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Climate change in Western Australia – Issues Paper by DWER

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Introduction

The issues paper accepts without question the philosophy underlying modern society: never-ending growth in population and the economy. No one ever says what is the optimum population size we should be aiming for or what is the optimum size for the economy. Yet it must be obvious that on a finite planet, both can't grow forever.

Australian society is built on a Ponzi scheme: bring in more people so that the current population can maintain and even upgrade their unsustainable lifestyle.

This policy is in direct conflict with almost every goal of this paper. More people and a bigger economy will inevitably mean more CO₂ emissions, more waste, more demand for water, towns and cities that are less and less liveable, and increased threats to biodiversity.

There must be open and frank discussion about the population and economy that the people of WA, informed by expert advice, want to achieve.

The issues and opportunities for WA are set out under 11 key areas:

1. TRANSFORMING ENERGY GENERATION

What are the main challenges for decarbonising WA's electricity supply while ensuring adequate generation capacity, security and reliability?

- How to find and establish reliable and dispatchable power production (including storage) that is renewable and carbon free, and debunk the archaic idea that base-load generation from coal or nuclear is required;
- How to encourage/compel government, industry and householders to transfer to renewable, carbon-free sources of energy;
- How to overcome the political power of the fossil fuel industry;
- How to ensure that LNG is not accepted as the answer to WA's energy problems (the LNG sector is currently the single biggest emitter of GHG emissions in WA);
- How to ensure that native forest 'biomass' is not fraudulently presented to the public as a source of 'renewable' energy.

What are the most effective ways to overcome these challenges by 2030?

- Educate the public about the realities of energy generation;
- Remove all subsidies to fossil fuel industries;
- Provide tax relief and subsidies for industry and householders to help with the transition to renewable and carbon-free sources of energy;
- Stop all new/extended fossil fuel mining in WA and offshore. This includes LNG, coal, coal seam gas fracking, oil.

Should the electricity sector make a pro-rata (or greater) contribution to Australia's national greenhouse gas emission targets?

- Yes. The sector should aim to achieve zero emissions by 2030 or sooner, i.e., transfer to 100% renewable and carbon-free sources of energy as quickly as possible.

How fast do you think the transition of the electricity sector should occur?

- Immediate and accelerating transition, to be completed by 2030.

2. INDUSTRY INNOVATION

What measures have been implemented by your business to lower energy use or emissions?

What are the barriers to decoupling energy use and emissions in the resources sector?

- Their placing profits above their social and environmental responsibilities.

Have you assessed the implications of the low carbon transition for your business or sector? How are these risks disclosed to stakeholders?

What exemptions should apply to trade-exposed sectors in reducing our emissions?

- None because survival is more important than trade. Trade-exposed industries must transition quickly otherwise their products will not be accepted into the many countries that value low-carbon input products, as is the case with GM-free food, for example.

How can the Government of WA foster clean industries and technologies?

- Support the development of a renewable hydrogen industry;
- Support the battery industry and other innovative generation and storage ideas;
- Subsidise installation of 'batteries before the meter' for low income earners, homeless shelters, remote communities;
- Require a renewable carbon-free energy supply for mining and energy projects;
- Require phasing out of all LNG production and coal mining as soon as possible;
- From 2020 apply a new, very high state resource tax to encourage the rapid transition out of LNG and coal mining;
- Lobby the Federal Government to remove the diesel fuel tax credit scheme rebate subsidies, which discourage the use of alternative fuels and cost the Government \$6b+ per year;
- Refuse approval of all new and extended LNG mining projects.

3. FUTURE MOBILITY

What are the barriers to purchasing a low emissions vehicle for your household or business?

- High price;
- Unfamiliarity with low emissions vehicles;
- Uncertainty of energy supply in remote areas;
- Without a price on carbon in Australia, transport fuel and all fossil derived products being discounted unfairly compared to cleaner transport alternatives;
- Hidden costs of health effects of petrol and especially diesel emissions, exacerbated by Australia not adopting industry-leading emission control and fuel economy technologies and standards.

What can be done to facilitate the uptake of electric and other low emission vehicles in Western Australia?

- Educate the public with, for example, displays at shopping centres;
- Expand recharging infrastructure;
- Support production of electric vehicles (EVs) in Australia suited to Australian conditions;
- Support conversion of existing petrol vehicles to EVs.

How can we further encourage use of public transport and active transport, such as walking and cycling?

- Increase the size and number of park and ride areas;
- Remove the cost for parking at park and ride areas (make it free again);
- Do not permit any further urban development on the urban fringe regardless of current zoning. The commuter distance is already too great;

- Improve cycling infrastructure;
- Encourage infill along current public transport corridors.

How can we ensure that Western Australia isn't left behind in the transition to cleaner transportation?

- Prohibit the use of all diesel-fuelled buses and trucks as quickly as possible, especially within populated areas;
- Support the introduction of hydrogen-fuelled buses and trucks;
- Ensure that new rail lines or other forms of public transport are not located in areas of native vegetation. Removal of native vegetation reduces carbon capture and storage and destroys biodiversity;
- Repair/upgrade/reopen all the rural grain transport rail lines.

4. REGIONAL PROSPERITY

How will climate change affect your regional community?

- Hotter drier weather will make living in SW WA very stressful, and is likely to increase the use of CO₂ emitting cooling systems.
- Hotter drier weather will affect human health, especially that of vulnerable people, and hot weather also increases violence.
- Much of the native vegetation we enjoy will be dead or dying. It is already under great stress from hotter drier weather and also more frequent, more severe frosts. Loss of native vegetation will in turn increase the heat.
- Hotter drier weather increases the risk of wildfires and the ill-informed demand for increased, dangerous and counter-productive prescribed burning.

What steps can we take to further enhance the resilience of our regions and our primary industries?

- Stop any further removal of native vegetation in SW WA;
- Stop any further removal of native vegetation in the Wheatbelt;
- Stop all logging of native forest;
- Actively encourage owners of bare land to form corridors of native vegetation to link with other such areas and for governments to acquire/establish corridors where necessary;
- Plant native species as crops SW WA and the Wheatbelt.

How can we support the agricultural sector to participate in the low carbon transition?

- Provide State Government Landcare grants and expertise to propagate and plant local plant species on farms for commercial food, seed and flower production;
- Encourage links of native vegetation across the farm landscape;
- Provide advice for reduced beef cattle farming and its replacement with carbon farming;
- For the leased rangelands properties in the north, remove the minimum stocking requirement, encourage carbon farming to replace pastoralism and allow tourism to be a main income earner;
- Encourage and support traditional Aboriginal landowners on their country to manage their lands sustainably;
- Support the State Government's Outback Ranger Program in cooperation with traditional landholders;
- In low rainfall areas and the SW, on land already stripped of its native vegetation, support carbon farming of local native species as crops. Examples are sandalwood production and other tree species such as wandoo and marri for wood suitable for the building industry, furniture etc.

What opportunities do carbon offset markets present for Western Australian land managers, including Aboriginal groups?

- The opportunities for Aboriginal people in carbon farming in regional and remote areas should be well funded by the State Government and major mining companies.
- For the Collie region, offsets and increased royalties on big mining companies could fund construction of wind farms and/or solar thermal plants to replace power supply to the grid after the coal-fired power stations at Collie are closed.
- Alternatives for Collie must not include burning native forest 'biomass' because that risks stripping our already depleted and degraded native forests. Burning native forest 'biomass' to produce electricity emits more carbon per unit of energy produced than burning coal.

What matters should the State Government take into account in developing a strategy for carbon farming in Western Australia?

- The State Government should monitor and regularly report on the density of vegetation cover in each IBRA region of WA from satellite imagery to see if it increases or decreases each year. Carbon capture and storage will increase as vegetation cover increases.
- Fires have an impact on vegetation density, which will change from year to year with regrowth after fire but may take many decades, even centuries, to reach its pre-fire density. It is essential to achieve increasing vegetation cover in every region.
- The Government should employ specialists in this data collection, management and reporting in an appropriate state agency. This information should be shared locally, nationally and internationally.
- All removal of native vegetation must be stopped in the over-cleared Wheatbelt and in the SW IBRA region. This is the first step needed in order to increase carbon capture and storage as well as biodiversity conservation.
- Large-scale prescribed burning as practised in the SW must stop. It reverses carbon sequestration achievements from carbon farming and destroys biodiversity in native vegetation.
- To reduce the risk of wildfire, much more needs to be done to stop arson.
- Unplanned fires must be quickly detected and attacked immediately.

5. WASTE REDUCTION

What areas can we target to further reduce greenhouse gas emissions from waste?

- Methane production must be greatly reduced.
- Soft plastics should be banned from sale and use in WA.
- Single-use plastics such as takeaway cups and straws should be banned. This needs to be put into legislation by the State Government and rigorously enforced.
- Products that are not re-useable, repairable or recyclable should not be permitted for sale or use in WA as they end up in landfill or in the environment, including waterways and the oceans.

What can households, businesses and government do to reduce their waste and compost more?

- On-site aerobic composting and worm farms should be encouraged and supported so that organic kitchen waste and garden waste do not go to landfill.
- Lawns should be discouraged, with householders educated and encouraged to replace them with local native vegetation that requires little or no fertiliser or water.
- In mowing remaining lawns, all householders and lawn mowing contractors should be advised to take the catcher off their mower so that lawn clippings are recycled on site and are not sent to landfill, where they break down anaerobically and produce methane, a greenhouse gas worse than CO₂.
- All LGAs with support from DWER should conduct an awareness program to achieve these objectives.

6. SAFE AND HEALTHY COMMUNITIES

What are the main climate risks for your household or your community? What can be done to manage these risks?

- Smoke from wild fires and prescribed burns, which have become both more frequent and more intense because of climate change, is a significant human health hazard that should be measured and costed.
- Extreme weather events, unseasonal and increasing hot weather and decreased rainfall are all a significant threat in our SW biodiversity hotspot for native flora, fauna and the human population, especially the most vulnerable.
- The heat island effect in newer suburbs is real. The excessive areas of concrete and hard surface should be planted with local native trees and shrubs. This can be achieved on streets and on household blocks. House and building design needs changing to much smaller, solar passive dwellings (including orientation on block, materials, verandas) with much less use of concrete.
- New houses should be required to meet high environmental standards such as exist in Germany, and when old houses change hands, they should be upgraded to meet these standards before the title is transferred.
- Underground power should be installed in all suburbs so that more tree planting and cooling can take place, and the risk of fallen power lines in wild weather is removed.
- Flammable grassy weeds along street verges and especially adjacent to bushland reserves increase the fire risk. They should be replaced with native vegetation. Until then, road verges should all be mown before seed set and drying by the LGA or Main Roads, or by residents in suburban streets.

- Prescribed burning in the SW region should be minimised because smoke is a serious health hazard, and prescribed burning threatens biodiversity, increases the spread of flammable grassy weeds and may stimulate arson activity.

What are your biggest concerns about Western Australia's future climate?

- We are doing too little too late. The reality of climate change and its harmful consequences have been known for decades, but the self-interested merchants of doubt have prevented Australian Governments from taking action.
- Exponential increase in average temperatures, declining rainfall especially in the SW region and increased number and intensity of extreme weather events will continue, with all their harmful impacts on the human population and the environment.
- We are already seeing significant degradation and loss of biodiversity and ecosystem stability.
- Western Australians are not aware of or prepared for the interacting harm to their wellbeing and the environment from climate change (hotter drier weather; more frequent, more severe frosts; more frequent, more extreme weather events; rising sea level and more storm surges), and more frequent, more intense fires.

What could be done to ensure your community is better prepared for possible climate impacts?

- Help local governments to conduct education programs about steps people can take to prepare for the consequences of climate change;
- Provide government grants and incentives for fans, solar panels and solar hot water systems, especially for vulnerable people;
- Retrofit existing housing with insulation, daylighting and energy efficient systems;
- Reduce outdoor hard areas of concrete and replace it with heat- and drought-resistant native trees and other native vegetation;
- Discourage the destruction of old but liveable homes and their replacement with block-covering mansions that result in the removal of all vegetation;
- Using suitable local native species, plant urban forests where there are now water-guzzling lawns;
- Provide underground power to all suburbs;
- Increase rapid detection and preparedness for very fast attack in the event of fire;
- Invest in more water bombers, for example, six Air Crane helicopters (7,000 litre drop), based in Perth, Bunbury, Margaret River, Manjimup, Albany and Esperance;
- Encourage local people with fire fighting equipment and experience to respond to local fires without waiting for departmental action;
- Invest in arson prevention programs such as the successful Juvenile and Family Fire Awareness (JAFFA) program by DFES;
- Educate all primary school-aged children about fire, its behaviour and dangers so that they understand and are not tempted to play with it;
- Increase arson-watch programs especially for residents adjacent to and near bushland areas;
- Find *The death of a wombat*, have it updated and play it in schools

7. WATER SECURITY

What can we do to encourage Western Australians to use water more efficiently and adapt to a drying climate?

- With groundwater levels declining on the Gnangara and Jandakot Mounds, review the use of groundwater for home gardens and its impact on groundwater levels;
- Introduce metering of domestic and government use of groundwater;
- Immediately make restrictions for domestic home bore water use the same as for scheme water, i.e., in summer twice per week only,
- The volume of groundwater used by LGAs for irrigating sports facilities, public places etc should be reviewed and reduced. Sprinkler systems that deliver large droplet sizes (compared with fine spray and misting) are more efficient and should be mandatory.
- Prohibit the extraction of groundwater in areas adjacent to bushland reserves;
- Work with LGAs to help them and ratepayers to replace lawns and gardens of exotic plants that require fertilisers and a lot of water with local native plants.

Are there policies adopted in other jurisdictions we should consider for Western Australia?

- The Water Corporation should be required to recycle all wastewater for re-use rather than pumping secondary treated water out to sea. The Water Corporation is proposing to duplicate the Sepia Depression Ocean Outlet Landline (SDOOL2) pipeline rather than upgrade treatment for re-use such as potential industrial use at Kwinana. The SDOOL2 pipeline risks destruction of the CE TEC Lake Richmond thrombolites. DWER/EPA must stop it.
- Treated wastewater could be used to grow tree crops in agricultural and near country town areas.

What are the best management options to deal with the water security implications of climate change for our agricultural sector?

- For the drying Wheatbelt region, invest in revegetation with local species on farms and along roadsides. Revegetation may help increase rainfall;
- Require the most efficient irrigation techniques for all licensed horticultural users. A volumetric charge should be introduced for all agricultural and horticultural licensed users with meters installed and monitored by the Government as is the case for domestic potable supply in Perth. This would drive much more efficient use.
- Impose new limits in the next Gnamangara groundwater allocation plan. Substantial new limits on groundwater availability are urgently needed.
- Learn from the catastrophic failure of government allocation and control of water use in the Murray-Darling Basin. Do not fund or approve the environmentally disastrous proposal by the Southern Forests Irrigation Co-operative Ltd to dam Record Brook/Donnelly River for private profit at taxpayers' expense.

8. LIVEABLE TOWNS AND CITIES

What are the key barriers to improved energy efficiency for our built environment?

- No requirement for passive solar design;
- No requirement for energy efficiency through passive solar design for both residential buildings and commercial developments;
- No requirement for solar panels and solar hot water on buildings. They should be mandatory for all new buildings and renovations.
- Excessive use of concrete and paving resulting in far too much hard surface area and lack of vegetation and shade. This includes 'plastic lawn', which is laid on a hard base, stopping water infiltration and also creating a heat sink.
- No requirement for regulation of the use of concrete, production of which causes very high CO₂ emissions.
- Increasing demand for excessively large houses on small-medium blocks where no trees or vegetation cover are retained.

What information or tools do you require to improve energy efficiency in your household or workplace?

- Assessment of energy use and recommendations for improvement.

What energy efficiency standards or disclosure measures do you support for our homes and offices and the appliances we use in them?

- Require highest construction standards for all new dwellings (passive solar design features including north facing windows, double glazing, windows for natural air flows, daylighting, space lighting, insulated ceilings and walls) and retrofitting to these standards when the property changes hands;
- Require rooftop solar panels and solar hot water systems for all new dwellings and their installation when the property changes hands;
- Prohibit black or dark coloured roofs;
- Encourage replacement of gas appliances with electric appliances and work towards cutting off gas supply to homes and offices in association with installation of solar panels and solar hot water systems;
- Build or retrofit with small smart interior design;
- Educate the community about the disadvantages (economic, social and environmental) of big houses and the value of small houses with 50% green area retained on the site;
- Install roof gardens on multi-story buildings where feasible;
- Minimise paving and tall and dark colour fencing;
- Plant local native trees and shrubs to provide shading especially on the west side of buildings.

How do you think climate change will affect the liveability of your neighbourhood or region?

- Houses will be hotter.
- Streets will be hotter.
- Trees and gardens will die off from increasing heat and lack of water (already happening).
- People will stay indoors more and socialise less.
- There is likely to be more violence.

How can we improve the retention of vegetation, particularly tree canopy, in our cities and suburbs?

- Impose a total ban on removal of native vegetation and remnant trees (regardless of the zoning);
- Provide greatly increased funding for DBCA so that all Threatened Ecological Communities (TECs) and habitat of endangered species and all Bush Forever Areas are properly protected and restored. This includes the Banksia Woodlands TEC and Tuart Woodlands CE TEC. and many other TECs. These are valuable public assets that capture and store CO₂ and also improve public health and wellbeing.
- Stop outer urban sprawl with introduction of an 'Urban Growth Boundary'.
- Install underground power in all suburbs and cities;
- Introduce a program to decrease the area of concrete and hard cover on verges, driveways and around houses and other buildings;
- Require an increase in green area cover in established suburbs;
- Require 50% green area in redevelopments and new developments;
- Retain trees and native vegetation remnants in redevelopments;
- Get LGAs to introduce tree protection. Removal of any tree greater than 3 metres high should require written approval of the LGA.
- Plant local native plants on suburban street verges and in gardens;
- Advertise and increase the sale at low prices of local native plants from, for example, Apace and the Kings Park quarterly native plants sales;
- Give landholders information on local native plant species, and advice and assistance on turning lawns on verges into native gardens.

9. RESILIENT INFRASTRUCTURE AND BUSINESS

What are the key climate risks for the primary industry or resources sectors?

- Some farms will no longer be viable for farming.
- Reduced rainfall and higher temperatures will result in reduced pasture production for stock, reduced animal carrying capacity of farms and reduced crop yields.
- On-site living conditions for workers in the resources sector will be even harsher.
- Water required by the resources sector will be needed by other sectors (domestic, agricultural, dairy).

Do you currently assess the impact of physical climate risks on your business, assets or infrastructure?

Is there information which would assist you to do this better?

What are the best ways to enhance the resilience of public and private infrastructure?

- The integration of large-scale renewable energy projects such as solar farms, solar thermal plants and wind farms near country towns and/or near the grid would help. With battery storage, they could be independent of the main grid and 100% renewable and carbon free. Thus after initial capital cost, they could provide cheaper power. Reliance on expensive and loss-producing transmission lines will be reduced or eliminated.
- There could be smaller scale renewable energy projects on individual properties or on small groups of properties. This would be beneficial in remote Aboriginal communities.

10. PROTECTING BIODIVERSITY

Can existing land use and biodiversity management practices be modified to reduce vulnerability and improve resilience?

- Yes.
- In the assessment and approval of proposals, minimise the use of offsets. These enable the unjustifiable removal of native vegetation and rarely if ever see replacement of like with like.

- Stop removing native vegetation and where possible, revegetate stripped land with drought resistant native species;
- Using satellite imagery (such as Land Monitor), monitor and regularly report on vegetation cover (Normalised Difference Vegetation Index - NDVI) in each IBRA region of WA. This information is needed so that the Government and the community can know whether vegetation cover is increasing or decreasing, and if the latter, take steps to reverse it.
- Completely revise fire management and place much less reliance on prescribed burning. Prescribed burning produces GHG emissions and air pollution that is a serious health hazard, depletes capacity to capture and store CO₂, kills native flora and fauna that may or may not recover, and reduces biodiversity, especially in fragmented areas such as the Perth – Peel regions. Long unburnt (>30 years) forest and bushland areas may have the lowest fire risk and lowest ground fire fuel load, and support the highest populations of fire-sensitive fauna and flora. Wildfire risk is not necessarily related to fuel load.
- Abandon the 2,000 ha/yr target for prescribed burning in the SW. It is unhelpful and may be counterproductive. More meaningful KPIs for fire management should be used:
 - no one killed or injured (whether by fire or by smoke);
 - no valued property destroyed or damaged;
 - no native plant or animal driven closer to extinction.
- Abandon the ill-advised requirement to have 45% of the SW region with a fuel age less than 6 years. The amount of prescribed burning this necessitates is a threat to human health and disastrous for biodiversity.
- Prohibit prescribed burning on the Swan Coastal Plain because it destroys threatened biodiversity, increases flammable grassy weed growth and worsens fire risk;
- Modify fire management practices by:-
 - increasing capacity for rapid detection;
 - using water bombers for immediate attack in the event of fire;
 - having Air Crane helicopters (7,000 litre drop) based in Perth, Bunbury, Margaret River, Manjimup, Albany and Esperance;
 - installing large edge sprinklers especially in urban areas;
 - expanding arson watch and JAFFA program;
 - removing flammable grassy weeds on road verges adjacent to bushland and replacing them with native vegetation.
- Complete the gazettal of all already approved national parks and nature reserves throughout the State;
- Complete the implementation of all regional parks recommendations;
- Greatly increase State and Local Government funding for management of the conservation estate;
- Increase collaborative support and funding for community groups to assist in managing bushland reserves, especially in the Perth and Peel regions;
- Fully implement Bush Forever as planned, with all sites fully protected and managed as ‘A’ class reserves;
- Greatly increase funding of DBCA Swan Region to manage Bush Forever Areas as planned.
- Invest in protecting and restoring links between existing patches of bushland in the Perth and Peel regions and especially along regionally significant ecological links and potential links as defined in Bush Forever.
- Increase re-introduction of endemic native fauna to Bush Forever Areas and other reserves as they greatly help reduce the fuel load and associated fire risk.
- Actively control foxes and cats especially in the Perth, Peel and SW regions, where current DBCA budget constraints limit control measures to a handful of nature reserves.
- Greatly increase efforts to reduce the numbers of feral animals (pigs, camels, goats, horses, donkeys, deer).
- Retain small patches and individual mature remnant trees, and all roadside vegetation especially in the Wheatbelt and in the Perth and Peel regions.
- Improve awareness amongst LGAs about the need to retain and manage remnant trees and vegetation on all their lands, especially roadsides.
- Improve management capacity and expertise by LGAs to properly manage and restore their native vegetation remnants and links.
- In the Perth and Peel regions especially, increase funding for DBCA and LGAs for grassy weed removal which will help reduce vulnerability to fire and its destruction of biodiversity. This should involve hand weeding by trained hand weeding teams.

Are there opportunities for new collaborations with landholders or communities to address climate risks and improve biodiversity outcomes?

- Yes.
- Landowners should be encouraged to have conservation covenants with the National Trust or DBCA on their native bush. These should be made free again and not a cost to the landowner.
- Bushland with a conservation covenant should be exempt from stamp duty when ownership is transferred, just as it is exempt from land tax.
- Teams of hand weeders can be trained and employed by landholders, LGAs and/or DBCA to remove grassy weeds from reserves on the Swan Coastal Plain especially in Banksia woodlands, which are vulnerable to disturbance.
- There are many opportunities for landholders to work with local communities to help manage and remove invasive species and thus improve biodiversity outcomes.
- Landowners who cannot get a permit to remove their native vegetation and are thus ineligible for carbon credits should be rewarded and helped to manage their bush with, e.g., advice and financial assistance for fencing, weed control and fire management.
- To address climate risks and improve biodiversity outcomes, we must close the major knowledge gaps in our knowledge of biodiversity state wide. Substantial government funding should be provided to conduct a range of new citizen science projects in conjunction with government and academic specialist scientists for surveys and monitoring of fauna, flora and ecological communities.

11. STRENGTHENING ADAPTIVE CAPACITY.

Are there gaps in the availability of adaptation knowledge, climate information or skills for your community, organisation or sector?

- Yes. As described above.
- It is not known how much and where native vegetation is being removed each year (i.e., the net loss of vegetation cover and hence carbon capture and storage) on all lands.
- It is not known how much and where land is burnt in wildfires and prescribed burns.
- Information on local native flora species suitable for revegetation projects for each region and soil type should be readily available. Landholders and community groups need the help and advice from a contact person such as a botanist with the relevant knowledge of flora species for their area.
- Local Government authorities especially in rural and remote regions lack knowledge of their local native vegetation, rare flora sites and the need for their protection, especially on roadsides and lands they manage. Roadsides are graded and burnt, and rare species carelessly destroyed. This needs to be addressed.
- Farmers and land managers in remote areas need contacts with the relevant local knowledge of flora and fauna species. Aboriginal elder knowledge of country should be shared with community groups and landholders.

How can these be addressed?

- The Government should provide substantial funding to conduct new citizen science projects in conjunction with government and academic specialist scientists for surveys of native flora, including fungi, vegetation communities, and native fauna, including invertebrates.
- The area and extent of vegetation cover and removal in each IBRA region need to be monitored and made publicly available by the State Government. At least 6 monthly and annual data updates need to be available on line, with changes shown. This enables the net changes in vegetation cover and density (NDVI) to be reported.
- The area and extent of land burnt in wildfires and prescribed burns should be shown on data maps for each 6-month period.
- LGAs need to be educated about their local native vegetation, flora and fauna species. They need to be advised to stop all clearing of their roadsides and to manage them and restore significant sites with replanting of the local species, especially if rare. Increased roadside tree and shrub cover increases tourism values in rural areas, increases wildlife habitat and resilience and has a cooling effect.

What are the main barriers to the adoption of effective climate change adaptation?

- Ideology
- Selfishness
- Greed
- Stupidity
- Ignorance
- Widespread ignorance of actions that can be taken at the local level and individual landholder level.
- Lack of State Government leadership.
- Lack of State Government funding and incentives for:
 - renewable energy production at the householder and small business level for solar panels;
 - installation of solar hot water;
 - transition to carbon-free transport for domestic and industrial users;
 - biodiversity management especially by DBCA;
 - scientific expertise and capacity in government.
- Lack of State Government (via DPIRD) support and funding for:
 - carbon farming and growing of WA native tree species for building materials and furniture manufacture in WA;
 - ecological links across the rural landscape as in the Gondwana Link example.
- Defunding/inadequate funding of environmental NGOs and catchment councils, e.g., Warren Catchments Council.
- Lack of government action via the *Environmental Protection Act* to prevent increases in Greenhouse Gas Emissions from new or extended fossil fuel production (especially LNG and fracking) whether for WA use or for export.