In Melbourne 250 watt Pedelecs cannot enhance the safety and mobility of public transport users due to inept state laws

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1. Introduction

Given Australia's sunny climate, the widespread use of electric bicycles with ion lithium batteries charged by small solar cell arrays at home or work will be feasible in five years. The 250 watt "pedelec" is the safest E-bike on the world market in 2011. Invented, tested and made in Japan in the 1990s and mass produced in Europe, China and Japan since 2007. The best and safest pedelecs are not made in Australia. Consumers can buy the best cars but not the best models of 250 watt pedelecs because they are illegal. This paper proposes the 2010 adoption of the new EU regulations, thereby allowing pedelec imports in 2012.

Speed limited 250 pedelecs are a safe, healthy and viable alternative to unsustainable car travel in towns and cities and on recreational routes in many rural areas. There are good reasons for consumers to be able to ride them as bicycles. They could help Australian state and local governments to make better use of both existing and new public transport (& bicycle) infrastructure. The 200 watt limit, and obsolete Victorian regulations need to be changed.
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Figure1
- Pedelec: front wheel 26 inch with hub drive.
- 250 Watt motor. DC brushless.
- Lithium battery. Range 46 Km.
- Gear 6 or12 speed in hub.
- Weight 20 kg.

1.1. **Definition of the pedelec**: it usually looks look similar to a bicycle with a female frame (figure 1). Pedelecs have male, female, fold up and tricycle frames; have wheels from 20 to 28 inches; weighing 15 kg to 25 kg. All have automatic start by ignition key; giving 2 to 1 power assistance till 6 Km/hr, then 1 to 1 assistance up to 25 Km/hr before cutting out power. They are heavier than bicycles, but with lightweight lithium batteries are easier to control and to increase travel range. Like bicycles they come with adjustable saddles and with the same length of pedals cranks used on bicycles of similar size. Some new pedelec designs use regenerative braking, riding down hill to reduce battery life.

1.2. Definition of the 250 watt (E-bike) is that it is throttle controlled and started by riding that cuts in at the 1 to 1 power assist and cuts out at 25 km per hour. It is not an electric scooter or a moped with no pedals; these are mostly petrol powered and not speed limited.

1.3. Riding a bicycle is more ergonomically energy efficient than walking and enables the average rider to go 3.5 times as far as walking . Pedelec riders go even further and make productive use of the existing road system and bike ways. Pedelecs make cross suburban travel easier across radiating rail and express bus routes in capital cities. (Parker 1989).

1.4. Riding a Pedelec is even more energy efficient than walking; that means up to 30 times more homes are accessible to railway stations. Pedelecs enable the average person easier access to spread-out rail and bus stations in the urban fringe areas. The use of pedelecs could become a means of local transport and to access outer urban rail stations or express bus routes, well beyond walking distance, as it is Japan and the Netherlands, see table **1** (Parker, A.A. 1999 B)

Table 1. Rail and bus station catchment area data.

Rail & bus station access	Walking	City bicycle	Racing bike	Pedelec or E-Bike
Effort advantage	1	3.1	3.8	1
Speed Km/hr	6.1	20.	25	24
Distance km	0.8	2.5	3.2	7
Catchment area square km's	1.3	12.4	20	40

1.5. Evidence that riding pedelecs is safe comes from selected bicycle friendly EU countries which have the following 2010 road death rates per 100,000 population: - UK 2.9, Sweden 3.0, Netherlands 3.9, Japan 4.3, and Germany 4.7, Denmark 4.5, Switzerland 4.5 France 6.1. Australia's death rate is higher (6.2) and the US death rate of 10.5 is even higher.
Ideally, it is desirable to analyse the three road safety risks measures used by the international IRTAD accident analysis to compare the safety levels in those countries experiencing a large growth in both bicycle and pedelec usage, as is done for other road vehicles. Today pedelecs and E-bike accidents are both counted as bicycle accidents.

Table 2 . Road deaths and death rates selected EU countries. Source IRTAD 2011

COUNTRY	Number of deaths			Country : road death rates				
	number road users			Per 100,000 persons			billions of vehicle Kms 2009	10,000 registered vehicles 2009
	Total deaths 2010	Total ped's 2009	Total cyclists 2009	total deaths 2010	0--14 years 2009	65+ years 2009		
Australia	1492	196	31	6.23	5.0	7.6	6.7	0.95
Denmark	250	52	25	4.54	4.0	7.0	8.2	1.1
France	3848	496	162	6.1	4.0	7.5	7.8	NA
Germany	3738	591	462	4.7	3.0	7.0	6.0	0.8
Netherlands	691	63	136	3.7	5.5	7.5	5.5	0.7
Sweden	323	44	20	3.4	1.9	6.5	4.4	0.7
Switzerland	343	88	21	4.5	5.2	6.5	5.7	0.7
New Zealand	358	31	8	8.3	3.5	10.0	9.6	1.2
Japan	5541	2012	933	4.3	2.5	10.0	7.74	0.64
United Kingdom	1846	524	104	3.0	3.4	4.2	4.6	0.7
United State	32,118	4052	630	10.5	7.5	13.5	7.0	1.5

1.6. In the Netherlands cyclists' deaths have reduced from 185 in 2009 to 162 in 2010. Since 1970 the reduction in road fatalities has benefited all age groups but the most impressive reduction has concerned young bicyclists (the age group 0 to 14) for which fatalities decreased by 95%, from 459 in 1970 to 23 in 2008 (IRTAD 2011). 70% of Dutch urban roads have a 30 km/ hr speed limit and the police take a tougher approach to unsafe drivers.

The fastest growing market for pedelecs and E-bikes is in the Netherlands, with 700,0000 fleet now mostly being used by the elderly. Life expectancy is high, at 80 years, as in other EU

bicycle friendly countries. Dutch road deaths increased from 1950 (1,020) and peaked in 1972 (3440) and then declined to 691 in 2010, and the population grew from 10 million to 16.5 million in 2010. In 2010 the traffic death rate was 3.7, deaths/100,000 population. In 2009 deaths/per billion veh-km was 5.5 and deaths/10,000 motor vehicle 0.7. Since 1970, the reduction in child deaths (0 to 14) from 459 to 23 in 2008 was impressive, decreasing by 95%. For the elderly of 65+ years deaths reduced from 648 in 1970 to 187 in 2009

The Dutch own 18 million bikes and about half of them ride bikes once a day. The average distance travelled by bike per person per day was 2.5km. The bicycle is used for almost a quarter of all journeys and 35% of journeys below 7.5km. Roads are safer because 70% of urban roads had speed limits of 30 km/h or less in 2008. A similar development took place on rural roads (excluding state roads): in 1998, 3% of the road length had a limit of 60 km/h. By 2008 the percentage had risen to 60% and driving speeds on these roads reduced substantially. (IRTAD 2011).

According to Wellemen, the former Manager of the Dutch Bicycle Masterplan, (NEPP 3 1998)the most important measure in increasing bicycle use in Dutch cities is reducing car parking on a systematic basis in inner urban areas. (Wellemen 1995 &1999). Indeed, the high level of non-motorised travel in the Netherlands is not accidental nor is it the result of Dutch culture.

Figure 2. Selected EU major cities with % of bicycle trips 1930 to 2010.

Source::1. *Wellemen (1999) Netherlands Bicycle Master Plan. 2. Parker A,A (1999 B) 3. Melbourne Metropolitan Planning Scheme1954 surveys and analysis*. MMBW *4. 1929 Melbourne Transport Plan,* 4. *Metropolitan Town Planning Commission.*

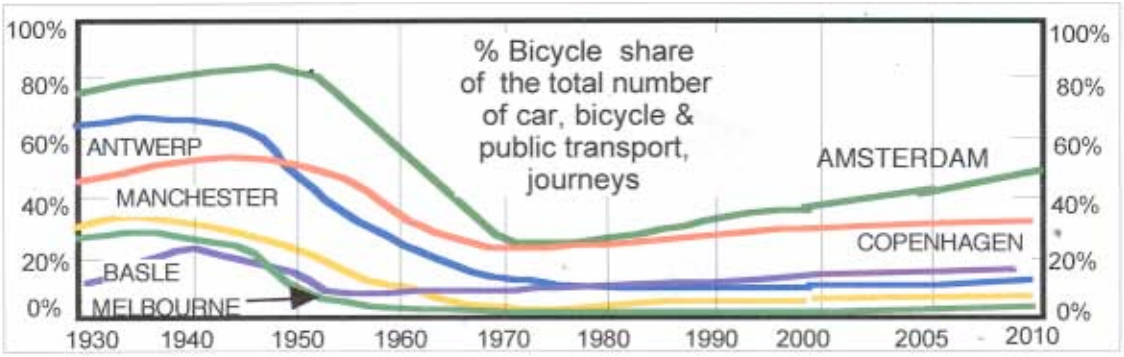
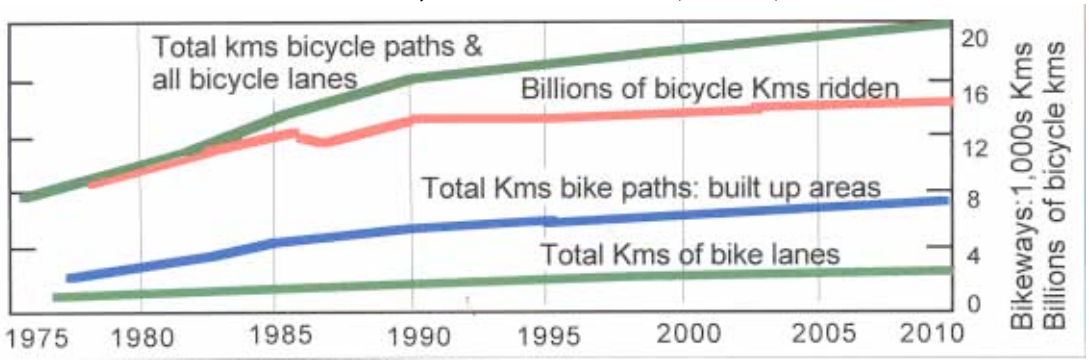


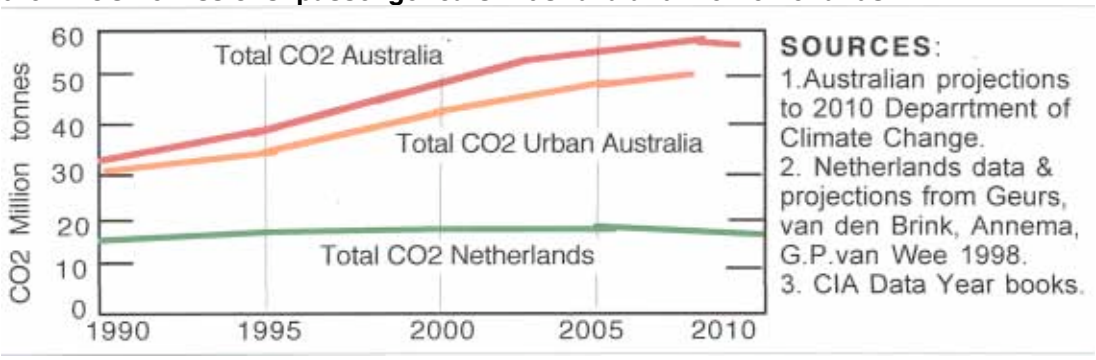
Figure 3. Bikeways in The Netherlands and bicycle kms ridden.

Source, Pucher and Buehler , Vol. 28, 2008



Using a pedelec in the Netherlands instead of a car use some 5 to 6 kWh per 100 kilometres, compared with 80 to 100 kWh for a 'medium size' car. As a result, each pedelec on the road allows avoiding on average 900 car kilometres per year and with that 80 litres of petrol. The average medium size Australian car would use 150 to 200 kWh.

Figure 4. CO2 emissions: passenger cars: Australia and the Netherlands



1.7. Japans' elderly need pedelecs: researchers found that elderly cyclists in Japan needed bicycles with auxiliary motors which required 50% less effort to pedal, and contributed to their health and mobility and enabled them to ride up hills Sales of pedelecs and electric bicycles in Japan increased to 414,000 in 2010 and were particularly high to the elderly. Life expectancy in Japan is the highest in the world.Japanese public health researchers knew of the need to enhance the mobility of the elderly, They had the hard evidence that persuaded Yamaha to design a powered bicycle to take 50% of the effort of riding. It took 5 years to perfect the computer chip controls for the throttle driven E-bikes with lead acid batteries to be produced in 2000. It took a decade to improve the detailed design of today's lightweight and safe pedelec; 400,000 of them were sold in 2010 with forecasts of 500,000 sales in 2012, and many of made in China. (CyclePress 2008) Life expectancy in Japan is the highest in the world.

Japan had developed sound methods of 'community policing' the behaviour of bicyclists in Japanese cities using mini police stations (Kobans} which housed small police bicycle patrols units. (Parker A.A.1993 B). Japan's experience successfully enforcing bicycle law became the model for the pedelec regulations and their later enforcement.Japans experience of successfully enforcing bicycle law became the model for the pedelec, regulations and their enforcement. In 1993 the Japanese National Police Agency established the rules for speed limitation and controls. The Road Traffic Law Enforcement Regulations were established in 1995 allowing electric bicycles to operate on roads with traffic and require two procedures:

1. The design, quality control, handling instructions, and test results are submitted to the National Public Safety Commission for approval. (Jamerson and Benjamin 2005 and 2007)

2. The Commission asks the Japan Traffic Management Technical Association to test the models and report back the results. When tests and other requirements are met, a certificate of approval issued to the manufacturer. (Jamerson and Benjamin, 2005 and 2007).

1.8 Japanese designed pedelecs have been tested and proven as electricity savers by users in the last five years. At night they can be charged with off peak mains electricity or from back up batteries in 'stables' at places of work, study, shop or play. At home roof top solar cells can feed pedelecs directly or at night from back up batteries.

The evolution of Japan's mains electric battery charged pedelec fleet into a solar powered means of transport is taking place now because the price of solar electricity is coming down and can be generated by domestic solar cell arrays on homes. Mains electric charged pedelecs with a power output of only 250 watts are economically viable now. Within a few years pedelecs complete with a package of solar cells for DIY installation at home.

1.9 Enhanced mobility of the elderly needed worldwide

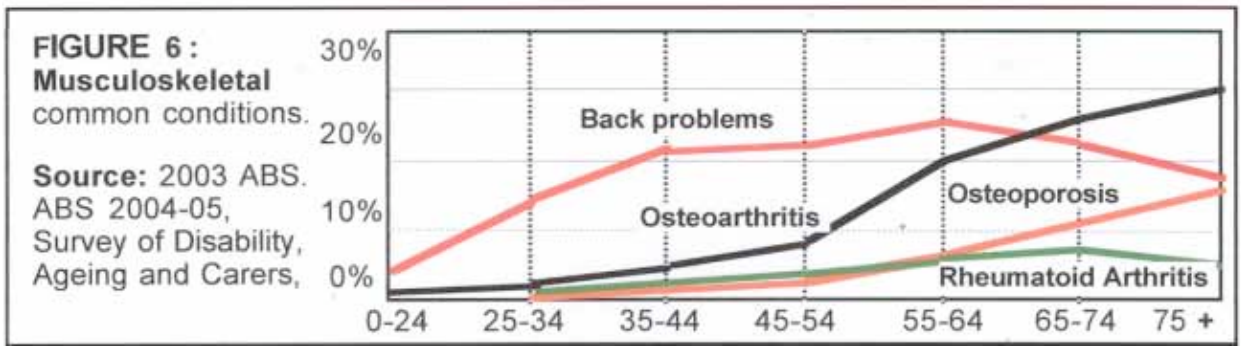
In 2006, 16.8% of the population in the EU-27 was aged 65 and over, that is almost 83 million people and the number is growing (ETRA 2008]). More of them become less mobile. In some

EU countries the elderly were helping themselves. 700,000 pedelecs were being used, mostly by elderly people, in the Netherlands in 2010 thus providing evidence that the pedelec was part of a real transport solution for the EU's 65+ population. Japanese public health researchers knew of the need to enhance the mobility of the elderly 15 years ago; with an elderly population aged over 65 of 28.7 million some mobility aids like the pedelec were needed. The hard evidence is that 70% of pedelec users were women over 50 years of age. (See section 7). The number of elderly in China is increasing and has alarmed the government. China's national health care system is already straining and two-thirds of rural workers are without pensions. The found that more than 13 percent of the population was over the age of 60, up three percentage points from the 2000 count. (China Census 2010)

Figure 5.

There are pedelec models, which are specifically designed for this group, for instance pedelecs with a step-through frames and adult tricycles which are available with 250 watt electric front wheel motors. (Parker, A.A 1992 A) At the discretion of the NZ Minister for Transport 650 watt pedelecs can be used by people with proven medical needs, as confirmed in letters from doctors. See figure 5.

1.10. Elderly Australians need to use pedelecs as in Japan and the EU but are constrained by unsuitable regulations. Australia is in need of more bicycle infrastructure, lower speed limits, to improve safety and health experts recommending use of pedelecs as the "In -between machine", after driving cars but before using the 3 and 4 wheeled scooters.



Australia has a proportionally smaller elderly population than Japan but Australian data shown on figure 6 and below show the proportion and mix of common elderly ailments. Many other elderly conditions could also benefit from using 2 and 3 wheeled pedelecs: asthma, MS, lung heart and muscle conditions, obesity, alcoholism chronic fatigue syndrome. However there is a data vacuum on some conditions apart from those on figure 6 and below

• Australia in 2004–05, 31% (6 million) of the population (33% of females and 29% of males) reported having a long-term disease of the musculoskeletal system and connective tissue.

• Of the total population in 2004-05, 15% reported having arthritis, 15% reported having back problems, and 3% reported having osteoporosis.
• In 2004-05, of those with arthritis, 51% reported having osteoarthritis and 16% reported having rheumatoid arthritis.

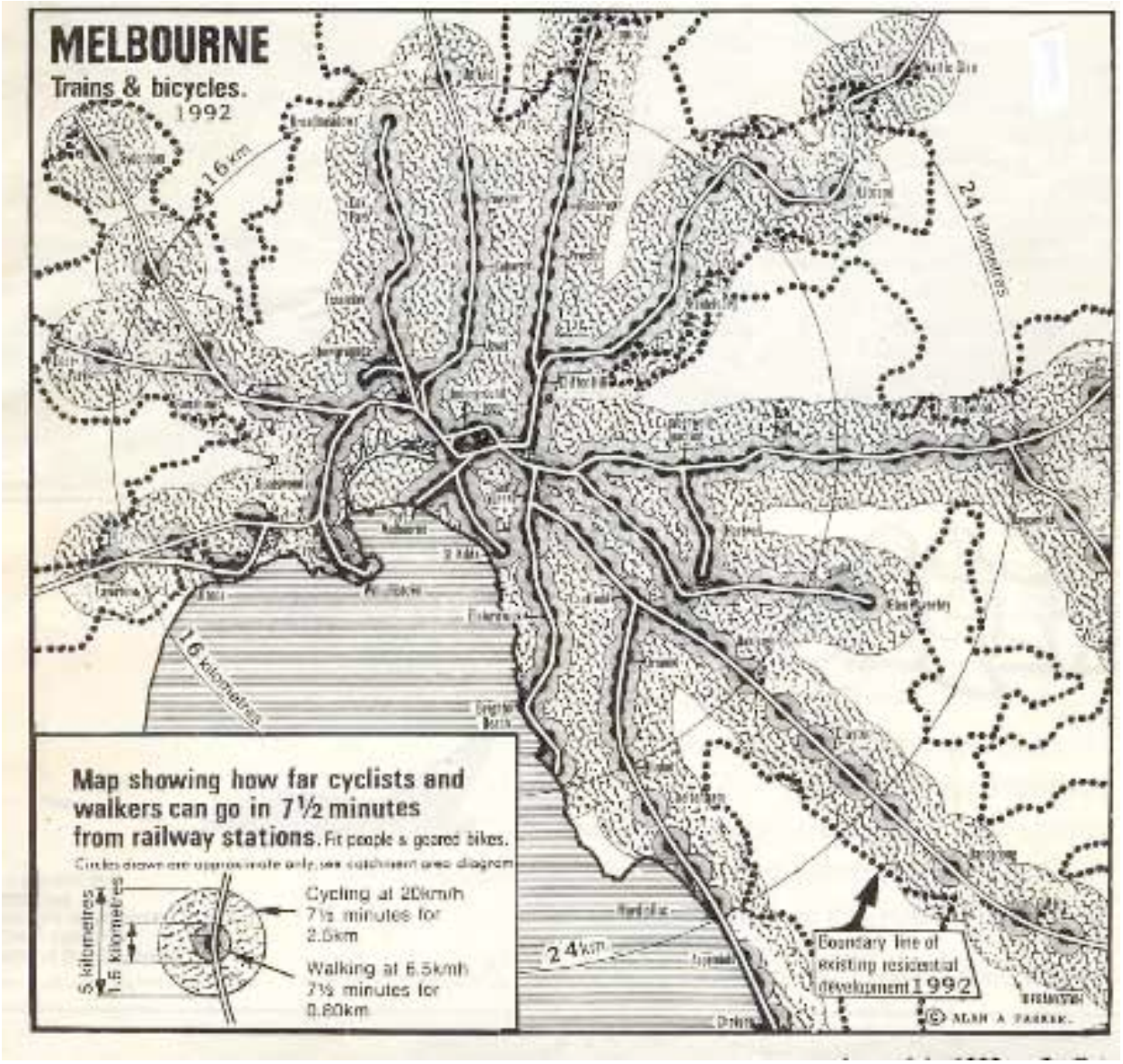


Figure 7 Bicycle and walking access to Melbournes rails stations in 1992.

This is why Australian modal interchanges and rail stations need to become a highly visible focal point of surrounding bike networks and become the objective of land use development and urban renewal. The use of pedelecs could become the main means of local transport and to hubs which is an effective, practical way of increasing the catchment area of each station, access rail stations or express and trunk bus routes, providing that secure parking is available. Pedelecs could be used to enhance personal mobility in hilly areas much the same way as bicycles do in flat cities. In Japan , housewives and elderly cyclists start to give up cycling when it becomes too strenuous but when 250 watt pedelecs are available they will use them.

There is a need for **pt4me2** to consider the safety records of large pedelec fleets in the EU. IN particular the EU postal services. British Royal Mail had 14,000 pedelecs. Deutsche Post has

8,000 pedelecs, France in 2011 ordered 5000, Posti Finnland about 2,000. Other pedelec fleets are in use in the Netherlands, Denmark, Italy, Austria and Switzerland, and now in use in Sydney and Melbourne. Indeed, Australia Post were impressed with the safety record of European postal services and did not see safety problems with 250 watt pedelecs but by passed the Victorian regulatory constraint by retro fitting postal worker bicycles with new powered front wheels with 200 watt geared brushless motors.

The retro fitter was EVS Electric Vehicles (EVS 2010). The objective was to cut CO2 emissions by 1000 tonnes a year and reduce the need to use motor cycles. This company would be interested in making hire bikes available at rails stations used by tourists and others stored in new bicycle Cages set up to hold both hire bicycles and electric bicycles for hire. As is done in the Netherlands and Japan.

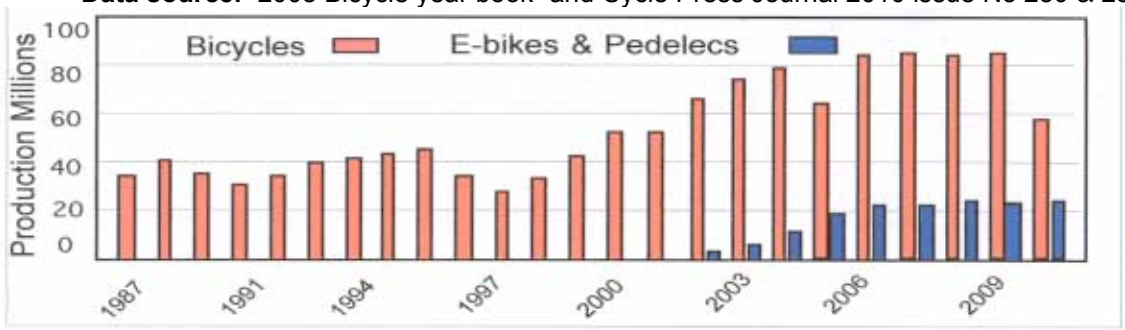
The Chinese government wants its manufacturers to mass produce 250 watt pedelecs to comply with new EU safety standards. The only constraint on the choice of using bicycles, pedelecs, E-bikes is if Australia fails to adopts the EU standards. As with the 200 watt postal bikes EVS Electric Vehicles could produce 200 watt hire bikes

1.11. China can mass produce safe pedelecs to EU standards

The latest and safest pedelecs manufactured in China, for export to the EU originate from European and Japanese designs, and from June 1, 2011 will comply with EU safety standard EN 15194. The Chinese government wants all pedelecs and E-bikes made for export to the EU to meet the EU standards because it will be China's largest sales market for many years. The production of electric bicycles in China stood at 27 million units in 2010 most going to the domestic market, and 600,000 E-bike to the 27 EU countries, the total export number for the whole of 2010 is estimated at 700,000 units; (BIKE Europe 2011 B).

The idea for a common China/EU standard for e-bikes came at seminar organised by the China Bicycle Association about one year ago where the European standardisation process was analysed and emphasised the importance for China to become actively involved in this work. The reason 60% of China's e-bike exports go to Europe for complete E-bikes and pedelecs The parts that are shipped from China and built into bikes at EU factories do not appear in the 60% above as most of the components, including frames, also come from China including Bafang Motor 400,000 hub motors to Europe in 2010. (BIKE Europe 2011 B).

Figure 8. China bicycle: E-bike + pedelec, production in millions
Data source. "2008 Bicycle year book" and Cycle Press Journal 2010 issue No 250 & 25.



China recognises the need for policies to reduce the road deaths of bicyclists, pedestrians, pedelec and E-bike users. Total road death rate per 100,000 population is 6.2 in 2007.

2. Electric bicycle legislation in Australia, EU and China

Having a Federation of States and Territories, each with their own road traffic regulations applying to imported pedelecs and e-bikes, is inept and complex because pedelecs are not

made in any State but by Asian trading partners who mass produce safe pedelecs complying with EU regulations and standards. Compliance with EU regulations and new safety standards for ion lithium batteries and E-bike component parts is required in Australia but no Commonwealth or State Standard for these exists. This regulatory bungle started in 2001 and has spread to the new national strategies for Road safety, Bicycles, and Future Cities which were released in 2011 with no mention of the word pedelec (Austroads 2010).

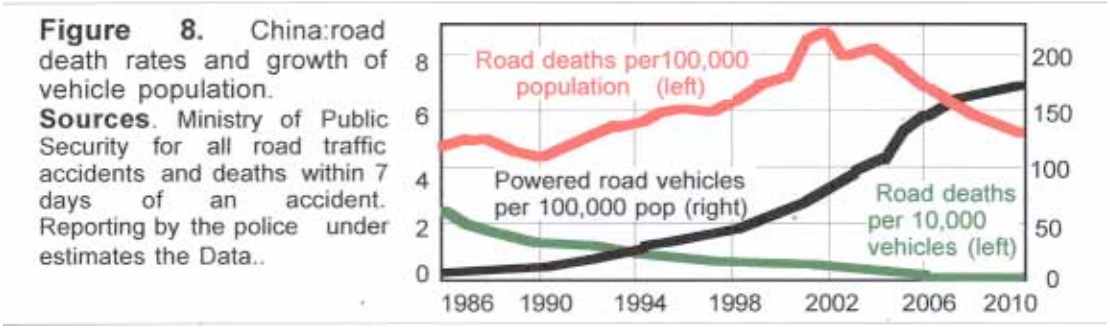


Figure 8. China:road death rates and growth of vehicle population.
Sources. Ministry of Public Security for all road traffic accidents and deaths within 7 days of an accident. Reporting by the police under estimates the Data..

Worst of all the Australian Bicycle Council (ABC) in its report on the future of bicycling made no mention of the need for elderly and lame bicyclists or postal workers to use pedelecs. Even so, the first Australia Post bikes, retrofitted with 200 watt 36 volt Ion lithium batteries, have been in use in Melbourne since March 2011.(Austroads 2010)

This submission argues that all new and existing transport infrastructure projects take into account the mobility needs of elderly people and all cabinet minutes relating to bicycle and pedelec infrastructure include and include an elderly impact statement and that the ABCshould be funded and staffed to coordinate action on these recommendations & undertake a two yearly review of progress made.

Vic roads, on the 29 April 2010, reaffirmed its existing 200 watt rule. Yet Bicycle Victoria, which has 45,000 members, through its representative on the State Bicycle Advisory Committee, (Hosted by Vic Roads) that “It expected all Australian States to adopt the new European Standard of 250 watts”. The former EU standard also had a 250 watt requirement (Bicycle Victoria 2011) .Meanwhile, the world market in quality bicycles, pedelecs and e-bicycles is booming. More and more bicycles sold on the European markets are made in Asia. Nine million bicycles were imported from the top ten Asian producing countries in 2010. (See Table 3).

If the regulations in dispute have not been resolved by the EU by June 2011 a planning opportunity exists for the Australian Commonwealth and State Government to give Australian consumers and importers what they want, while keeping compulsory helmet wearing, which can be piggy backed onto any new Australian 250 watt road rule.

Table 3 The Top Ten EU Asian Suppliers of 9 million bicycles in 2010
Source. Bike Europe News. 25-2-2011

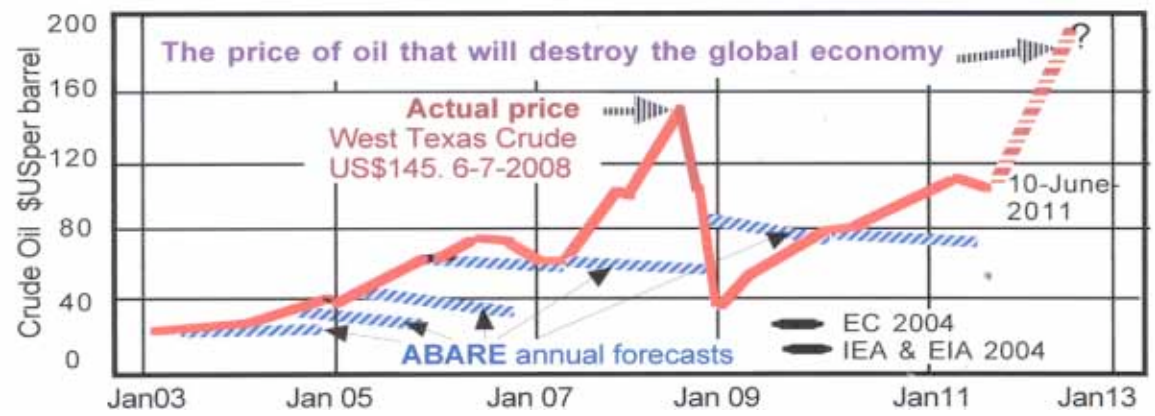
Country		Indonesia	550,432	Malaysia	259,213
Taiwan	3,358,674	Bangladesh	503,582	Cambodia	368,040
Thailand	1,218,472	Philippines	503,109	Tunisia	411,980
Sri Lanka	1,201,138	China	461,082		

3. Pedelecs help cope with peaked oil supplies and Increased fuel prices.

Japan was always dependent on imported fuels and the cost of electricity was very high with a stagnant economy and ageing population. This explains the large Japanese investment in the

rail network and the 27% of trips made to work or education by public transport by 1990. Seven million people cycle to the rail system every workday; around 15% of the population cycle all the way to work and another 12 % walk to work. Japan's energy security policy has reduced oil dependence in the transport sector from 80% in 1973 to 50% in 2004, thus reversing a negative trend (Hooke 1994). (Parker 1995)

Figure 9. ABARE's recent oil price forecasts reflect the 2004 forecasts of the US IEA, EIA and OPEC for 2010. Source See table 5



The EU, US, Japan, China and India know they have to reduce oil imports and reduce their consumption. In Australia BTRE economists have made serious error of judgment in 2005 and put their faith in oil reserve estimates that ultimately are derived from the nationalized oil industries of dictatorial regimes. These countries do not publish details about how much oil is extracted from each reservoir, what methods are used to extract that oil; nor do they permit external audits and some are failing economies. (Economist 2006)(Parker A.A.2007)

Fatih Birol, chief economist for the International Energy Agency, (IEA) has warned that rising oil prices due to the conflicts in Libya and the Middle East could threaten the global economic recovery now that oil production has peaked. On 30 May 2011 he said that energy related 2010 CO2 emissions were estimated to have climbed to a record 30.6 Gigatonnes (Gt).

The IEA has estimated that 80% of projected emissions from power stations in 2020 are already locked in, as they are currently in place or under construction today. "This significant increase in CO2 emissions and the locking in of future emissions due to infrastructure investments represent a serious setback to our hopes of limiting global rise in temperature to no more than 2ºC."The prospect of limiting the global temperature to 2% is getting bleaker and current rate fossil fuel consumption will push the global temperature up by 4˚c (Harvey, Fiona 2011)

Table 4 Oil price forecasts for the period 2010, 2020 and 2030 (US $ per barrel)

Government or intergovernmental source	2010	2020	2030
International Energy Agency (IEA).	22	26	29
Energy Information Agency (EIA); US Department of Energy.	23	25	
European Commission (EC)	28	33	40
Organisation of Petroleum Exporting Countries (OPEC)	19	19	
Institute of Energy Economics Japan (IEEAJ)	24	27	
Centre for Global Energy Studies (GGES)	20	15	

Source: (BTRE 2005 working paper 61. p. 24).

4. Conclusion

This submission concludes that Australian government bodies should enable 250 watt pedelecs to be imported so as to reduce carbon emissions and air pollution while enhancing the mobility of the young, the elderly and the partially disabled, by simply using the new EU regulations or China/EU regulations, the existing state regulations are in conflict and obsolete. In Australia we see can see unsustainable road congestion growing worse due to a lack of policy vision regarding the integration of bicycle, pedelec and E-bike access and secure storage at rail and bus stations and modal interchanges. Bicycle pedelec hire facilities are needed at tourist destinations.

China, Japan and EU countries are leading the way to sustainable and integrated transport systems by introducing pedelecs, energy efficient hybrid cars, and faster rail transport. Indeed all are trying to risk manage 4 serious problems they share with Australia: global warming, oil depletion, population growth, and less liveable cities. (US academy of science 2007)
In the real world solar charged pedelec batteries and quality bicycles will reduce car use and reduce electricity demand on power stations.

5. **Recommendations.**

✦ Dumping old state electric bicycle regulations and adopt the new China/EU Pedelec regulations, whatever they do, as a decision seems certain by early 2012. That would be a small but significant step towards sustainable transport

✦ Ensure that all new and existing public transport infrastructure projects take into account the mobility needs of elderly people and all cabinet minutes relating to bicycle and pedelec infrastructure include both an elderly, Pedelec, E-bike impact statement on access to public transport routes and the use in tourist bike hiring services at selected urban and rural rail stations.

✦ Evidence based actions to improve accessibility and mobility of elderly non-drivers at local and state levels and ensure they are implemented at a regional level.

✦ These recommendations should form part of a revision to the “Victorian Cycling Strategy”and revision. Of VicRoads road rules. The Victorian Bicycle Advisory Council should be funded and staffed to coordinate action on these recommendations. And undertake a two yearly review of progress being made.

✦ Submission by the City of Melbourne to the National Australian Bicycle Council in support of the Integration of bicycles and pedelecs within i a revision of the National Australian Bicycle Council Strategy 2011-2016.

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