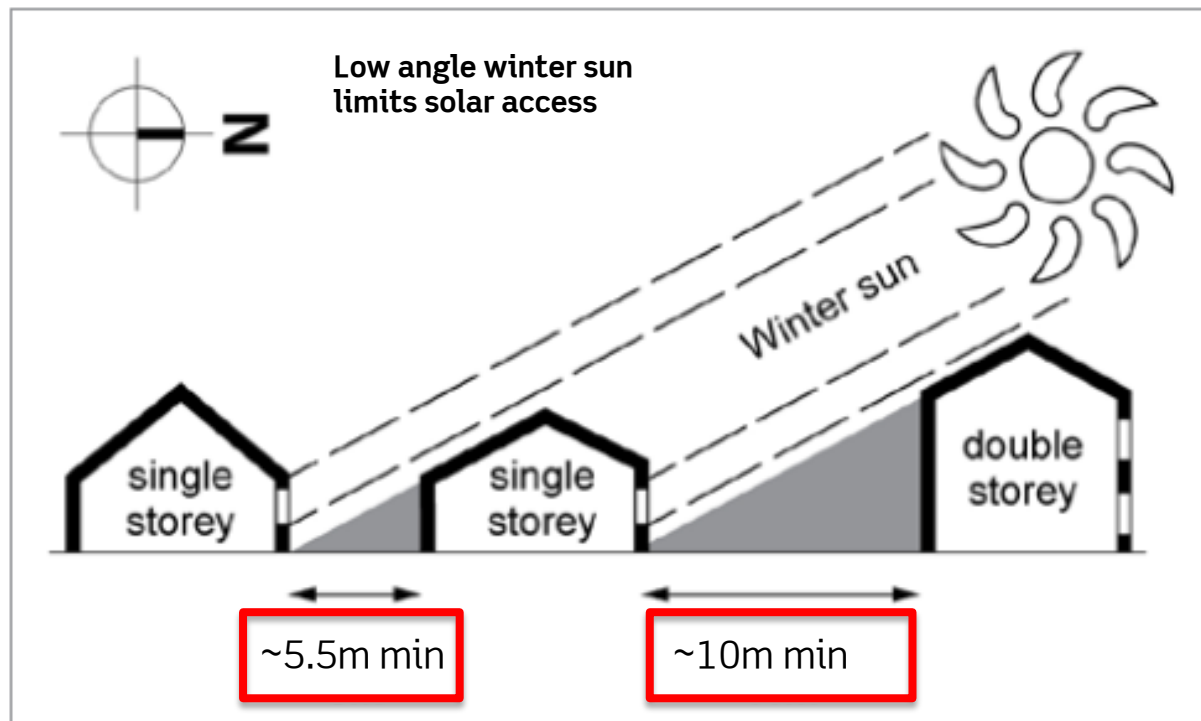


Source: *Your Home: Australia's guide to environmentally sustainable homes*, Australian Government

# Orientation

## Orientation on flat sites – for best passive solar performance at minimal cost

- Built form, setback and separation

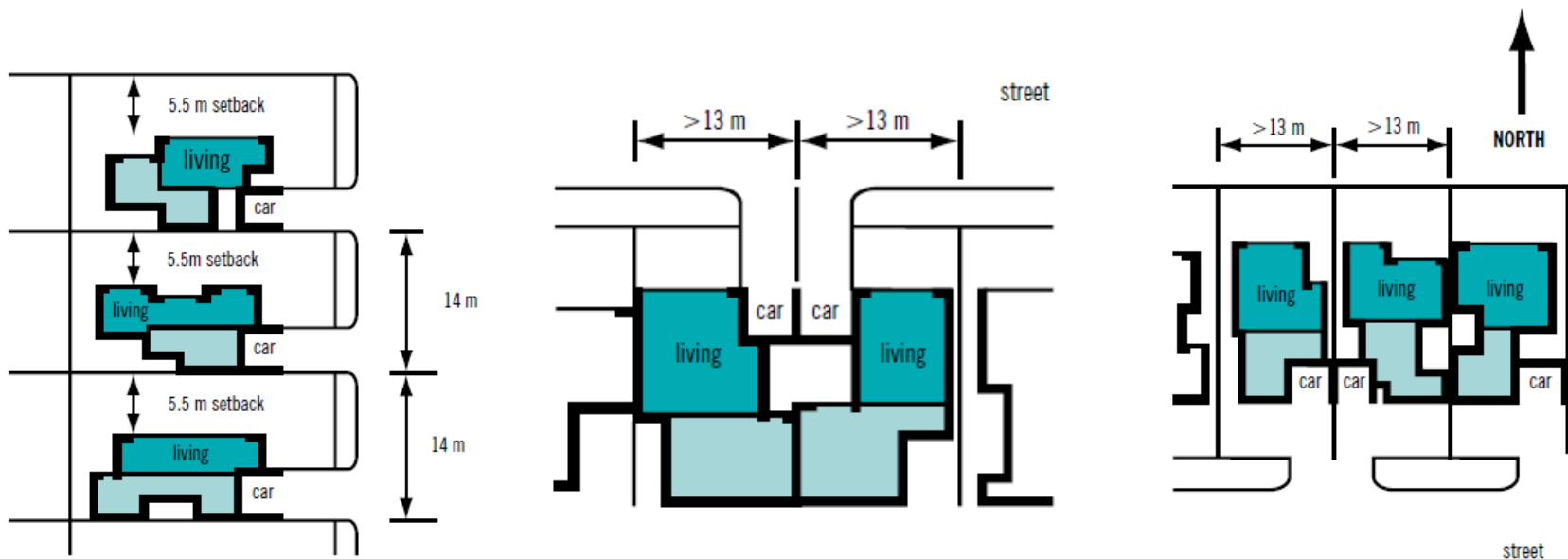


Source: Your Home: Australia's guide to environmentally sustainable homes, Australian Government

# Orientation

## Orientation on flat sites – for best passive solar performance at minimal cost

- Siting: examples

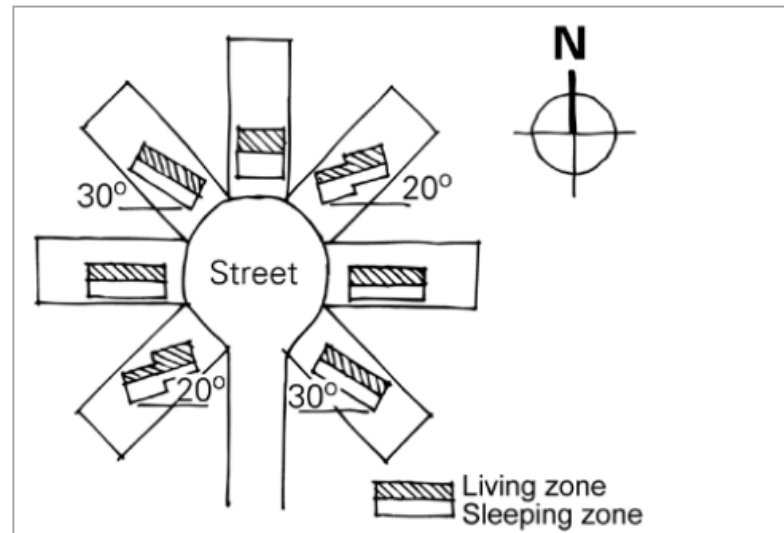


Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria

# Orientation

## Orientation on lots of irregular shapes, for example, cul-de-sacs

- Siting: Same principles as flat sites

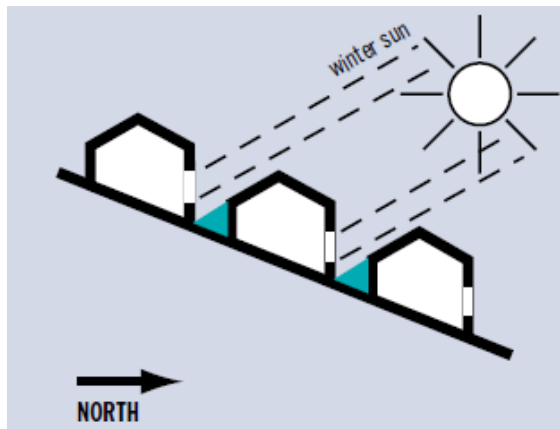


Source: *Your Home: Australia's guide to environmentally sustainable homes*, Australian Government

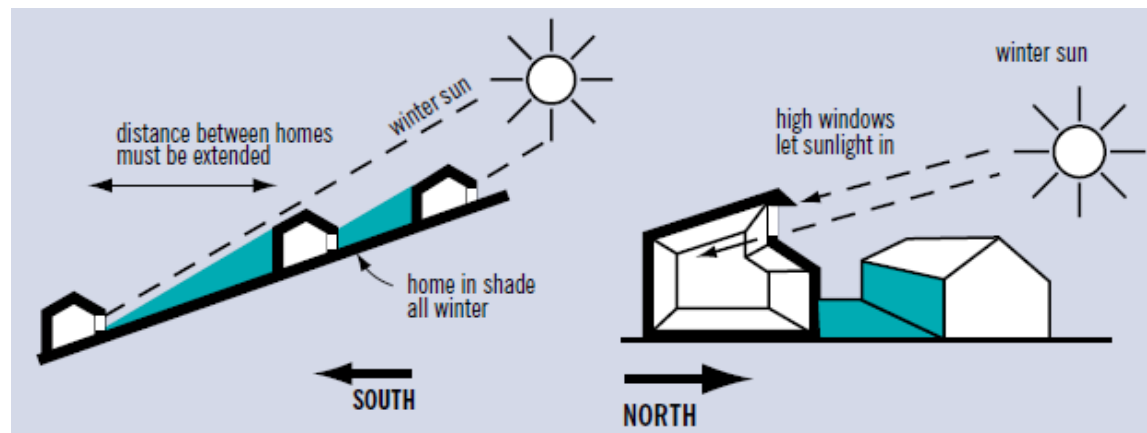
# Orientation

## Orientation on sloped sites

- Depending on slope orientation



Distance can be less on north-facing slopes






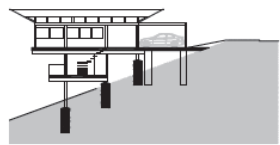
Distance need to be extended on south-facing slopes, OR consider installing high windows

# Orientation

## Orientation on sloped sites:

- Preferred built forms based on gradients
- Achieve best orientation based on built form

### MATCH BUILDING DESIGN TO SUIT THE SLOPE

<p>FLAT 0-6°</p>		<p><b>FLAT SITES</b> Single slab on ground construction (most project homes) are only really appropriate up to a slope incline of 4° or 7% as the cut/fill required becomes excessive (over 1.5m). Slopes between 4-6° should accommodate some level change within the building footprint.</p>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Single slab on ground</li> <li><input checked="" type="checkbox"/> Split or multiple slab for slopes over 4°</li> <li><input checked="" type="checkbox"/> Post and beam</li> </ul>
<p>MODERATE 6-12°</p>		<p><b>MODERATE SLOPE</b> On slopes of 6-12° (up to 1:5) step two or more slabs or use part slab / part post and beam construction to accommodate the slope.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Single slab on ground</li> <li><input checked="" type="checkbox"/> Split or multiple slab</li> <li><input checked="" type="checkbox"/> Post and beam</li> </ul>
<p>STEEP 14 - 18°</p>		<p><b>STEEP SLOPE</b> On slopes over 12°-18° (1:5-1:3) post and beam construction which steps with the site. This may include a lower part level which is a concrete slab.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Single slab on ground</li> <li><input checked="" type="checkbox"/> Split or multiple slab</li> <li><input checked="" type="checkbox"/> Post and beam</li> </ul>
<p>EXTREME &lt; 20°</p>		<p><b>EXTREME SLOPE</b> Slopes over 18° (1:3) suspended or pole construction is required. This degree of slope is more suited to a downslope configuration. Driveway access is generally difficult on upslope lots which require large batters/retaining walls and a curving driveway.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Single slab on ground</li> <li><input type="checkbox"/> Split or multiple slab</li> <li><input checked="" type="checkbox"/> Post and beam</li> <li><input checked="" type="checkbox"/> Pole house</li> </ul>

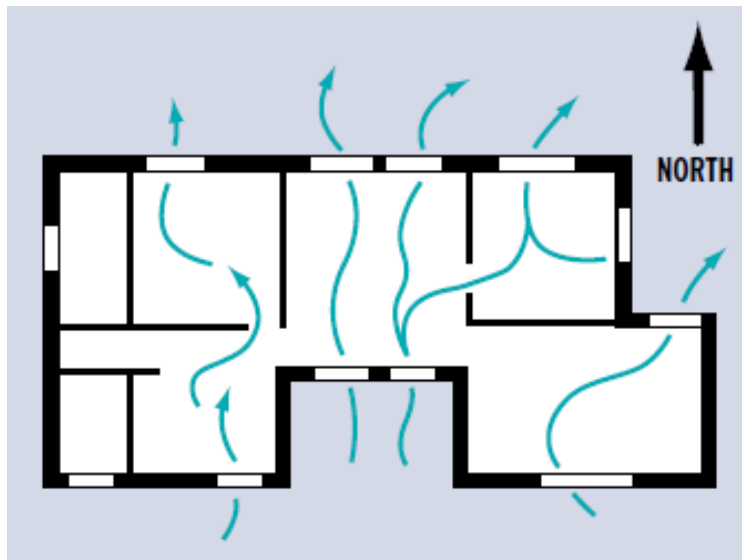
Source: *Sloping Sites: Your guide to building a house*, Tweed Shire Council.



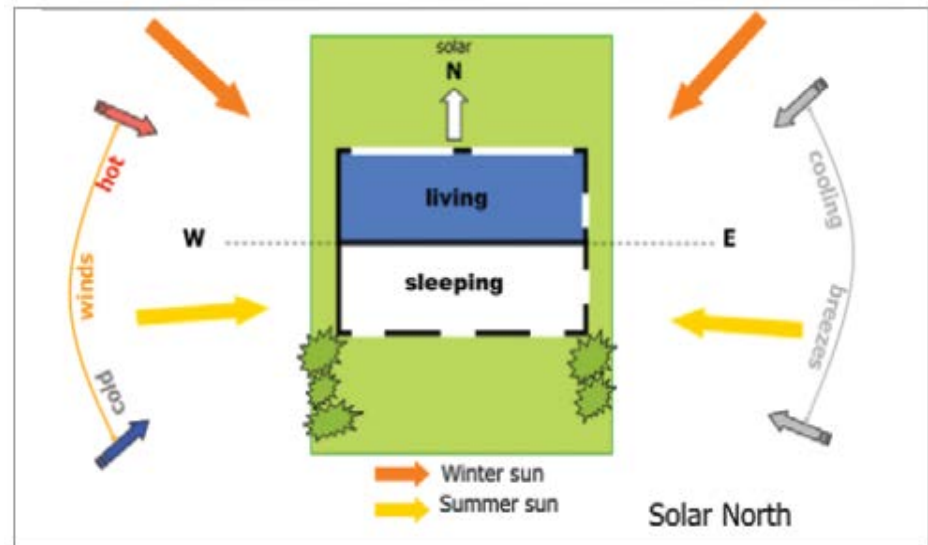
# Ventilation

## Orientation and siting to encourage natural ventilation

- Wodonga: Temperate Inland Zone



**Cross-ventilation can provide most of summer cooling needs**

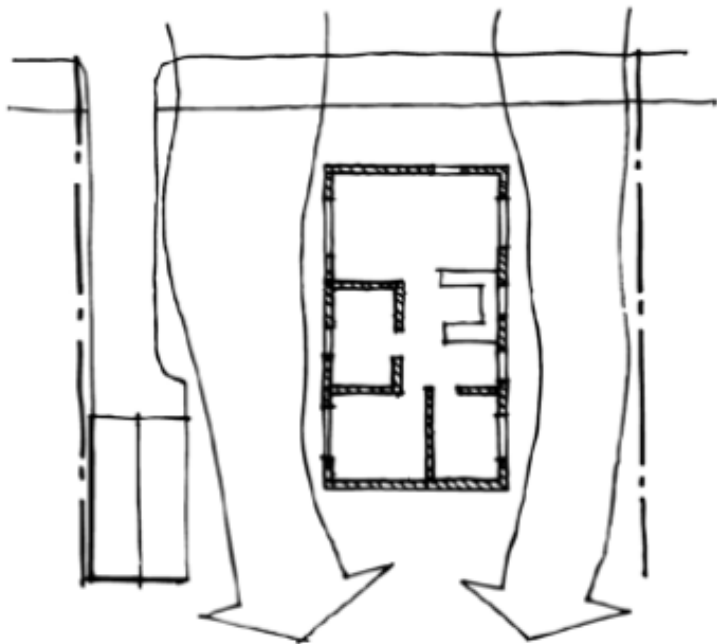


**Temperate climate orientation - day time heating and cool sleeping required**

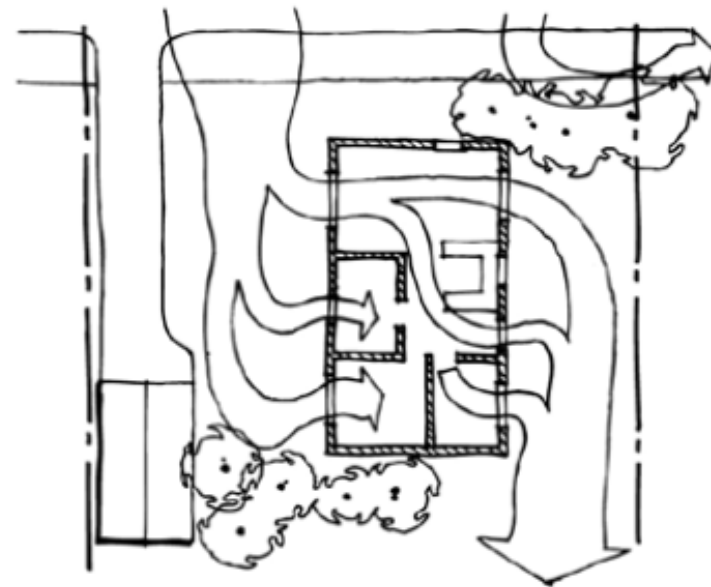
# Ventilation

- Challenging sites
- Building layout improvements

Cool breeze diversion



Prevailing breeze flows past house



Dense tree planting deflects breeze through house

# References

- Planning for Sustainable Buildings Guide, Municipal Association of Victoria, April 2011.
- Accelerating Sustainable Building in the Local Government Sector Final Report, DELWP, September 2010.
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- <http://www.gaisma.com/>