

## **The Tasmanian Forests Agreement 2012.**

### **A critique Attachment One.**

**By John Hawkins**

The Agreement is between the

Australian Conservation Foundation,  
Environment Tasmania Inc.  
The Wilderness Society Inc.  
The Wilderness Society (Tasmania) Inc.  
The Australian Forest Contractors Association,  
Australian Forest Products Association,  
Construction, Forestry, Mining and Energy Union (CMFEU),  
Forest Industries Association of Tasmania (FIAT),  
Tasmanian Forest Contractors Association,  
Timber Communities Australia,  
Tasmanian Sawmillers Association.

The number of industry or forest related organisations far outweigh those for conservation. If the CMFEU is counted, there are 8 organisations that are pro-forestry, and 3 that are conservation oriented. This is not seen as equity.

There is no “community” input and the community has not been engaged in this process. In 2013 this is regarded as retrogressive. It isn’t equitable.

There are 17 pages in the Agreement if all pages are counted but only 12 pages of text. It took over two years for the signatories to reach this end point.

1. Shared Objectives. (p. 3) The industry want an ongoing ‘ “vibrant” forest industry based on “native forests and increasingly, in the future Plantation. “ (p.3) If by this is meant business-as-usual, then there can be no peace in the forests. Nowhere is there an objective, a vision for a price-maker industry. For an ecologically sustainable industry.
2. “Protection of significant additional areas of native forest” (p. 3) Important here are the words “significant” and “additional”. This is motherhood. Means little as stated. Vague. Imprecise. Too generalised.
3. There is an agreed “Vision”. We’ll come to that.
4. Industry requirements, transitional arrangements, support for workers and contractors, the transition to greater use of plantations, reference to residue solutions, take up pp. 4-7 and part of 8. Conservation outcomes take up less than 1

page, (pp. 8-9). What is called “Durability” or the setting up of a Special Council, certification, dispute resolution (pp. 9, 10) takes several more pages. There are Institutional arrangements and the Nature of Obligations, (p.11, small part of 12). Definitions are at p.14, part of p. 15. The Vision occupies p.16, part 17.

Overwhelmingly then, the statements that have been made are those that suit the industry.

5. Vital maps are missing making any public assessment more than difficult. There are least 4 of these; *Maps A and D*, which apparently identify agreed wood production zones, speciality craft and timber zones but also the 504,012 ha. forests with important conservation values. *Map C* – extension to the World Heritage Zone, *Map B*, (which might show 395,199 ha. following Protection Orders) + tranche 2 (?) (108,813 ha. by March 2015) possibly agreed areas arising from 2022 Durability Report. (Clauses 7, 8 p.4; Clause 37, p. 9; Clause 35, p. 8).

Maps were obtained at the very last minute. They are meaningless. No scale has been given. The whole of the state is represented. This means that the scale, (if there is one) is enormous; possibly more than 1: 1,000,000. No doubt they have been digitally produced (i.e. pixels) and so would be available at resolutions such as 1: 5,000, 1:10,000. Why are these types of maps not available to the public? Why are not maps available which link topography to areas under consideration, contoured maps that allow genuine consideration of what is, or isn't to be reserved, what is, or isn't Timber Production Zone? Such maps ought to be provided before any decisions are made.

6. Reserve status is critical. We have been given no idea of reserve status in any of the documents to hand. Some Tasmanian reserves are much more “secure” than are others. For example Informal Forest Reserves have no “secure” status. “Regional Reserves” have less conservation protection than do National Parks.

7. Clauses 4, 5, 8, (under Industry Requirements, p. 4) indicate that “at least 137,000 cubic metres per annum of high quality sawlog” is mandatory. Peeler wood supply agreements are not included; they have to meet “renegotiated contracts arising out this agreement”. So far then, their total is open ended. There are regional sawmill requirements (Cat 2 and 8) for a “secure supply of low quality sawlogs.” Special species timber forms another group requiring timber; this group will have a special species management plan.

8. The maximum cap of allowable cubic metres per annum; is it 300,000 cubic metres or more? This type of fuzziness is not acceptable.

9. There are to be transitional arrangements. Noted is that there will be some “short-term” logging in some areas identified for reservation” (Clause 10, p.5). The agreed transitional Schedule has to be in place “prior to the issuing of the Protection Order.” No time has been set within which this must occur. This order of obfuscation is not acceptable. How long is a piece of string?

10. Clause 14 (p. 5) notes that “additional funding may be required to complete this program” (that is the Tasmanian Native Forest High Quality Sawlog Contract voluntary Buyback Program).

11. It would seem highly likely that there will be additional funding allocated for workers and contractors to exit the industry. (See Clauses 17-21, p. 6).

Across time the Tasmanian forest industry has received untold millions. It is not considered conscionable at this time to fund the forest industry further, considering that essential services (doctors, nurses, police, teachers, support staff, etc) are being pruned to the bone.

12. The transition to greater use of plantations can be found on pp. 6-7 Clauses 22-27. This needs to be read in conjunction with residue wastes (pp.7-8, Clauses 28-32). “The signatories agree on the need to develop and implement a plan for utilisation of the existing and *future plantations* as an integral part of a future forest industry.” (p. 6. Clause 22).

Further information on plantation development is found in Appendix 1. If the added intent for further plantation development is to be for biomass and carbon sequester, it is not supported. Appropriate policy has not been developed. Monoculture in particular is not supported.

Information on how plantation development has impacted on Tasmania’s landscapes is found in Appendix 2. No reference is made in the TFA document re landscape apart from two oblique references (at No 8 and 12) in the Vision.

This submission does NOT support further plantation development as envisaged in the TFA, without strong, rigorous, mandated land management policy that crosses all jurisdictions. This would involve fundamental changes to the pattern of forest industry previous practices. Land planning, heritage, biodiversity provision, climate change research, fire research, natural resource entities etc. have to be involved. Resilience of our natural and cultural resources is a vital key element. Nowhere is resilience of the natural environment considered.

13. The TFA is to focus on a “solid wood supply” .. (Clause 23) with Clause 24 noting, “the Signatories call for a review of existing and potential policy initiatives that will incentivise and facilitate investment in and management of plantations for solid-wood products from existing plantation land to assist with a greater reliance on plantations in Tasmania.” (Clause 25, p. 7).

See Appendix 1, especially that which relates to water and plantations, climate change and fire and plantations.

14. There is a call for further government funding. The signatories want direct investment in a (1) Public Plantation Management Fund “to support investment in

improved plantation management” (production of solid wood, reconstituted wood), (2) Plantation Manufacturing Innovation Fund (to encourage private investment in solid and reconstituted plantation wood manufacturing, to assist in transition to increase demand for plantations) (p. 7. 26).

Not supported. See above and Appendix 1.

15. Residues will be produced as a result of forest activity. The “full range of options” has to be a priority, such solutions consistent with a transition to a “greater” reliance on plantations. (Clause 29. p. 7) The Signatories want to urgently achieve access to the Triabunna facility (Clause 30, p.7).

See Appendix 1. It would appear from this generalised statement that there is an intent for biomass production in Tasmania. If this is the case it must be stated plainly, openly, so that everyone knows.

See above and Appendix 1.

16. The two governments, signatories, independent experts, commercial interests and representatives of the two governments are to investigate “the economic viability and environmental sustainability or a range of proposals to minimise and process, value add and/or utilise wood residues...” (Clause 31 (a), p. 8)

This appears to be about biomass. Energy requirements? Plantation expansion Mark 2. The public may be given the opportunity to comment it notes. When? When it’s all done and dusted.

17. The conservation outcomes are stated in Clauses 33-39. Exactly what amount is to be reserved as “legally binding” is far from clear. Without adequate large scale maps it can only be guessed at. The Durability Report hasn’t been made public. In the mish-mash of hectares, with no time limit on the administrative transitional schedule there appears to be a potential for considerable areas to be logged, for Carbon Offsets and /Sequestration projects to be established, while the transitioning is taking place. Given the clauses in the Bill, linking to the Commonwealth Carbon Credits Bill, there is nothing to stop such projects from being established.

18. Under the TFA the Government is not bound to deliver the land tenure reserve status with the greatest amount of integrity or rigour. Clause 36 (p. 8) notes Government “should” rather than government “must.” A vital difference.

19. One can postulate that perhaps a new “type” of reserve status, (e.g. Carbon Sequestration Reserve) could conceivably emerge. Reading between the lines such a reserve would be able to be logged and re-logged. This is not supported.

20. A stakeholder Council is to be set up (in the Bill this is called the Special Council). It will comprise exactly the same organisational mix and same organisations as delivered the TFA. This is not supported.

21. Instead of Multiple Use Forest Land the name is to be converted to Permanent Timber Production Zone. It sounds retrogressive as a way forward. I'm presuming that the public will be excluded from these "production" zones. A lot of "blue" is found on the map provided. Nowhere has Permanent Timber Production Zone been defined. It is not defined in the Bill.

22. The Forest Practices Code from memory has been "under review" since 2000, (Clauses, 53, 54, p. 11), for twelve years. Someone correct me if I'm wrong. Bill Manning in particular spoke of the anomalies in the FPC and outlined them clearly. When the FPC is compared with the recommendations of the background documentation for the RFA, the cherry picking that occurred was quite disgraceful. Placed against the Independent Expert Advisory Group's (IEAP) Final Document for the Regional Forest Agreement, (1997) the FPC was a failure. There are so many aspects of the FPC that did not meet ecological sustainable development. Forest Practices Plans are secretive documents. I am aware (information from a senior member of the FPA, 2007 (?)) that only the front page (the "housekeeping page") from any FPP was being archived. Thus any specialist reports, any additional information will have disappeared into the ether. That is reprehensible.

23. Attachment A. (The Vision)

There are 13 clauses in The Vision as well as 3 paragraphs which state Tasmania's vision. Given what has been outlined elsewhere these highly generalised comments are a disjunct. They cannot be met. The detail is missing as is evident from the comments in this document. Would the plantation development as envisaged proceed with the same degree of self regulation in the past, how would the "forest products supply chain" allow "for sustainable utilisation of all harvested forest resources" be implemented. Conservation wants a "protected" area system that is consistent, but what exactly is this and how are the "reserve lands" to be divided up? It asks for a "long-term" approach to land and resource management which optimises "conservation functions at a landscape level." The actual meaning of this is far from clear and also unclear is how the forest industry would reply to "conservation functions" at a landscape level. In the past they have actively resisted anything at a landscape level.

Exactly how is the long term "vision" possible given that Tasmania has no overarching land management department, no strategic planning department, a forestry sector and GBE that insist on self regulation. The TFAA will (if passed) will take precedence over some of the State's most important land management acts where any inconsistency occurs. How is that equity? The vision asks for "strong, cohesive and resilient Tasmanian communities" but how can this be effected when the vast mass of the Tasmanian community has been entirely left out of the forest process. A "fair reconciliation" hand is extended to the Aboriginal community, but

they too have been left out. Finally for management agencies and regulatory institutions, the Vision asks for decision-making to be “efficiently integrated at a landscape level.” Just precisely what does this mean? Does it mean more than consideration of one coupe? Consideration of place and character of place as defined by ICOMOS (International Council on Monuments and Sites) or even other Australian jurisdictions?

24. Reserves might be seen to be light years away from being proclaimed as “secure”; that is statutorily protected. Fundamental structural reform is required. Equity of purpose, transparency in intent, rigour in decision making....

### **Appendix 1. Plantations.**

One could write at length about the massive dislocation that has occurred across Tasmania over plantation development especially 1990-2012. Below is purposely brief but introduces elements as to why future unfettered, unregulated plantation development across Tasmania is extremely poor land management and land use.

With those comments in mind, given what has been written in the TFA, and the Bill /Act it would be madness to repeat what has happened previously and allow the Bill to become legislation.

The pattern has to be stopped.

### **Plantations and Tasmania’s land size.**

Tasmania is quite a small island, 6.8 million hectares approximately. A significant part of the western part of the island is very mountainous but the topography elsewhere generally is hilly. Much of the western area of Tasmania has been proclaimed as having World Heritage Area status.

Tasmania therefore has a finite number of hectares that are available for agriculturally based production. Limits of cultivation are set by Tasmania’s topography – said to be the most mountainous island in the world – and what follows on from that.

Critically Tasmania has very little prime agricultural land (e.g. 70,000 ha approximately). It only has around 1.6 million ha of agricultural / pastoral land in total. This land should be kept for food production.

This land is only partially protected by Tasmania’s PAL policy. It is a policy, it doesn’t have statutory protection.

The flatter, lowland areas of Tasmania occur along river valleys, and are located in the north and north west of the state. These lands contain prime agricultural soils (Class capability 1-3). There are no vast areas of flat to undulating land to compare in size to similar agricultural or pastoral use lands in New South Wales and southern Queensland for example. Of the 6.8 million hectares, there is a disparity in findings

between two reports for hectares available for agricultural and pastoral activities in Tasmania. That of the Senate Select Committee,<sup>1</sup> *Plantations 2004* (gives a figure of 1.6 million ha.) and Davey and Maynard (2003) 1.9 million hectares.

## **Plantations and Administration**

There is no department of land management in Tasmania. That is an entity that has under its umbrella, Agriculture, Planning, Forestry, Private Forestry etc.

Disparate, disconnected departments siphoned off for political ease are what we have.

There is no Department of Agriculture in Tasmania. The Department of Primary Industry, Parks, Water and the Environment replaced the Dept of Agriculture. But it is multi-faceted and there has been a downgrading of research and extension where agriculture is concerned. The Tasmanian Institute of Agricultural Research (a joint role between UTAS and the state government) does not deal with the issues raised in this submission.

- It would appear no organisation, no government entity is overseeing and monitoring the change or rate of change which is occurring across rural Tasmania. There needs to be “flexibility” in rural use of land according to world changing markets and climate change. The Tasmanian Farmers and Graziers organisation appears to favour overseas investment.
- There is no Department of Planning in Tasmania.

Strategic research isn’t mandated. Intimately linked are Tasmania’s less-than rigorous planning laws and policy, the forest industry’s self regulatory laws and practices, and less-than rigorous heritage legislation or policy.

Tasmania urgently needs comprehensive land management and land use coordinated research for all its rural lands. Their change, their resilience, the “new normal” ahead of us has to be factored in; piecemeal or nothing is simply not good enough. Forestry sits outside of any land planning regulations too, has always done so, insists on this state of affairs. In other jurisdictions this simply does not happen. Considering the enormous challenges ahead of us (eg climate change) this dominance of one land use over others is archaic.

Australia had a Senate Select Committee examine land use policy in 1984; this called the *Standing Committee on Science, Technology and the Environment: Land Use policy*. Then, the government had the opportunity to carefully examine land use in Australia and formulate appropriate policy to deal with land conflict and competing land uses. It failed to do so. Canada it should be noted by the late 1950s had commenced to develop the *Canada Land Inventory*. It was quite a sophisticated assessment (for its time) and gave classifications for land uses, (and potential areas of conflicts).

## **Plantations and land use**

### **Food production**

- Food production is critical to our survival. Tasmania's rural land should be primarily used for food production. It must not for be used for inflexible rural land uses that lock land up for decades. We've already had that experiment. Regional evaluation and land use change should be a critical priority at state and national level. We do not want to become a net food importer in the future in Tasmania because our productive farm land has been sold off, property, by property, title by title to overseas interests. Leasing of land by corporatised, highly industrialised entities has to be very carefully monitored.
- Tasmania should be a special case if compared with the Mainland due to its limited areal size overall, its limitations due to topography, its heritage land patterns.
- Tasmania has little rural land available for agricultural and pastoral production when compared with other Australian states. Its topography and water availability has governed this. Any national interest test for Tasmania should be invoked at much lower levels than is currently the case.

## **Plantations and Tasmanian Farms Overview**

- Compared with the Mainland, Tasmanian farms are smaller in size, have sale prices well below the Mainland, have farm owners who are ageing.
- Acquisition can occur title by title. It's death by a thousand cuts, farm by farm, property by property. There is no wider more rigorous assessment of what land is being lost in the national interest. The domino effect is a part of this change over in farm ownership. There is evidence that plantation development has altered land titles in some instances. Creating smaller titles.
- Soil capabilities, see elsewhere in this Appendix
- Rural land conflicts and traditional farm production, see this Appendix.
- Ownership. Tasmanian farms have traditionally been owned and owner occupied sometimes across a hundred years or more. Much of the present change is one to corporatised ownership. For example, Tasman Farms (City of New Plymouth, New Zealand, a large shareholder) bought the Van Diemens Land Company in the N.W. are now expanding dairying and clearing large areas of land.
- The MIS /2020 Vision, was an excellent example of corporate change in land use from 1995 -2012 with plantations. Significant areas of rural lands were corporatised.
- Such corporatisation has enormous implications for traditional farm patterns, heritage landscape patterns, implications for Tasmania's tourism industry

### **Farm facts**

It appears to be 2003 since Tasmania updated its statistical information and an agency or consultant group collated relevant information, needed for a submission such as this one. What is required urgently are statistics that relate to the first decade of the twenty first century.

There appears to be no recent statistical update for critical elements of farm change at the state level in Tasmania. Reports cited here relate to information that was published, up to 2007. Changes that have been assessed, are from the 1980s, and 1990s.

The greatest degree of land use change and land use conflict has been in Tasmania's north and north west and has been associated with plantation development as a result of the MIS, the 2020 Vision and Gunns' announcement to build a very large pulp mill at Longreach.



## **Farm location**

The Mersey-Lyell Region was noted to have Tasmania's largest number of agricultural establishments, (farm) with 37.9% of the state's 4,286 farms in 2000-01. This was followed by the Northern Region, with 35.8% of all farms, and the Greater Hobart-Southern Region, with 26.3%.

The Northern Region had Tasmania's largest area of holding, (farm size) in 2000-01, with 840,809 hectares or 44.1% of the state's total of 1,906,759 hectares.<sup>2</sup> The Greater Hobart-Southern Region had 742,247 hectares, 38.9% of Tasmania's total, and the Mersey-Lyell Region had 323,703 hectares, 17.0% of the total.

The Greater Hobart-Southern Region had the largest average farm size, in 2001, with 659.2 hectares. This was followed by the Northern Region, with an average farm size of 548.1 hectares and the Mersey-Lyell Region with 199.1 hectares. The Tasmanian average farm size was 444.9 hectares in 2001.<sup>3</sup>

## **Farm production type**

DIER gave a figure of 75-80% of total farm area in Tasmania as being given over to broad acre farming; this included sheep and beef farming and cereal cropping.<sup>4</sup>

## **Cash farm income**

The cash farm income for example of Tasmanian farms can be compared with the Mainland on map plan 1 in a 2011 ABARES<sup>5</sup> report (p. 108). This indicated that Tasmanian farms were in the bracket of income \$50-000 - \$100,000, (farm cash income, broad-acre and dairy farms). The map, showed that compared to the average ten years to 2009-2010, Tasmanian farms had not shifted into a higher cash farm income bracket by 2010-2011. They were expected to reach \$80,000 by 2010-2011.<sup>6</sup> By comparison a significant proportion of Mainland farms had a cash income greater than \$100,000.

## **Age of Tasmanian farmers**

The Tasmanian Institute of Agricultural Research in Senate committee *2010 FPIA Report*, noted,<sup>7</sup>

The age of farmers is rising to the point where in other industries most would be retired. The entry of newcomers is restricted by costs of entry due to the need for large scale farms to be efficient in the existing systems and to the small proportion of the total food value that returns to growers.

It is highly desirable that farms be owner occupied and not managed for large corporations. An owner occupier has on the whole a much greater 'investment' in the land to manage it into perpetuity than does a corporation. We already have a convolution of "land management" issues over the MIS idiocy.. Land is held by, leased to, managed by, etc. etc. and it will increase, carbon rights, carbon sequestration etc. etc. etc.

## **Loss of farms.**

Davey and Maynard in 2003 for example found example that the number of farms had declined by almost 20% since 1986; significantly that 75% of total agricultural establishments were found in the northern and north western NRM areas<sup>8</sup> (so relatively close to mill sites or industrial forestry processing).

Simon Bevilacqua<sup>9</sup> in a disturbing article of 2005 also noted farm disappearance.

Almost 800 Tasmanian farms have disappeared in the past decade. The number of farms has fallen by a whopping 17% in that 10 years, that's almost one in five Tasmanian farms shutting up shop. The latest Australian Bureau of Statistics figures suggest that Tasmania's image as a paradise of rural life where local produce comes fresh from the family farm may be losing currency. .... The decline in Tasmania is substantially worse than interstate...

Material released online by the Department of Infrastructure, Energy and Resources,<sup>10</sup> [DIER] queried the degree of farm change suggesting that the loss might be explained by the accounting procedures that were used in 1986 for Estimated Value of Agricultural Operations as against those used in 2001. Their report noted the trend towards larger farm sizes, and output. Even so, comparisons of value with Mainland farm income is palpable. In 2001, 'there were slightly less than 1,000 establishments with an Estimated Value of Agricultural Operations of \$200,000 or more.'<sup>11</sup>

The Davey and Maynard figure does not tally with more recent material released by ABARES. Tasmanian farms were shown in 2009-2010 to be in the income cash bracket of \$50,000-\$100,000.<sup>12</sup>

### **Farms and land use change; The distorted market place**

The Senate Committee 2010, *FPIA Report*<sup>13</sup> devoted its Chapter 3 to Managed Investment Schemes. At 3.12 the committee quoted from a submission by MS & A.

The overwhelming majority of schemes have focused on the short rotation pulpwood.

At 3.16, MS & A argued,

This is an argument about access to capital. In the MIS case ... [investors] can obtain capital which is subsidised by the government up to nearly 50% of the principal, being the top tax rate, while the farmer must buy in capital [from the banks] at full cost and with no subsidy on the principal amount.

The NSW Farmers Federation argued at 3.26,

When firms are selling products (i.e. woodlots, olive groves etc) and investors are primarily focused on buying something else (receiving a tax deduction) issues develop when the financial focus is shifted away from the commercial viability of the business' productive operation. The result sees a business entity not operating under the normal market supply and demand forces that guide sound operating decisions.<sup>14</sup>

A further consideration in respect of property valuation<sup>15</sup> is the 'passive income' in the form of rental generated under a lease to a main timber company.

One such factor with plantation is the concern investors will have as to what occurs at the expiry of the lease term – i.e. the first rotation of trees. Depending on market conditions prevailing, an investor may find they will be left with a non-income producing asset at the end of the first rotation or 15 year cycle.

It can be anticipated that in the future if the TFA and the Bill are allowed to proceed there will be further enormous pressures and competition exerted on the Class 3-4-5 lands in Tasmania, given the aggregated set of incentives which would actively foster plantation development, (eg. possible carbon accreditation for plantations, location distance to the mill, ease of the present 'one-stop shop' system of forestry regulation, biomass planting out). If the Davey and Maynard figures, (p. 38) are compared with figures issued in 2006 by Private Forests Tasmania for Class 1-3, and Class 4 land, the actual hectare totals seem to have gone backwards, (Davey and Maynard (2003)<sup>16</sup>: Class 1-3: - 4,400 hectares: PFT,<sup>17</sup> (2006) – 4,300 hectares: Davey and Maynard: Class 4: 22,100 hectares: PFT, (2006) 21,500 hectares.

What happened with MIS was that it quickly translated into land valuation<sup>18</sup> changes which emerged for particular classes of land, notably Class 4 as predicted above.

Statistical data indicates that there has been a dramatic increase in the [tree] plantings of class 4 land, with some 8,446 hectares of Class 4 land planted with plantation [2006]. In 2005 this figure was 2,703 hectares and in 2004 the figure was 1,263 hectares [Private Property Plantations in the Landscape in Tasmania as at 31 December 2006].

This dramatic increase in Class 4 land has been at the expense of a continual reduction in the acreages of Class 1-3 land planted.

The continual development of plantation has seen the value of Class 4 land increase from a rate per hectare in the vicinity of \$1,200 p /ha. in 2002 to values in the vicinity of \$3,500 p /ha in 2008.

It is not a level playing field further explained below. Soil capability and water holding capacity are vital ingredients to farm sale. This apparently is already a given.

In respect of valuation change<sup>19</sup> the water component is now an aspect of the valuation given.

Value of water will be dependent upon its security and supply. Whilst water rights may be in place, the security and the full allocation of these water rights is becoming an important consideration.

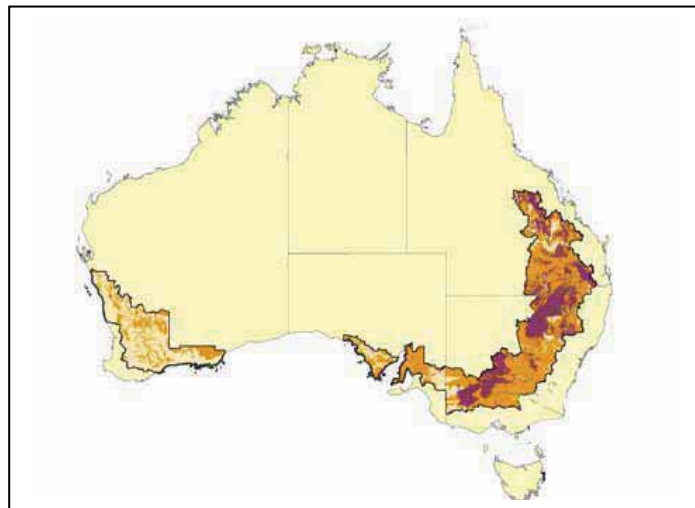
On Tasmanian farmer, noted to me that,

'water and its value is a huge potential problem with non-producing investors buying water rights already. Theoretically market forces will decide the best use for the water according to what farmers can pay, but is the market truly unbiased? The plantation schemes suggest that no market is truly free and therefore able to accurately apportion resources.'

The farmer noted that ‘assuming carbon taxes or carbon trading comes into play, then naturally fertile soil all over the world will become more valuable and sought after, because it will require fewer inputs in the form of fertilizers and diesel fuel. Artificial nitrogenous fertilizers are all made from fossil energy. At some stage in Australia we will hit peak availability of both phosphorus and potassium; fertile soils will become even more valuable and sought after’.

The map plan below for all of Australia is from ABARES.<sup>20</sup> *Australian Commodities*. March quarter 2011 is revealing despite the small scale.

The pale yellow soil type shown for all of Tasmania was called a sandy loam. In Tasmania the capacity of a soil to hold water will be in the future a critical aspect of cropping and whatever other agricultural land use comes to the fore which requires water (See Plantations and Land capabilities).



## Plantations and soil and land capabilities

### Prime agricultural land

Tasmania has very little land with a soil capability of Classes 1-3. Davey and Maynard<sup>21</sup> in 2003 committed itself to ‘in general there is a relatively small amount of prime agricultural land in Tasmania,<sup>22</sup> whilst (at a later stage buried in a table), noting that Class 1-3 land amounted to 4.4% of the state’s 1.9 million “agricultural” hectares. The bulk of this small amount was in the north western region of Tasmania and in other small localised pockets (eg south of Kingston). These classes are in areas underlain by basalt, and occur along river flats and terraces. However no map can be sourced in Tasmania to show these lands. Where is the map? The areal extent of land therefore only partially protected under a state policy on Prime Agricultural Land (PAL) in emerging new Interim planning schemes across Tasmania could be as little as 70,000 ha. given the Senate Select Committee’s 2004 Report on Australian Plantations. It is hardly surprising that the largest proportion of community dissent is also found in the north and north west where competing land uses from traditional farms to plantations are changing old patterns of farming and at the same time changing its landscape. The Davey and Maynard assessment done in 2003 is now ten years old. I’m not aware that there has been another similar assessment in the intervening time.

### **Class capability 3/ 4, 4, 4/5 and 5.**

What is up for grabs, and hasn't been properly assessed for its pastoral /agricultural value in my opinion in Tasmania is the vast sizeable rump of Tasmanian farms that are composed of Class capability 3/4-4-5 soils.

This pattern of farm location, this connectedness to soil capability has an historical basis in that many of the early grants extended from a river frontage, across hilly land to the ridge-top. This meant that farms had different types of capabilities, a factor which still exists in many, many areas in Tasmania. Later in the nineteenth century other grant patterns were put in place. A farm can therefore have different types of soil capabilities but only a section of its land will in any way be protected by Tasmania's PAL policy or in a subsequent planning scheme. Many old title farms in Tasmania remain in the landscape. The area of soil capabilities 3/ 4- 5 is where the conflict and competition for farmland, is likely to be strongest and most destructive. There is evidence that this is already happening.

It is anticipated that soils which have a high subsoil clay content, which will hold moisture, (Classes Capability 3/ 4, 4, 4/5, will become the subject of intense pressure; alternatively those which have a river frontage will also be highly favoured. This then is a pattern which goes back to the original settlement of Tasmanian farming lands.

This change has occurred in large measure since the implementation of the Regional Forest Agreement for Tasmania, particularly from 1997 with the introduction of mono-cultural hardwood plantations for short term rotations. It has a direct connection to the ' death by a thousand cuts' scenario.

The water availability, water retention and underlying geology are critical aspects to the soil profile and its ability to hold water. Two forestry scientists in 2001, D. Mummery and M. Battaglia<sup>23</sup> were already aware of the water question when they modelled Tasmania's tree growth and soil variations in soil depth, nutrient status, and drainage.' A plantation suitability map was created. Large areas of the north west, north, east, and north east of the state were seen as having their second nominated category, (i.e. moderately suitable, low variability). There were very few areas identified in the model which fitted the first category - highly suitable. Different areas were classified as highly suitable, moderately suitable, (low variability), moderately suitable, (high variability), not suitable, (low variability )and not suitable, (high variability).

The Legislative Council are directed to this paper given its significance.

### **The Failure of the MIS and the 2020 Vision**

2020 Vision and the Managed Investment Schemes went into top gear, post Regional Forest Agreement in Tasmania in November 1997.

Tasmania has a self regulated forestry industry. That is now – in 2013 – on its knees. It went down the path of high volume, low value woodchip production as a result of the 2020 Vision and the now failed Managed Investment Scheme experiment. The Senate's Rural and Regional Affairs and Transport References Committee. *Australia Forest Plantations. A Review of Plantations for Australia, The 2020 Vision*, September 2004, considered the case of Tasmania so different to the rest of Australia that its Chapter 8 was solely devoted to Tasmania and its plantations and to the issues raised by submitters. The Committee visited Tasmania on a number of occasions. At 8.51 of its report, the Committee noted that,

Tasmania's total plantation estate while not the largest in Australia, covers comparatively more land than in any other state.<sup>24</sup>

If ever there was a lesson as to what not to do in respect of sustainable land management, of land use conflict, of sudden and dramatic change to land use, from food to fibre productive use, of community concern where decisions were made top-down and without equity, just look to the Tasmanian example of mono-cultural short rotation hardwood plantations. The Senate Committee are directed to the Tasmanian chapter of *Review of Plantations for Australia. 2004.*

Thousands of hectares of native forest hardwoods from that period still sit in the Tasmanian landscape, many with an uncertain future.

Tasmania developed what are called Private Timber Reserves. No other Australian state has this self regulated mechanism. The Senate Select Committee 2004, Plantations, commented on these.

At 8.36. Under the forest Practices Act 1985 landowners can apply to the Forest Practices Board to have all or part of their land declared a Private Timber Reserve. Land declared a Private Timber Reserve is only to be used for the establishment , growing or harvesting of timber and other such activities considered by the Forest Practices Board to be compatible. The type of forestry (native forest or plantations) they engage in on a Private Timber Reserve is up to landowners themselves.<sup>25</sup>

A covenant is placed on the title into perpetuity, so in effect the PTR transfers land use rights across generations. It is quite difficult for a subsequent owner to remove the covenant from the title held. The forest industry was responsible for Forest Practices Plans, and Tasmania's planning system was only rarely involved when a PTR appeared as a development application at local government level.

There are somewhere approaching 500,000 hectares of land which have designated PTR status attached to titles in Tasmania. In the 1.9 million hectares cited in the Davey and Maynard. *Rural Land Use Trends Report* of 2003, (or the 1.6 million ha. by the Senate Committee?) as 'agricultural enterprises', where do the 500,000 ha. of PTRs sit? Is it mostly in private forest or where? If statistics are being kept of location, type, size, etc who is the gatekeeper of them? If patterns of change are being mapped, who is the gatekeeper of the mapped patterns?

The Department of Agriculture, Forestry and Fisheries in 2010 published information on Australia's plantations. Tasmania's total was 309,190 ha. of which 231,992 ha. was in hardwood plantation. In respect of hardwood plantation, Tasmania with its very small land base came second to Western Australia, (311,823 ha.) ahead of Victoria (202,703 ha.) and New South Wales (92,541 ha).<sup>26</sup> Clearly under the MIS, 2020 experiment, Tasmania was seen by the market as a suitable place in which to invest and plant trees.

In assessing the TFA and the associated Bill/Act there is the potential for what was a rort to occur again.

Given carbon pricing as of July 1, there is the significant likelihood of all manner of changing and convoluted ownership, lease or "rights" arrangements that accrue to land, particularly

farming and rural land. For example and quite simply, there might be the farmer who owns the title of the land, the corporate company that grows trees and leases the land, the overseas national interest that has the carbon “rights” to the trees on the land and so on. Such convoluted arrangements need particular scrutiny.

This should not be allowed to happen again in the future, with investors seeking carbon rights accreditation, or with others creating biomass to aid energy requirements. The TFA/ and the Bill and the linkage to the Carbon Credits (Carbon Farming Initiative) Act 2011 are surely pointing straight in this direction.

### **Plantations are NOT Agriculture**

The state’s planning Template which underpins all Interim Planning Schemes included in its definition of agriculture that ‘intensive tree farming’ fitted to an agricultural definition.

This is the sort of crap that has to disappear.

It is simply devious and misleading semantics to insist that forestry is agriculture. Forestry and plantations have always been a separate land use from the time of the Romans. An agricultural definition should not include “intensive tree farming.” Nor plantation forestry. Are we to see “intensive tree farming” as a permitted use in the Significant Agriculture Zone? This would make a mockery out of land use definitions and “use” of the Significant Agriculture Zone intent.

Undoubtedly we will see more of the semantics if they are not corrected and if the TFA and the Bill / Act are given the green light to go ahead.

### **Plantations and Resilience of Ecosystems**

Issues such as farm health, soil health and land capability, and below, water yield, climate change and fire risk are all connected to what is called resilience thinking. Land planning and land management in the future must be underpinned by principles of *resilience thinking*.<sup>27</sup> Resilience thinking concerns the ability of any particular system to absorb shocks, not to cross critical thresholds of sustainability, but to have inbuilt capacity in the system to adjust to changes (sometimes sudden) which can be thrust upon it. Fundamentally, the biophysical footprint, (and its ecosystem services provision) when taken with the development and use of that land footprint is a fine, subtle and profoundly complex balancing act of innumerable interrelationships between variables in the system. These work together towards a stasis. Change in one, can result in changes in others. What is at issue is how the system’s biophysical capacity will cope into the future at critical threshold points of change. We can cross critical thresholds of absorption capacity quite quickly, yet be not aware of this having occurred until decades later. One of the principles of resilience thinking is the awareness and knowledge of the action of *slow variables at work*. The collapse of the Murray-Darling system on the Mainland is an excellent example of how resilience thinking has NOT been applied across a huge land area system in the past. “Fixing” the Murray-Darling will probably not be possible in our lifetimes. It may never be possible.

Clearly LUPAA 1993 in its Schedule 1, Part 1 sets out the beginning of how resilience thinking might be applied.

We have to look at land use, and its capacity not to damage the air, water, soil health, soil capability, *into perpetuity*. *Given climate change the future of Tasmania depends on such approach*. Old thinking has to go. It's retrogressive.

You don't need a degree in science to apply resilience thinking. You do need a capacity to look at a social-ecological system as a whole and from different perspectives and at different scales.<sup>28</sup>

Here is Jeffrey Sachs considered one of the world's foremost economic thinkers in 2007 delivering the BBC Reith lectures.

The big question for the planet is the unprecedented challenge to move to a sustainable energy system, requiring a great degree of co-operation, foresight, and planning, over a time span of decades. Can we do it? Can we find that level of public understanding, political consensus, direction and determination? We may fake it with nice speeches, but the climate will change whether we fake it or not. There is no spinning this one. This one is dependent on what we actually do, not what we say we do.<sup>29</sup>

We have to cut the crap, eradicate the "deals", the hidden agendas, and get the entire crisis into the open.

Monocultural plantations of native hardwoods are out whether they're for biomass, energy considerations or carbon sequestration.

History leaves us with many past examples of biophysical systems, then human systems collapsing.

Without a healthy biophysical natural place – in balance, not passing critical threshold points – as a civilised society we will fail. Everything depends on a stasis, on a critical natural balance. We cannot change the natural balance at a speed that it can't be replenished or adjusted. Critical threshold limits of the capacity of the system to absorb change will be crossed which can then become irreversible.

### **Plantations and Water Use, Catchment Issues**

Natural ecosystems provide a complement of interrelated, interconnected ecosystem "services." We mostly take these for granted. These are things like clean water, plant pollination, fish breeding grounds, adequate water supplies, healthy soil, biodiversity breeding grounds and hundreds more. A critical world wide problem outlined clearly in 2005 by Lord Robert May – an Australian – at the release of the Millennium Ecosystem Assessment Reports<sup>30</sup> noted two major constraints. One was that the entire biological interrelationship diversity that contributed to the functioning of ecosystems was an unknown, was not focussed upon in research, and that current economic valuing systems had no suitable mechanism to be able to measure the actual cost of loss within the system. At the whole-of-catchment level in Tasmania needed is the research information that tells us of the interrelationships between the various 'services' that any one catchment provides and of its long term health. Needed is integrated research across land tenures and various administering agencies that monitor *what happens upstream and relates that to what is happening downstream*.



In a most insightful 2008 contribution to *Uncertainty and Risk*, Dovers et al.<sup>31</sup> wrote that,

The impact of multiple sources of uncertainty is compounded by fragmentation of responsibilities across portfolios and agencies.

In Tasmania this uncertainty is compounded by the fact that each agency has its own agenda and its own vision. Each agency sits inside of its own box. This has to change. It is archaic.

There is a hesitancy, reluctance or even denial to spell out the reality. A curious section in Chapter 5 of the *Natural Resource Management: South Report* titled 'Managing Water' 2005 for example noted the upstream/downstream interrelationship... but only partially. The Report<sup>32</sup> noted,

Upstream water use can also have a detrimental effect on industries and ecosystems in estuarine and coastal areas,

thus acknowledging that what happens upstream can effect what happens downstream. The Report failed to follow on however or to include any assessment of a possible water yield loss effect upstream in the catchment system and how that might change in respect of downstream users where water yield was considered.

It appears that no one is monitoring the overall health of *whole* ecosystem catchments in Tasmania from their beginning to their end. How many catchment ecosystem services are to decline before there is long term irreversible damage? How is the LUPAA intent of Schedule 1 Part 1 being upheld? The precautionary principle in land management, has it entirely vanished into the ether?

From the Resilience writers<sup>33</sup> comes this message concerning forest land use.

A resilience approach explicitly involves identifying the secondary effects of direct actions, like harvesting. In so doing it highlights the values of otherwise unrecognized ecosystem services (water purification, flood control, pest control, pollination, etc) making it harder for the exploiters to hide the consequences of their greed. In a similar way, because a resilient world sustains diversity and keeps future options open, it makes it harder to justify the conversion of all diversity into single-option solutions that ignore the value of diversity. Greed often leads to a denial of ecological variability in order to profit from short-term development. A resilient world embraces ecological variability rather than attempting to control it and would resist such developments.

The Senate 2004 Committee assessing plantation development across the nation<sup>34</sup> noted,

Tasmania is a mountainous island and the majority of the Crown forest lands and private forest holdings being proclaimed as Private Timber Reserves, (PTRs) lie between the agricultural farmland at lower elevations and the higher peaks and mountains. Thus they are located in the upper catchments of major and minor river catchments.

The Committee<sup>35</sup> also used information from Dr. David Leaman, Hobart geohydrologist, (mentioned below). Dr. Leaman indicated to the Committee that the results of his own

modelling had shown shown that 20% use may in fact lead to a 10% loss in annual yield from the catchment. He also added that taking into account seasonal effects,

10% of annual loss may translate into 20-40% of summer flow loss which is more than 'discernible' and crucial to all other water users in the catchment.

The FWPRDC Water Supply submission made a number of recommendations to this 2004 Senate Plantations Committee. Basic to all of these was that a great deal more considered scientific research be undertaken. The recommendations are found at 5.12, (p. 68). At 5.13, the Committee noted specifically that the National Land and Water Resources Audit, which includes the collection of comparable natural resource data from all states, (Tasmania would be included) must contain sufficiently broad terms of reference such that the impact of plantation forests on catchments was drawn into the net of reporting.<sup>36</sup>

Recommendation 9<sup>37</sup> from the Committee stated that,

The committee recommends that the Commonwealth urgently funds the conduct of a water audit in both the mainland and Tasmania, to assess the impact of plantation forests on both water quantity and water quality.

Just a month prior to the release of the Senate Committee's Report, in 2004<sup>38</sup> the Cooperative Research Centre for Sustainable Production Forestry Hobart, held a workshop entitled *Plantation Water Use in Tasmania*. What was called a statement of common understanding was subsequently issued, this seen to be highly relevant for the present discussion; extended parts are included below.

Evaluation of potential impacts should take into account all the stakeholders within a catchment, their needs and the relative benefits and impacts of various land uses that affect stream and groundwater flows.

Water management and water allocation should be based on the recognition that within a catchment water yield is best treated as a single resource comprised of interconnected surface and groundwater components.

A summary of the national data shows that in general, expansion of plantations has the potential to reduce water yield in catchments depending on factors including area planted, rainfall and previous land use,

While the eco-physiology of the water use by plantations are driven by a set of general scientific principles, the impacts of plantations on water are ecosystem specific and influenced by catchment, regional factors and goals of land use changes. Impacts may vary even within catchments if, for example there are gradients in rainfall within a catchment.

In Tasmania competition for water resources may occur and the impacts of all developments on water yield needs to be considered in evaluating land use options. Land use changes confined within one part of catchment may cause detectable local impacts, but might be undetectable at the whole of catchment scale. Such situations need to be considered as an integrated analysis at the whole catchment level in the planning process.

The potential impact of plantation forestry on catchment water yield will vary; the proportion and location of area planted, the previous vegetation, the hydrogeological characteristics, harvesting cycle and the mosaic of age class distribution and the management of stands are influencing factors acting in combination or cumulatively.

David Leaman, an independent geophysicist-hydrologist was a speaker at the CRC Workshop. For Leaman, each catchment and user balance had to be assessed individually for its climate, geological and biological content, its yield and its responses. 'All the parts are inseparable, it is a single system and no part can be neglected.'<sup>39</sup> Leaman particularly noted for plantations that,

This involved a clearing stage, often a fire stage, commonly a tilling stage, all followed by a new planting with possible trimming, thinning and harvesting phases..... there is considerable soil disturbance in each cycle. It is unavoidable. Within each cycle there is a temporary phase of increased run off, mainly surface, (after clearing and burning) raised water tables and temporary rises in base flows if previous forest was cleared, followed by a general lowering of water tables, infiltration and base flow as the plantation matures. This is a tapering function.... But the taper is never completed... the trees are harvested and the cycle repeated; the run off, and groundwater budget runs negatively in perpetuity...<sup>40</sup>

Zhang in 2001 summarised 200 studies from around the world, looking at water yield and catchments. As might be expected from such a range of studies, different issues surfaced such as what proportion was forest, non forest, amount of rainfall, tree age, rotation length, time of implementation, (lag time for any change to occur).<sup>41</sup> What was interpreted in a Peter Hairsine talk and a partial literature perusal relating to water yield was this; where mature forest is replaced by a land use change to new plantation and young trees, the curve for stream flow rises, (ie. more water into the catchment as Leaman suggested) before it dips sharply below a stasis level. It then gradually returns in a very slow curve rising back to its stasis point. The rise, (ie return to stasis water yield) may take as long as 100 years, *presumably all other factors being equal during that time*. The lowest points are reached (ie greatest water yield loss) somewhere in the vicinity of approximately 10-20 years following the initial tree planting. It is not known, but presumed that Zhang's literature assessment was from modelled studies rather than actual longitudinal studies across a long time frame.

In a world study reported in the journal *Science* in 2005,<sup>42</sup> a total of 504 catchment studies were reported. This showed that,

Afforestation dramatically decreased stream flow within a few years of planting. Across all ages in the data base, afforestation of grasslands, shrublands, or croplands decreased stream flow by 38% on average. For years 6-10, it was 42% and by 10-20 year old plantations, the loss was recorded at 52% of stream flow. .... 13% of streams dried up completely for at least one year with eucalypts more likely to dry up than pines. Afforestation in drier regions [less than 1000 mm per MAP] was more likely to eliminate stream flow completely than in wetter regions.

Two different comments (*Treeline* 2006 and 2007) place plantation conversion in Tasmanian catchments at 6% but in one<sup>43</sup> the 6% referred to the 'average' catchment. What wasn't spelled out was what 'average' meant and whether that was 6% across 100 years, 6% each

ten years or 6% conversion each year. This particular article noted that as a generalisation only where more than 20% was planted to high water using rapidly growing forest could any impact on surface water yield be detected. The research that this percentage was based on was not reported in the article. This article noted too that science had had difficulty predicting the effects of plantations on low flows because of variability of rainfall and erratic runoff during dry periods.<sup>44</sup> By comparison, David Leaman noted that some real physical catchments, had already suffered modifications across more than half their area.<sup>45</sup>

The second article<sup>46</sup> gave a catchment land use figure of 3.4% to plantations in the Tamar and Esk and 9.6% for North West Tasmania; a much finer grained assessment must be a requisite. The figures for the catchment given are so generalised (ie the Tamar 'catchment' would take in both the North and South Esk rivers as well as other rivers and comprise probably more than a third of the entire island).

Dr. Peter Hairsine was commissioned to develop a model to that would predict water yield usage and loss in catchments. That report<sup>47</sup> to which the L.C. is directed was completed in 2006. It's opening comment of the Executive Summary was that,

It is now widely recognised that major changes to land use result in effects on the quantity of water flowing from that land. This conclusion is based on catchment studies conducted in a diverse range of environments both in Australian and overseas.<sup>48</sup>

It notes that only a small number of catchments in Tasmania could be evaluated. The predictive tool was called TasLUCaS.<sup>49</sup> The tool can be used by the various agencies or by the community. In Section 7.1 near the end of the report, the authors candidly noted the limitations of their model. Some of these were,

The tool provides an annual average response in ungauged catchments and annual average and flow duration curve responses in gauged catchments. It does not consider climate variability, including seasonal or inter annual variation

Changes in streamflow due to long-term climate can not be modelled using the tool. It would be possible with further work.

The underpinning change in streamflow relationships .... are limited by the small number of available paired catchment studies and the length of data record for some of these studies. None of these [ paired catchment studies?] is based in Tasmania.

The tool does not discriminate between types of trees, (ie pine and/or plantation)

The tool does not discriminate between types of pasture.

The tool does not discriminate between the land uses of cropping and grazing.<sup>50</sup>

In their conclusion, the authors further noted that the 'TasLUCaS predictions for catchments that do not have stream gauging are confined to the annual streamflow that would occur for mean annual rainfall' [and] 'for ungauged catchments the application of the TasLUCaS tool is limited to first-order problems of water resources.'<sup>51</sup>

It is not known what the response of the three Natural Resource Management Committees was to the TasLUCaS model or how the forest industry responded to it. However, the hydrology of stream flow loss or yield is obviously a hugely complex issue and the model might be seen as only its rudimentary beginning. Certainly there is no unequivocal scientific consensus on the public record that the plantation conversion model such as has occurred/might conceivably re-occur in Tasmania is ecologically sustainable into perpetuity. Nowhere does one apparently find the precautionary principle being exercised in respect of either PTR registration, (the right to harvest and replant trees) or of any particular Forest Practices Plan being refused on the grounds of anticipated potential catchment water yield loss. Meander Valley Council were in the recent past in the court system over this very issue; that concerned with the very sensitive issue of plantation conversion and potential water loss on areas underlain by karst.

## **Plantations and Climate Change**

The degree of change, rate of change, intensity of change is likely to drive what other countries do in respect of their food production security. The world's climate will continue to be influenced by the occurrences of La Nina and El Nino weather patterns. The frequency of these, their strength, their length of duration will be critical factors in determining food production.

Tasmania, thought to be well watered, year round, has a salutary lesson for all, one not widely known or perhaps even understood.

Depending on the severity of El Nino, an enormous area of Tasmania can be affected, which includes all of its food production areas. Even when the rest of Australia is suffering from the effects of a La Nina, the situation in Tasmania can be almost reversed, especially in the south east.

Tasmania obviously has a changing climate particularly in respect of its rainfall and other important associated climate elements. Figure 1 should be a wake up call to anyone connected with managing, or involved in land use in Tasmania. The gross deficiencies in rainfall patterns across the state are precisely in those areas of Tasmania's rural agricultural and pastoral lands. Increasingly too, these are also the areas where the largest areal extent of tree plantations will be found. They are the areas where the prime Capability Classes 1-3 soils are found. They are the areas where the old heritage land patterns are found. All of these components are interrelated and how we manage (or don't manage) them will spin off onto the others. To ignore the changing regime which is upon us and which is at least partially unknown in its presenting pattern, is not to adhere to the precautionary principle, outlined in intent in LUPAA, Schedule 1.

The catchment ecosystem services (at present un-costed) which occur across entire catchments will most likely reflect rainfall and drought patterns. *What happens in the upper catchment will affect what happens in the lower catchment.* What happens in respect of one major variable ( e.g. water quantity or water yield) will affect what happens to countless other variables. Sustaining the entire ecosystem services that a catchment provides is essential to the health of the system into perpetuity (LUPAA, Schedule 1. Part 1.(2) (a), (b), (c).

The National Climate Centre on 3 October 2008 issued a statement on drought The relevant parts of that statement for Tasmania were,

Rainfall deficiencies for the **16-month** period from June 2007 to September 2008 persist over much of SA, the southern NT and also in parts of southern WA, far western parts of both Queensland and NSW, western and central Victoria and northern and eastern Tasmania. The largest area of lowest on record rainfall for the period is in eastern Tasmania, north of Hobart, with only a couple of small isolated record dry areas elsewhere. The anomalies are remarkable given that they partly coincide with a La Niña event. La Niña events are usually associated with above average rainfall rather than widespread rainfall deficiencies.

The deficiencies discussed above have occurred against a backdrop of decade-long rainfall deficits and record high temperatures that have severely stressed water supplies in the east and southwest of the country. The combination of record heat and widespread drought during the past five to ten years over large parts of southern and eastern Australia is without historical precedent and is, at least partly, a result of climate change.

Figure 1 graphically portrays those parts of Tasmania which are most affected. This covers our major food producing agricultural regions of the state. The map with its large areas of bright red should serve as a wake-up call to all of those who are involved with land management, and development. Is it a portent of things to come or is it a glitch in an otherwise cyclical flow of climate pattern movement? We simply don't know. Hence the risk and the uncertainty. The National Climate Centre opts that such patterns are 'at least partly a result of climate change.'

**Figure 1.** Map of 36 monthly rainfall deficiencies for Tasmania. Bureau of Meteorology. Australia. Available online from the BOM website.

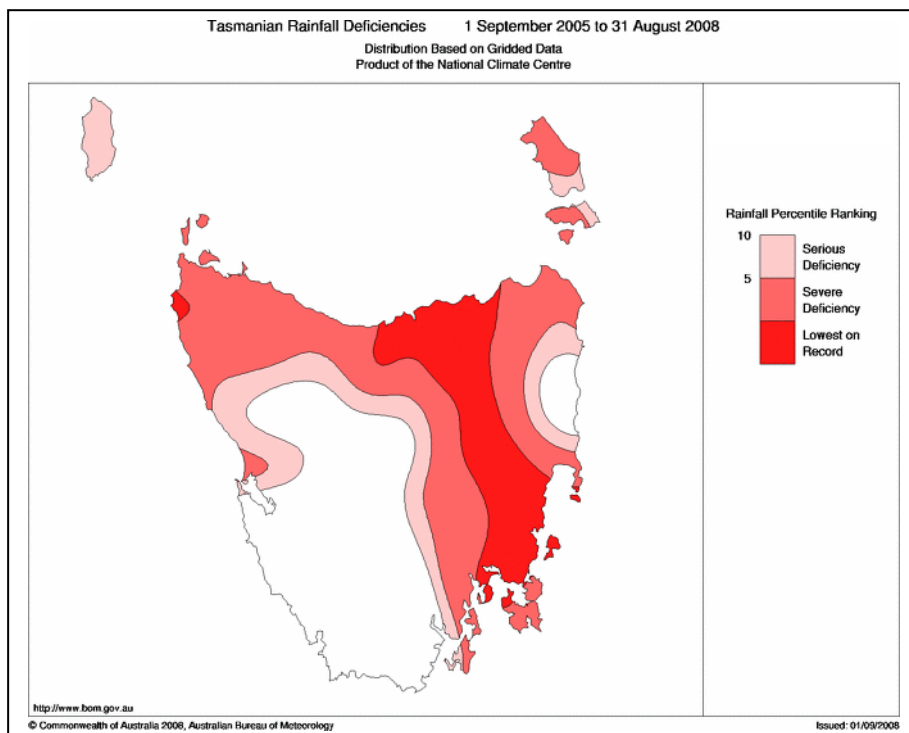


Figure 1 covers major ecosystem areas, (major river systems for example) which have to adapt very quickly to the change. It covers the ecosystem services that are provided within those ecosystems. This includes a significant part of Tasmania's rural lands which are administered by local government and which will be subject to any PAL policy. Tasmania's prime agricultural land lies within the confines of the red line boundaries drawn on the map.

The Climate Commission<sup>52</sup> also has critical messages for Tasmanian legislators. Its key messages in 2011 were,

Tasmania has become drier, posing challenges for agriculture and Tasmania's hydro-electric power supply.

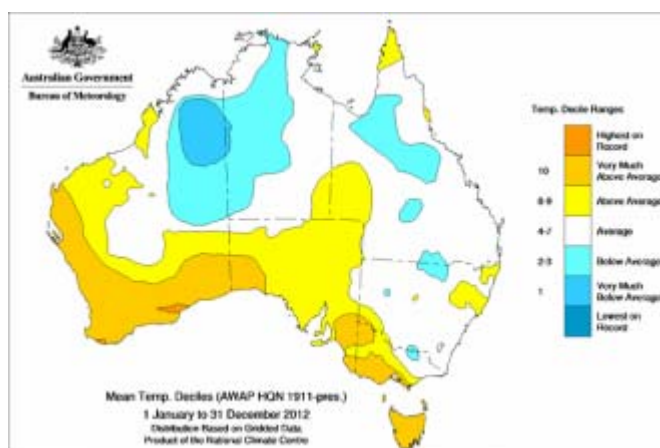
- Changes in Tasmania's climate will have far-reaching implications for agriculture, tourism, electricity generation, fisheries, biodiversity and human health.
- A hotter climate is a climate of more extremes, .Tasmanians can expect to feel the impacts of more intense rain events and associated flooding, as well as increased fire danger days.
- Tasmania is particularly vulnerable to sea-level rise because most Tasmanians live close to the coast. For instance, in some places a 50 cm sea-level rise could result in a present 1-in-100 year event becoming an annual or more frequent event by the end of the century.
- Tasmania's internationally renowned biodiversity is at risk from a changing climate. For instance, it is likely that hotter temperatures will reduce available habitat for unique Tasmanian plants and animals.

The Tasmanian fisheries industry, worth \$522 million per year, will also be at risk from rapidly increasing water temperatures and new invasive species.

- This is the critical decade for action. The choices we make between now and 2020 will shape our future. To minimise climate change risks we must begin to decarbonise our economy and move to cleaner energy sources this decade. The longer we wait the more difficult and costly it will be. Tasmania is leading Australia in renewable energy generation and is well-placed to capitalise on the global trend towards clean energy.

The Legislative Council are directed to this report. In a sense, the issue is one between a rock and a hard place.

A further message from the Bureau of Meteorology website re temperature, 2012.<sup>53</sup> It's not looking good. Tasmania sits with very high mean averages in 2012, similar to Western Australia.



## Plantations and Fire Risk

The *Australian Financial Review* issued a dire warning on risk from changing weather conditions in November 2005.<sup>54</sup> The paper's front page dramatically burst forth, '*Flash Point: Business has finally realised that the weather is becoming a major threat to who will make money in the future.*' A three page article was titled: Future Shock.

Inside it offered a map of Australia with the risks for various states or regional areas. No. 1 risk for Tasmania was seen as bushfire risk.<sup>55</sup>

Given what has happened in Tasmania over the last fortnight with most of the summer still ahead, fire risk is on most people's minds.

It is noted the *Implementation Report* for the 2007 Ten Year RFA Review indicated that it had in place documentation of a 'statewide fire management'<sup>56</sup> but to this author's knowledge that is not public and may not specifically have in its policy what is being recommended by experts dealing with fire management issues. Further information or a policy could not be found on any recognisable public website in regard to fire management. What is the state's fire management policy when it comes to plantations? Will fire-fighters be directed from saving residential and farm property to saving plantations in a worst case scenario?

Gould et al.<sup>57</sup> warned the tree plantation growers in 2002 that particular measures needed to be taken where tree farms were concerned. Several points are especially noted from their paper.

Plantations... substantially change the quantity and arrangement of flammable fuels in the landscape, resulting in changed potential fire behaviour from that commonly experienced in agricultural fuels.

Seven to ten years after planting, the fuel load can increase to 8 – 12 tonnes per hectare and may be similar to that in dry eucalypt forest un-burnt for 8 years.

If a disastrous conflagration is likely to occur once or more per rotation, fire management must determine the level of protection expenditure required to minimize losses under the 'worst possible' scenario. Thus analysis of the cost of fire management must be an integral part of plantation establishment and management with the aim of producing a 'least-cost-plus-lost outcome for the plantation growers.'<sup>58</sup>

Were any plantation growers for the MIs offered the 'least-cost-plus-lost outcome? However preliminary research suggests that even low density, low impact fires can be seriously detrimental to trees younger than 10 years.<sup>59</sup> Investors may well be in trouble if fires and particularly Megafires occur in plantations. Tasmania has yet to witness what happens when a Megafire sweeps through broad swathes of plantation land that has been established via the MIS and 2020 Vision.

Not known with respect to fire management are costs built in with factors such as falling bark, twigs, leaves, weeds, etc. for any individual plantation woodlot across a rotation cycle. How many rural settlements are downwind of plantations particularly on the NW/SE or SW/NE trajectory? Following the Canberra Megafire and its later inquiry, it was reported



that to have any hope of 'managing' such a fire, fuel build up would need to be as low as 4-5 tonnes per hectare or less.<sup>60</sup> This degree of fuel loading is apparently reached in plantations by 3-7 years after planting.<sup>61</sup> Fuel loads in native hardwood plantations in Tasmania; what are their low levels? Was there ever a prescribed mandatory policy?

British historical botanical researcher Oliver Rackham, described Australia as the 'Planet of Fire.' He noted, 'except in the small area of rainforest, fire is as necessary to Australian native vegetation as rain to Britain.'<sup>62</sup> This is a highly significant remark because in Tasmania *what replaces rainforest and wet forest (which inhibits fire) in many areas are eucalypt rich forests*, these consequently more fire prone and adapted to fire.

Urgent research into both fire incidence and intensity in Australian native forests and forestry plantations is critical. Since 1984 scientists have warned that the clearfell, slash and burn regeneration techniques of the forest industry 'increased the risk of wildfire damage rather than the reverse'.<sup>63</sup> An edition of *OnWood*<sup>64</sup> presented some critical information for those involved with the plantation industry. Jim Gould from the CSIRO and others concluded that,

extending rotations beyond an age of around ten years will increase the risk of losses in the event of a fire because of the greater amounts of litter and bark fuel present in these older plantations,<sup>65</sup>

with a fuel loading

similar to that in dry eucalypt forest 8-10 years after [the] last fire..<sup>66</sup>

CSIRO and the Country Fire Authority research from the area known as the Green Triangle area of Victoria and South Australia indicated that young plantations could still exhibit large fuel loads. Researchers discovered that beyond seven years the eucalyptus plantation had a continuous litter cover with a fuel load of over eight tonnes per hectare with bark streamers of bark peeling from the trees; this added to the fuel load. The research concluded that,

extending rotation[s] beyond 10 years on a broad scale could result in an escalating fire hazard across the landscape. Silvicultural treatments to reduce the hazard level in older plantations need to be examined.<sup>67</sup> The authors also suggest that 'new models that provide fire and plantation managers with a better basis for planning pre-suppression and suppression activities are required,<sup>68</sup>

and again that large plantation blocks of hundreds of hectares,

raises concerns that the risk of fire associated with plantations in the future will differ significantly from the historical fire risk associated with agriculture activities.<sup>69</sup>

It appears that the type of plantation forest species used, their age and management even their alignment design are critical in determining the wildfire risk occurring and affecting adjoining properties.

An interview in 2005 with a senior fire research scientist from the CSIRO in Canberra revealed that,

- (i) it is often difficult even for the professionals in fire management to gain knowledge of company plantation fires,
- (ii) that a body of knowledge exists amongst fire fighters built up over decades regarding native forest fires and their behaviour,
- (iii) that this knowledge doesn't extend to plantations which are seen as a new challenge in respect of fire management; fire behaviour and difficulty of suppression at different stage of plantation development,
- (iv) that the amount of litter on the 'forest' tree plantation floor was critical,
- (v) the age of plantations was also a critical factor.
- (vi) frequency and severity of fire weather was another critical key determinant,

A number of these points were spelled out in a pamphlet issued by the Country Fire Authority of Victoria in conjunction with the CSIRO and the L.C is directed to that. Like Gould's paper at an earlier time it is headed: *Bluegum plantations. Are we under-estimating the fire hazard?* The pamphlet notes,

Fire management must form an integral part of plantation planning and management [and]

Wind is the most dynamic variable influencing fire behaviour. Wind speed fluctuates during short periods and varies with height above the ground and location in and around the plantation. The pattern and speed of wind within a plantation will depend on the alignment of the plantation with the prevailing wind direction, the density and height of the canopy, the terrain, adjacent vegetation and location of the breaks....

The transition [from paddock to plantation or plantation to paddock] will also have a great effect on the turbulence and speed of the wind. From a paddock to a plantation the diagram shows the wind picking up speed as it rises to cross the crowns of the tree plantation.

Much could be added in respect of the horrific Victorian fires of 2009. The L.C is directed to the Royal Commission's Report on these fires and to the *Report on the Nature of the Victorian Fires 7 February 2009* by Dr Kevin Tolhurst. Senior Lecturer, Fire Ecology and Management, Dept. of Forest and Ecosystem Science, University of Melbourne. 15 May 2009. Dr Tolhurst offers a new 'high' for the distance a fire can spot ahead in such dreadful conditions. It is 35 kms. That puts western Hobart and Kingborough at risk of the great swathe of plantations to the north west, west and south west of the Wellington Park.

**Plantations and a Social, Cultural and Heritage footprint.**

The community has been left outside of the TFA process which has taken over two years. What factors haven't been and aren't being addressed are,

- (i) consideration of the historically evolved rural countryside settlement pattern upon which plantations are imposed and the dramatic change to traditional farming patterns,
- (ii) the sustainable *quality of life capital* which includes the tourism industry in Tasmania and what the real cost of the land use change is to tourism, agriculture, and other land uses which are not forestry or tree plantations.
- (iii) the forest landscape as a place of memory.
- (iv) community perception of the change

Discussed previously are that there are significant interrelated ecosystem “services” benefits and values which are provided by the land uses which are being replaced. The value of these and the cost to the economy of their loss hasn’t been to this author’s knowledge the subject of any government, or even independent reporting.

### **Plantations and landscape**

There are thousands of years of indigenous occupation of Tasmanian lands; these patterns of recognition in their infancy. The English settlement of the island is just over two centuries old. The patterns are complex and of infinite variety and need urgent recognition, analysis and registration of significantly defined areas. One historical landscape researcher has been involved in this aspect of Tasmanian planning and cultural history for over fifteen years. There are numerous reports connected with specific places.<sup>70</sup>

The evolved cultural landscapes – particularly in Tasmania’s rural countryside - have emerged after two hundred years of white settlement. It is here, in the rural countryside, (which also embraces native forest hill slope areas as a backdrop) that plantation development is occurring. While forestry remains self regulated, loss of rural landscape can be rapid and sudden,<sup>71</sup> as the traditional ‘picturesque’ countryside is replaced. Colonial painters and photographers perceived such landscapes to be an archetypal Arcadia; the apparently gentle, comfortable, securely familiar known countryside idyll for which England was then famous. More than anywhere else in Australia, that re-created English ideal is still able to be interpreted in many areas where broad cultural landscapes remain in Tasmania. From the former hop farms of the upper Derwent Valley, to the apple orchards of the Huon, the small fruit and orchard farms of the Channel, the pastoral landscapes of the Midlands, the north west dairying and vegetable growing farms, a particularly Tasmanian cultural landscape ideal emerged across time; one which combined the naturally occurring landscape elements with those of evolving built structures in unique patterns.

What emerged from the mix was and is quintessentially Tasmanian,<sup>72</sup> such landscapes don’t appear elsewhere in the world. Significantly, ‘wildness’ and forested upper hill slopes were seen as a backdrop to the settled districts; heightening the juxtaposition of the known to the unknown, the wild archetype and the settled farmland archetype each a feature of this island’s landscape pattern.<sup>73</sup> The characteristic nineteenth century landscape ideal of the ‘long prospect’ occurred in abundance, realised by visitors and settlers alike, while farm lot sizes were more of the order of those in the old country and afforded great visual diversity. Water was a very visible landscape presence either at the shoreline or within the river valley and authentic Georgian architecture abounded.<sup>74</sup> Marked out by hedges, by exotic or indigenous tree lines, certain parts of the landscape took on a distinct ‘chequerboard’ effect,<sup>75</sup> parts of it still intact in 2007.

Landscape beauty – and the total complexity which comprises it - is a vital part of Tasmanian rural and natural scenes and has been across centuries.

This is well recorded in the literature, 150 years of it.

This fact carries with it some principal patterns still easily detected in the 2013 landscapes. These will disappear into the ether given the continuation of current land use changes and projected further tree plantations.

### **The historical interrelatedness; patterns of place, forest and memory.**

Tasmania is the most forested of all of Australia's states.<sup>76</sup> Some of its forests are very old and a thesis could be mounted as to what constitutes Old Growth<sup>77</sup> and whether this is a useful term. Old eucalypt trees can form part of a regrowth forest, Eucalypts can form a very small percentage (5%) of the Rainforest ecosystem; but forest will still be labelled in Tasmania by forest managers<sup>78</sup> as a eucalypt forest and therefore as likely production forest. The natural transition (in the past at least) across hundreds of years of evolution was for tall wet sclerophyll forest to gradually merge into mixed species forest, (cool temperate rainforest + eucalypt) and ultimately into cool temperate rainforest. All of these forest ecosystems are amazingly complex; they confounded the early scientists, explorers from the other side of the world who commented on their primeval quality, humbled at their enormity. At a point in time<sup>79</sup> the mighty giants of the Tasmanian forest vied with the North Western American Giant Sequoias, (*Sequoiadendron giganteum*) as the tallest trees on earth.

A telling comment<sup>80</sup> from a series of scientific papers in 1982 perhaps best explains a changed ideology which emerged in respect of forest management from the 1970s,

[There has been] a vast increase in the scale of tree cutting operations on both State and private forest since the early 1970s. The [then] Forestry Commission came to view this increase in cutting (followed by regeneration) as a unique opportunity to "turnover" old and often previously "useless" Crown forests – in much the same light as a retailer considers old stock on the shelf. Rainforest in Tasmania, as a commercial forest type has never "sold well." However with the advent of export woodchipping, the possibility of a distinct avenue for clearance has emerged.

The old "stock" at least would have partly consisted of what are now called Special Species Timbers.

### **The nineteenth century farm**

The nineteenth century farm and its evolved landscape was a self sufficient farm *where everything was produced on the farm for the farm*. There were well defined land use and landscape patterns which evolved. They are not the patterns and rhythms of modern corporate farming.

The scale or intensiveness, usefulness or otherwise of any particular 'agricultural' use has not been canvassed. The planning discussions in respect of the Template and plantations for example didn't distinguish between a traditional farmer who wished to have a section of farm for 'farm forestry' and an intensive large scale corporatised tree plantation enterprise. Similarly it made no distinction between what might be an annual crop like poppies, (medicinal use) or a much longer term perennial non food 'crop' such as plantations (fibre). Such changes have implications for potential heritage change, agricultural change, and for biophysical change, for resilience change occasioned by the use and development.

Allowing the big-end market to determine land use change in Tasmania as is currently the case, given the energy crisis and global warming bio-security and food related issues is not an option.

The cultural landscapes of Tasmania's rural land were declared in 2009 by Tasmania's National Trust to be on the endangered list. There is no policy towards, and no heritage legislation which currently exists to save significant heritage landscapes in this state. Significant rural areas bought up by corporatised entities, (as in NSW) will simply eradicate old internal and external farm boundary lines. Many, many properties in Tasmania's rural hinterland still retain very old, even original grant lines. These form a significant part of the landscape character of the place given hedging lines, vegetation lines and other significant patterns. Landscape character disappearance is a central issue. But as indicated to a Senate Committee in 2004, there are interlinked, and interconnected considerations for the traditional farm and what happens to it.

The *Australian forest plantations. A review of Plantations for Australia* committee, took up a useful point,

8.68. "Ms Sheridan argued that as a result of plantation expansion, entire landscapes are being destroyed and whole communities are being displaced and that in her professional opinion,

.... If the present pattern is allowed to continue, then Tasmania's unique set of cultural landscapes, different in different areas of the state will be severely compromised, if not in places quite destroyed. Industrialised farming of trees in the twenty first century is a very different scenario to traditional farming in methods, characteristics, ownership, internal farm boundaries, economic bottom line expectations and in an end landscape result.

The disappearance of traditional rural landscapes has implications for Tasmania's tourism. This was raised as an issue at a national conference of the Planning Institute of Australia in 2004, the paper subsequently published in *Australian Planner*.<sup>81</sup>

The L.C. is directed to that paper. The 150 year old pattern of tourist "use" of Tasmania's rural lands in particular can be supplied to the Councillors. The obfuscation of government to adequately manage its heritage fabric of rural lands can also be supplied.

### **Heritage and Farm change in Tasmania.**

Agricultural practice is changing, (i.e. in turn changing the land use) and along with it, the landscape character of rural areas. Farm ownership is changing, the character of the place is changing and *no organisation in Tasmania is monitoring the change or assessing its impact*. Planning to date has not become involved with this at any level. Factors such as farm practice, farm demise, farm disappearance, the input of associated land capabilities, other than prime agricultural land and so on remain unanswered components of the state's land management planning system. The land use and landscape changes are ignored it appears at either state or local level as though they are not happening. Planning schemes therefore relate to the PAL policy but they don't relate this to other related issues. It is another example of the disjunct in the system in that it considers one component (e.g. land capability at the prime agricultural level) but leaves it unrelated to other serious concomitant land management problems.

Ownership of the twenty first century farm in Tasmania is a critical one. Whereas in the past farming was traditionally family owned, even across generations or even centuries held in the same family, these patterns are changing. Corporations are taking over farms and the ethos is different. Corporate farming appears uninterested in traditional farming patterns. There would appear to be little or no recognition that the land tapestry has an evolved history and character of place and that this might be significant, (Burra Charter Articles 6, 8 and 24) for example.

What factors haven't been and aren't being addressed are,

- (i) consideration of the whole historically evolved rural countryside settlement pattern upon which plantations are imposed and the dramatic change to traditional farming patterns,
- (ii) the sustainable *quality of life capital* which includes the tourism industry in Tasmania and what the real cost of the land use change is to tourism, agriculture, and other land uses which are not forestry or tree plantations.
- (iii) the forest landscape as a place of memory.
- (iv) community perception of the change

In my opinion we are at a point in rural farm planning where,

- (i) The traditional farm with an owner operator, family style farm (this may have ranged from a small farm to quite a large one) is in danger and could in the future disappear as an entity.
- (ii) What is taking over is a corporately owned enterprise which is less likely to have even a manager live on-site.
- (iii) The traditional farm had an investment in the ongoing perpetuity of the land, its fabric, and often particular interconnections to the capacity of 'system' maintenance survival into the future. Estate farms for example were often passed down across many generations.
- (iv) 'Investment' properties have little 'investment' in the notion of perpetuity of the biophysical fabric of the land to sustain itself.
- (v) There can be leased arrangements over a traditional farm for areas of tree plantations for example. This will probably increase in complexity given anticipated carbon trading arrangements.
- (iv) Huge advantages in the market place existed in the past because of Managed Investment Schemes giving advantages to those investors and those companies managing the investments.
- (v) There is an end goal for 'agricultural' use very different to that of the traditional farmer in terms of the expectation outcome of the enterprise. It might be anticipated that biophysical 'threshold' limits would be reached earlier, given that the land base will be artificially altered to produce the outcome required.
- (vi) Corporate broad acre farming, feed lots, industrialised farming commodifies production. It destroys old internal and external farm boundary patterns, as well as other patterns and fabric.
- (vii) Corporate broad acre farming (to date) is simply not interested in the notion of 'resilience' farming patterns or what that might mean.

- (viii) The best land is sought out; this used intensively in order to maximise returns to shareholders.
- (ix) A corporation is really a changed entity in terms of the conservation of, management of, land uses and what follows.
- (x) There is no way that heritage landscapes can be maintained and conserved under the present planning system, given the change that is occurring and the failure of planning or heritage instruments to recognise its value and manage for it.
- (xi) Local government planning schemes don't recognise the change.

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<sup>1</sup> Senate Select Committee. Rural and Regional Affairs and Transport References Committee. *Australian Plantations. A review of Plantations for Australia. The 2020 Vision*. September 2004. 109.

<sup>2</sup> NB. Note again the disparity given here in figures of a 1.9million hectare total for the state.

<sup>3</sup> <http://www.abs.gov.au/ausstats/abs@.nsf/0/A27F2AD2BF4DAAA9CA257264000CB161?opendocument>

ABS. 1362.6 - Regional Statistics, Tasmania, 2007

<sup>4</sup> [http://www.dier.tas.gov.au/forests/rural\\_land2/land\\_use\\_trends](http://www.dier.tas.gov.au/forests/rural_land2/land_use_trends) Op. cit. 5

<sup>5</sup> ABARES. *Australian commodities*. March quarter 2011. Australian commodities Vol 18. No. 1. 108.

<sup>6</sup> Ibid. 114.

<sup>7</sup> Senate Select Committee Report Agricultural and Related Industries. *Food production in Australian. Final Report*. August 2010. 2.38. 18.

<sup>8</sup> Davey and Maynard Agricultural Consulting: *Rural land use trends in Tasmania 2003*. Op. cit. 9-10.

<sup>9</sup> Simon Bevilacqua: Goodbye to the Farm. *Sunday Tasmanian*. August 6. 2005. 25.

<sup>10</sup> [http://www.dier.tas.gov.au/forests/rural\\_land2/land\\_use\\_trends](http://www.dier.tas.gov.au/forests/rural_land2/land_use_trends)

<sup>11</sup> Ibid. 2.

<sup>12</sup> ABARES. *Australian commodities*. March quarter 2011. Australian commodities Vol 18. No. 1. 108.

<sup>13</sup> Senate Select Committee Report Agricultural and Related Industries. *Food production in Australian. Final Report*. August 2010. 26.

<sup>14</sup> Ibid 29.

<sup>15</sup> Rob Dixon. Valuation is neither an art nor a science. 11.

<sup>16</sup> Davey and Maynard Agricultural Consulting: *Rural land use trends in Tasmania 2003*. 38

<sup>17</sup> Private Forests Tasmania: *Treeline*: Spring 2006. 16.

<sup>18</sup> Rob Dixon. Valuation is neither an art nor a science. *Treeline*. Spring. 2008. 11.

<sup>19</sup> Rob Dixon. Valuation is neither an art nor a science. Op cit. 11.

<sup>20</sup> ABARES. *Australian commodities*. March quarter 2011. Australian commodities Vol 18. No. 1. 23.

<sup>21</sup> Davey and Maynard Agricultural Consulting: *Rural land use trends in Tasmania*. 2003

For Department of Energy and Resources. Tasmania.

<sup>22</sup> Ibid. 4.

<sup>23</sup> D. Mummery and M. Battaglia: Applying ProMod spatially across Tasmania with sensitivity analysis to screen for prospective Eucalyptus globulus plantation sites. *Forest Ecology and Management* 140. 2001. 51-63.

<sup>24</sup> Senate Select Committee. Rural and Regional Affairs and Transport References Committee. *Australian Plantations. A review of Plantations for Australia. The 2020 Vision*. 110.

<sup>25</sup> Ibid. 106.

<sup>26</sup> DAFF. *Australia's Plantations*. 2010 Inventory update. 3.

<sup>27</sup> Brian Walker and David Salt. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World. How Can Landscapes and Communities absorb Disturbance and Maintain Function*. Island Press. Washington. 2008.

<sup>28</sup> Ibid. 124.

<sup>29</sup> Jeffrey Sachs. Survival of the Anthropocene. Lecture 2. *BBC Reith lecture series*. Relayed on ABC. Radio National. 20 May. 2007. Sach's is regarded as one of the world's foremost economists and influential thinkers, is Director of the Earth Institute, and Outelet, Professor of Sustainable Development, Professor of Health Policy and Management at Columbia University.

<sup>30</sup> Reported on ABC: Radio National. PM programme 5 April 2005. Interview between Lord Robert May and Mark Colvin.

<sup>31</sup> This book is multidisciplinary and looks at a wide range of uncertainty and risk. Gabriele Brammer and Michael Smithson. *Uncertainty and Risk: Multidisciplinary Perspectives*. Earthscan.

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<sup>32</sup> *Natural Resource Management Strategy for Southern Tasmania*. May 2005. 39.

<sup>33</sup> Brian Walker and David Salt. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. Op. cit. 149.

<sup>34</sup> Ibid. 117-118.

<sup>35</sup> Ibid. 119.

<sup>36</sup> Ibid. 68.

<sup>37</sup> Ibid. 74.

<sup>38</sup> Held at the University of Tasmania. 31<sup>st</sup> August 2004.

<sup>39</sup> David Leaman: Unpublished paper prepared for the Conference: A thousand cuts: Tasmanian Conservation Trust. Hobart. Tasmania. 2003. Much of Leaman's work was subsequently incorporated into David Leaman: *Water: Facts, Issues and Problems*. Leaman Geophysics. Hobart First Edition 2004.

<sup>40</sup> Ibid.

<sup>41</sup> This information was given to the public in 2005 at a public lecture by Peter Hairsine, 22<sup>nd</sup> August 2005 at the Glenorchy Civic Centre. Hairsine was also a speaker at the CRC, 2004 workshop; (from the CSIRO Land and Water in Canberra).

<sup>42</sup> Robert B. Jackson; Esteban G. Jobbagy; Roni Avissar; Somnath Baidya Roy; Damian J. Barrett; Charles W. Cook; Kathleen A. Farley; David C. le Maitre; Bruce A. McCarl; Brian C. Murray.

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<sup>43</sup> Private Forests Tasmania. Plantations and their Water Use. In *Tree Line*. Summer 2006. 6-7.

<sup>44</sup> Ibid. 7.

<sup>45</sup> David Leaman in Letters to the Editor. *The Mercury*. 24<sup>th</sup> February, 2006.

<sup>46</sup> Private Forests Tasmania. Plantations and water. In *Tree Line*. Autumn 2007. 5-6.

<sup>47</sup> Peter B. Hairsine, Alice E. Brown and Andrew Freebairn: *The Development of the Tasmanian Land Use Change and Stream Flow (TasLUCaS) tool*: Report to the Tasmanian National Resource Management Committees. Land and Water Science Report 54/2006 CSIRO. Land and Water. July 2006.

<sup>48</sup> Ibid. iii.

<sup>49</sup> Ibid. iii.

<sup>50</sup> Ibid. 79-80

<sup>51</sup> Ibid. 81.

<sup>52</sup> Climate Commission. The Critical Decade. Tasmanian Impacts and opportunities 2011. BOM.

<sup>54</sup> *Australian Financial Review*. November 5-6. 2005. Future Shock was written by Tina Perinotto.

<sup>55</sup> Ibid. 18-19.

<sup>56</sup> Implementation of the Tasmanian RFA: 2007 Executive Summary. V.

<sup>57</sup> L. McGaw, J.S. Gould, N.P. Cheney: Bluegum Plantations – are we under-estimating the Fire Hazards? Paper delivered at the Forest Growers Conference, Albury. October 2003.

<sup>58</sup> Ibid.

<sup>59</sup> ICS Risk Management Group: *Wildfire Behaviour in Blue Gum Plantations*. W.A. 2002-2003 Fire Season.

<sup>60</sup> Interview ABC: TV: *7.30 Report*. Kerry O'Brien and Phil Koperberg, NSW Fire Chief. 4 August, 2003.

<sup>61</sup> L. McGaw, J.S. Gould, N.P. Cheney: Bluegum Plantations – are we under-estimating the Fire Hazards? Paper delivered at the Forest Growers Conference, Albury. October 2003. 4.

<sup>62</sup> Oliver Rackham. *Woodlands. A Survey of British Natural History*. Collins. London 2006. 54.

<sup>63</sup> *Journals and Papers of Parliament*. Legislative Council Select Committee. State Forestry. Paper 49. 1984. 25. The scientists were Jamie Kirkpatrick and D.M. Bowerman.

<sup>64</sup> CSIRO. Forestry and Forest Products. *OnWood 39*. Eucalypt plantations raise new fire management issues. Summer 2002/2003.



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