

THE HOUSING INDUSTRY IS NOT USING SCIENCE EFFECTIVELY IN NEW HOUSE DESIGNS TO REDUCE EMISSIONS OF GREENHOUSE GAS POLLUTION

V7

Anti-environmental features commonly used in current new housing	Reasons why they contribute to global warming	What needs to be done – urgently
ROOFS <i>the roof is no longer a simple cover to keep the weather out, but is rapidly becoming a critical interface between free solar radiation and internal wellbeing.</i>		
Dark coloured roofs	Increases internal room temperatures up to 7° in summer resulting in air conditioning being installed. Decreases Earth's albedo	Mandate light coloured roofs in new housing to increase reflection and albedo in summer.
Dark coloured roofs <i>with</i> air conditioners (<i>an awareness that houses get hot in summer and that a technical solution is needed</i>) – but no awareness of what is causing the problem	Increases terrestrial heat gain creating heat island effect, compounded by heat from air conditioner and pollution from electrical energy (unless from PVs - which is extremely rare)	Light coloured roofs without air conditioners. Ban all dark coloured roofs (limit to be determined). If air conditioners needed for medical reasons they must be powered from PVs (or other approved source of renewable energy)
Ineffective roof panels for PVs and solar hot water panels, eg. <i>too small in area, ineffective orientation and pitch</i>	By not enabling the installation of PVs and SHW units (new or retrofitted) the owner is forced to use fossil fuelled polluting electricity for the life of the house and <i>may be unable to retrofit at all in the future</i> .	Pitched roofs should be oriented to ~N(+/-30°) with relative area and pitch to maximize effectiveness of PVs and SHWH and should be mandatory.
Tiled roofs with many hips and valleys makes harvesting of water more difficult and expensive	Increases the need for more than one tank, needing extra resources and energy to construct = extra pollution.	Simple roof forms help to minimize collection points with (preferably) underground tanks.
Sloping ceilings parallel to the roof slope, often without any exhaust to the atmosphere in hot weather.	They are difficult and expensive to insulate against downward heat penetration in summer. They create extra space in which warm air collects in winter where it cannot be enjoyed by the residents, often requiring fans to push the warm air to lower levels, requiring increased use of polluting fossil fuels.	Flat ceilings to reduce volume of habitable space requiring heating, with highest position ridge vent and controllable ceiling vents to allow any warm air to escape vertically by free, natural buoyancy without any need for electrical assistance.
Limited or no use of skylights to increase daylighting of habitable spaces.	Lack of daylighting in interiors causes excessive use of polluting electricity.	Use roof lights and make ceiling vents (above) translucent to admit daylight, particularly in summer when curtains may be closed.
Terracotta or cement tiles have several current disadvantages which are likely to prove more anti-environmental in future increased weather intensities Predicted intensity and frequency of storms is already occurring.	TC tiles have a high embodied energy and all tiles have higher mass, which retain summer heat longer than metal roofs, causing lower internal cooling rates, often requiring more use of polluting electricity for fans or air conditioning. Predicted high winds will increase damage and replacement of <i>unitary</i> tiled roofs, causing significant extra energy input in manufacture and repair. This may well cause insurance companies to refuse to insure these roofs in future.	Although metal roofs also have a high embodied manufacturing energy, they have much lower mass, thus cool faster on hot nights. They can also be obtained with lighter colours to increase their albedo. All tiles should be wire tied to battens screwed to trusses (extra cost or all roofs should be metal, screwed down to trusses to resist suction uplift, or, if not screwed down then diagonal high tensile fencing wire over whole of roof secured to anchor bolts at lower course of brickwork.

Anti-environmental features commonly used in current new housing	Reasons why they contribute to global warming	What needs to be done – urgently
EXTERNAL WALLS, WINDOWS AND DOORS		
Dark coloured walls	Increases internal room temperatures especially on E and W sides, increasing cooling load. Increases thermal movements and possible cracking in masonry leading to damage, greater use of energy and resources.	Light coloured walls to reduce albedo effect in summer. Deciduous clinging vines to take advantage of shading in summer.
	Increases terrestrial heat gain creating heat island effect, compounded by heat from air conditioner and pollution from electrical energy (unless from PVs)	
Normal brick veneer walls (brick on the outside)	Lack of internal mass in a solar heated house contributes to daytime overheating and inadequate thermal storage for night time use = more use of fossil fuelled space heating.	Reversed brick veneer (brick on the inside) stores gained solar heat for night time use, reducing use of polluting fuels for space heating.
House plans are often irregular in shape with several external angles	Such houses have longer perimeter and greater heat losses. Tiled roofs are very complicated (several hips and valleys) and restrict location and sizes of PV arrays	Simple rectangular houses have smaller perimeter, lower heat losses and are simpler to roof, making PV location much easier and cheaper, but only if orientation is correct.
Many houses now have short elevations facing north and long elevations facing east or west.	These proportions and orientations severely limit the ingress of solar radiation, requiring greater need for fossil fuelled heating. . Southern reflectors will be equally ineffective Lack of effective sun and daylighting in interiors causes excessive use of polluting electricity and gas	Proportions close to 2:1 with the long elevation facing north (+/- 30°) will ensure more effective use of solar radiation and enables southern reflectors to be used effectively. This combination can provide up to 8 times more warmth and cheerfulness in winter, reducing heating costs and pollution.
Habitable rooms with <i>southern</i> windows receive no winter solar radiation.	Rooms remain cold and dark and consequently <i>are not used effectively</i> . If they have to be used for study or other work they will have to be heated with polluting electricity or gas. Southern reflectors cannot be used effectively with windows facing beyond more than 30° from S.	Habitable southern rooms facing within 30° of S with larger double glazed windows can be warmed free by external southern reflector panels, making the rooms more cheerful and warmer with no running costs or maintenance. The housing industry does not plan for their use or even be aware of their advantages.
Main LR windows facing beyond 30° East or West of N will not receive any effective solar radiation.	Lack of effective sun and daylighting in interiors causes excessive use of polluting electricity and gas and contributes proportionately to ill health (depression, rickets, tuberculosis) <i>all of which are statistically increasing in modern society.</i>	Solar gain from LR windows facing within 30° of N, combined with southern reflectors outside S windows will ensure warmth and cheerfulness in all habitable rooms No E or W windows will be needed or would be necessary.
Metal conductive window and door frames.	Create significant heat losses in winter and heat gain in summer.	Discontinuous metal frames or plastic coated timber frames help to reduce heat losses.
East,West & North windows are often unprotected externally against hot sun.	Excessive heat gain results which cannot be effectively corrected with <i>internal</i> blinds or curtains. Misguided reliance on air conditioning results in undesirable environmental consequences.	Fixed eaves to N windows and opaque external blinds are ineffective. Adjustable, white translucent awnings/blinds give better control.

Anti-environmental features commonly used in current new housing	Reasons why they contribute to global warming	What needs to be done – urgently
OTHER CONSTRUCTIONAL ELEMENTS		
INTERNAL WALLS		
Stud and plasterboard walls in solar heated houses have very limited mass to store gained solar heat.	Limited mass = limited storage of gained solar heat = greater use of polluting energy to maintain comfort during evening hours.	Use Micronal PCM Smartboard (German invention) instead of plasterboard (<i>not yet available in Australia due to CSR's intransigent attitude to making it here, despite many requests. Government persuasion needed!</i>). Brick or concrete internal walls with reverse brick external walls are best alternative if built on concrete slab on ground.
CEILINGS		
The ubiquitous plasterboard ceiling on battens has inadequate mass to absorb and store the higher heat accumulation at ceiling level.	Ditto = more pollution	Use Micronal PCM is currently the only material which makes the retrofitting of internal heat storage possible in existing stud framed houses <i>if available</i>.
FLOORS		
Boarded or MDF panel flooring on bearers and joists with vented underfloor space	Excessive heat loss by conduction and infiltration of cold air = more pollution as above.	If retrofitting, seal all shrinkage gaps and insulate between joists. If new house, use concrete slab with insulated edges, polished surface or dark tiles on cement.
WATER SYSTEMS		
The harvesting of roof water is not universally installed and is becoming increasingly difficult because of housing industry belief that visual complexity adds value.	The traditional, fragmented tiled roofs on undisciplined plan forms (ie. more than four corners) creates unnecessary difficulties in collection, particularly on the very small narrow blocks now becoming common.	Underground tanks will become more necessary due to shrinking block areas (<i>and more costly</i>).
LIQUID WASTE DISPOSAL		
Greywater treatment systems rarely installed in project housing. Insufficient research is being carried out.	Unless the problem of kitchen waste disposal is solved successfully (<i>such as by the Biolytic system</i>) the need for sewerage reticulation will continue. The need to maintain high water table levels high up the natural drainage system is becoming increasingly critical as natural rainfall decreases. All greywater flushed into the sewer potentially lowers the local water table level to the detriment of local plants which provide shade, soil retention, humus and food	Biolytic (or similar) treatment to treat all liquid wastes with on-site disposal could be used in most cases. The odd case where the subsoil is not suitable may force the installation of sewerage in that locality. Dry composting toilets must also become more acceptable. There will be an increasing need for a simple greywater purification system using freely available solar UV to produce sufficient potable water for a family on a daily basis. Secondary, partially purified water could be stored for toilet flushing, possibly clothes washing and garden watering without the need for chemicals and in safety.
STORMWATER		
Reliance on stormwater drains for surface water removal is still the norm in new suburbs		Surface water must be retained as high up the land as practicable using swales and sumps to ensure water retention.

VENTILATION		
Ventilation of internal spaces is almost entirely reliant on windows and doors which are ineffective in low wind speed areas like Canberra and natural buoyancy ventilation cannot take place.	Reliance on horizontal ventilation is contrary to natural physical laws leading to misguided reliance on fans or air conditioning which consumes fossil fuelled polluting electricity.	Roofs should be designed to enable hot air from the interior to escape through the highest point by free, natural buoyancy, thus drawing in cooler air at ground level to cool the interior rooms, especially overnight.
ACCESS ROADS		
Unnecessarily over-designed kerbs and gutters still impose a high cost on suburban living.	Hard paving increases quick run-off leading to floods and need for stormwater drains High volumes of concrete increase GHG pollution	Hard surfaces must be minimised to reduce runoff and maintain water table high up the drainage area. (unless topography determines otherwise.)
'FACE THE STREET MENTALITY'		
Cars, garages and carports have become dominant determinants of current suburban streetscapes and are often on the N side of houses.	Garages and carports often occupy valuable land, restricting solar access to N windows, increasing the need for polluting fuels for internal heating.	Grouped, off-site garaging must be considered. Cars are designed for outdoor use.

Anti-environmental features commonly used in current new housing	Reasons why they contribute to global warming	What needs to be done – urgently
ORGANISATIONAL		
The practice of 'Greenwashing' – misleading publicity which claims that the reality will be more environmentally appropriate than it will actually be.	As a result chaotic behaviour and entropy increases and waste and pollution continues to grow in all levels of society.	A community education campaign should be initiated by Federal Government which explains the truth of our planetary situation and stresses the urgent need for restraint and environmental awareness.
The housing industry does not appear to be conducting or stimulating any research into more effective ways of building houses to improve its contribution to society. <i>(The car industry has improved car efficiencies enormously through research, but both industries have nevertheless ignored world trends)</i>	This policy over the last century has resulted in some of the worst housing in comparable societies. It has not recognised the need for restraint in the face of climatic problems and consequently our housing stock is one of the most selfish, energy consumptive with the highest polluting levels in the world. This is completely unsustainable and cannot be allowed to continue.	More recognition of its responsibility for these problems, better, clearer regulations and encouragement of new ideas with money to develop, test and commercialise quickly with more sympathetic bureaucratic help. Government initiative is required in parallel with private initiative.
ACTPLA is not practicing what it preaches. Its good pronouncements are not followed through by appropriate approvals of DAs.	Inadequate attention to detail and unsound approvals are resulting in poor environmental performances of buildings.	ACTPLA should use qualified environmental expertise available in the community to pick up bad solar planning at the DA design stage.
The process of community consultations on DAs are too one-sided and undemocratic.	Misunderstandings, lack of detail, unequal expertise and adversarial attitudes lead to wasted energy and ultimately in excessive pollution and use of increasingly scarce resources. The profit motive is still too dominant.	Complete review of community consultation process should be undertaken by the Minister for Planning to achieve more equity between proponents and the affected community.
Non-Green politicians generally have not been trained in the 'hands on' arts and sciences and do not seem to understand the science behind the planetary problems. They appear to be overly swayed by the economic arguments of wealthy vested interests compared to those who care for the	Unsustainable decisions are made which go in the wrong direction, often ignoring the obvious but unpopular solutions in fear of poll reactions.	Greater understanding is needed by those who 'lead' of the unifying and creative power of small but widespread action by all 'on a wartime footing' toward a common goal. Establish widespread retrofitting programs, & incentives, through bodies like SeeChange. Encourage/stimulate/mandate the

environment and lack the means to shout louder.		installation of PVs and SHWHs.
Anti-environmental features commonly used in current new housing	Reasons why they contribute to global warming	What needs to be done – urgently
The annual Awards systems practiced by the HIA, MBA, the AIA and TV programs such as "Grand Designs" often send the wrong messages to the community. The programs obviously do not understand the real meaning of sustainability, concentrating on architectural novelty rather than explaining and demonstrating the need for sustainability.	They perpetuate the selfish and unsustainable excesses of western society; create false desires and expectations; care little about the consumption of polluting energy and scarce resources; are seduced by architectural extravagances, seemingly aimed at increasing profit and self-agrandisement; and are often <i>contradictions</i> of the sensible outcomes which would logically arise from an awareness of global warming.	Awards programs could be inherently good if sensibly re-directed toward sustainability issues which demonstrate a more responsible attitude. They could stress the opportunities of achieving a better world for our children by doing more with less, rather than glorifying architectural exhibitionism and the selfish desires of current generations with no thought for the future.
House blocks continue to be determined by the <i>supposed</i> primary needs of roads and services. Subdividers are apparently untrained in the art of optimising the planning of <i>solar</i> subdivisions, know nothing about the enjoyment of life in a solar house and do not follow ACTPLA Residential Design & Siting Code for Single Dwelling in the ACT .	This leads to blocks with sizes, proportions and orientations which will prevent any possibility of locating an effective solar house on them, resulting in illogical house designs with minimal solar effectiveness and consequent high reliance on unsustainable polluting energies. The primary reason for building houses for people to enjoy sustainable comfort is being ignored for economic convenience.	Subdividers must be trained for solar maximisation if we are to achieve any degree of sustainability. Really sustainable housing must conform to the more rigid discipline imposed by the sun which cannot be varied very much. We must learn to accept the end of laissez-faire planning and adopt effective solar planning techniques.
Housing design is a highly specialised professional occupation needing integrated knowledge and skill in the arts and sciences with many unrecognised health and welfare implications - yet any totally unqualified person can submit a DA for approval. Australia has been extremely neglectful in this area for the last 100 years and it should not continue.	The consequences of this laxity are around for everybody to see (<i>developers having stepped in to an uncontrolled professional area without any qualifications</i>) the result being visual chaos and physical ineffectiveness through lack of knowledge of physics and the inter-relatedness of the design arts. This has contributed significantly to global warming, ill health and future slums and will continue to do so until this primary social neglect is remedied.	All housing design must be restricted to those who are competent in this highly skilled area of design – especially as global warming is adding another layer of complexity and responsibility. Sustainability is now a paramount need for all inhabitants of this planet and <u>designers must be accredited</u> as in other far, far less important areas.
Mortgagors lend money on ineffective house designs and are taking increasing financial risks in so doing as global warming takes greater effect. Badly designed houses will inevitably reduce in value over time.	This encourages bad design by way of lack of discrimination, lack of respect or regard for others. There is plenty of evidence to prove that mortgaged houses of low quality will cost significantly more to run and will require more expenditure in future to combat climate changes etc.	It should be mandatory that loans can only be arranged on approved sustainable designs so that encouragement is given to designs which anticipate future climatic changes based on sound evidence (ie CSIRO predictions). A more skilful approval system than exists at the moment is now an urgent necessity.
Land prices in the ACT are unacceptably high with many ramifications. See paper by Jack Kershaw " New under the sun " July 2009 <jack.kershaw@work.netspeed.com.au>	There is an unhealthy reliance by the ACT Treasury on revenue from land sales which works against real sustainability, increases pollution and will eventually contribute to environmental catastrophe	Better thinking is necessary at the land sale stage along solar scientific lines to encourage effectiveness and to remove the many barriers to effective solar design. Incentives for change are needed and are listed in the paper..

Derek Wrigley / John Sandeman / Jack Kershaw / Stan Bevanda / Peter Overton
 On behalf of : Solar Housing Group. Nature and Society Forum ACT
 Contact : dwrigley@cyberone.com.au

V7
 October 2009