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In Europe 250 watt pedelecs reduce pollution and improve the safety and mobility of young and elderly riders

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ABSTRACT

The 250 watt "pedelec" is a state of the art electric bicycle invented in Japan in 1990. The EU bicycle Industry has been using that name for many years; pedelec it is not a brand name. The 250 watt pedelec is perhaps the safest type of mass produced electric bicycle; available in Europe the US and Japan, but not sold in Australia since 2001. It offers a simple, healthy alternative to much motor vehicle travel in urban areas. Revised EU pedelec safety regulations will soon apply. It is argued that Australia should adopt them for 4 reasons. 1: In 2010 pedelecs were considered as safe as bicycles in countries with lower low road death rates per 100,000 population than Australia: Sweden, the Netherlands, Japan, Switzerland and Germany. 2. Pedelecs enlarge train and bus access and make cross suburban travel across radiating rail lines easier; pedelec access is three times more efficient than a bicycle. 3. Millions of the elderly find walking and driving too stressful. Japan conducted research, which found that elderly cyclists needed bicycles with auxiliary motors that took 50% less effort to ride. 4. Pedelecs are similar to bicycles but a little heavier; the same wheels and frames but safer with an automatic motor start that cuts out at 25 km/hr.

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 a state of the art electric bicycle and is the safest E-bike on the world market in 2011. Invented, tested and made in Japan in the 1990s pedelecs have been mass produced in Europe, China and Japan since 2007. The best and safest pedelecs are not made in Australia because Australia has a limit of 200 watts on electric bicycles. Consumers can buy the best cars but not the best models of 250 watt pedelecs because they are illegal. This paper proposes the 2011 adoption of the new EU regulations, thereby allowing 250 watt 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.

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.

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 bicycle infrastructure. The 200 watt limit and contradictory state regulations need to be changed.

(i) 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 14 kg to 24 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, different ratios of power output and innovative new electronic gear changes as used by Darrel Evans in the 2011 Tour de France.
(ii) 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.
(iii) Riding a bicycle is more ergonomically energy efficient than walking and enables the average rider to go 3.5 times as far as a pedestrian. Pedelec riders go even further and make productive use of the existing road system and bike ways. Pedelecs make suburban travel easier across radiating rail and express bus routes in capital cities (Parker 2009).
(iv) 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. See Table 4, p 12.
(v) 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. Table 2 shows deaths for billion vehicles mile and 10,000 registered vehicles.
(vi) 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 . 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. There are no separate data for pedelecs or E-bikes.
(vii) 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.
(viii) Elderly Australians need to use pedelecs as in Japan and the EU but are constrained by unsuitable regulations. Australian bicycle infrastructure is inadequate. Lower speed limits, on the local road network (Parker 1998). Safety and health experts work together to encourage the use of pedelecs as the "In-between travel, option before 3 and 4 wheeled footpath scooters (Parker 2006).

Source: *2008 China bicycle year book In English and Chinese Tokyo,* Cycle Press.
Jamerson, F & Benjamin, E (2011) *Electric bikes worldwide reports,*

(ix) China's 100 million pedelec/E-bike fleet and 450 million bicycle fleet are already constraining the growth of transport CO2 emissions, oil imports and pollution in their cities. The world fleet of bicycles, pedelecs and E-bicycles is growing fast, compared to the possible growth of motor vehicles production shown on Figure 2 (Weinert 2007).
(x) 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.

2. History of electric bicycle legislation in Australia and the EU

Having a Federation of States and Territories, each with their own road traffic regulations applying to imported pedelecs and E-bikes, is a problem 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 started in 2001 and has spread to the new national strategies Road safety (ATC 2011), Bicycles (Austroads 2011) and Future Cities (DIT 2011), which was released with no mention of the word pedelec. The brief should have been to make roads safer, cities more liveable and with better use of bikeways by importing the best and safest pedelecs and E-bicycles. The more light weight (maximum 40 Kg) two wheelers are on the bikeways and streets with lower speed limits the safer it will be (Peck 2009).

"The Model Australian Road Rules" were adopted at a 2001 meeting of State Transport Ministers but many of the Ministers failed to adopt the model rules for 200 watt E-bikes. Only some went along with the 200 watt rule. No further action was taken until February 2011 when the then National Bicycle Committee attempted to get the new Department of Transport and Infrastructure (DIT 2011) to fix the problem and accept the need for 250 watt E-bikes. According to a member of the National Bicycle Advisory Committee, action is possible in November 2011 (Parker 2011). Vic Roads, on the 29 April 2010, reaffirmed its existing 200 watt rule (Victorian Government Gazette 2010). Yet Bicycle Victoria, which has 45,000 members, through its representative on the State Bicycle Advisory Committee, (hosted by Vic Roads) said that "It expected all Australian States to adopt the new European Standard of 250 watts" (Bicycle Victoria 2011).

Another problem is that the Australian Bicycle Council in its report on the future of bicycling (Austroads 2010) made no mention of the need for elderly and lame bicyclists or postal workers to use pedelecs. Even so, the first 200 watt Australia Post bikes with 36 volt ion lithium batteries have been in use in Melbourne since March 2011. Meanwhile the Australian Transport Commission, responsible for revising the Australian model road rules, has failed to use the opportunity to revise the rules.

Table 1 The Top Ten EU Asian Suppliers of 9 million bicycles in 2010 .

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		

Source. Bike Europe News. 25-2-2011

Meanwhile the world market in quality bicycles, pedelecs and e-bicycles is booming. More and more bicycles that are to be sold on the European markets are made in Asia **(**Jamerson and Benjamin 2011). Nine million bicycles were imported into Europe from the top ten Asian producing countries in 2010 (See Table 1).

2.1 Will the EU implement new rules and regulations by early 2012?

In 2010, the European Two wheeler Retailers' Association (ETRA) was given an opportunity to explain in detail to the European Parliament why the European Union's (EU) new 2011 regulations for the review of the type-approval for two- and three-wheel motor vehicles is not well adapted to E-bikes and E-scooters and creates even more confusion than the previous legislation, In the EU countries; a Member of European Parliament, Wim van de Camp, invited the ETRA to make a submission to the EU. The ETRA submitted a proposal based on two main principles applying to E-bikes and E-scooters. The differences between the two principles are very important (Bike Europe 2011 A):

1. Exclusion of all pedelecs with pedal assistance up to 25 km/h in order to allow the EU to amend the Classification under the Machinery, Directive+ EN 15194, the current standard. This would exempt these vehicles from the type-approval procedure and they would be classified as bicycles. As a result they could be used In the EU without helmets, drivers' licenses or insurance.

2. E-scooters with pedals, up to 45 km/h cycles that can be propelled by the motor itself, would still be subject to type-approval but the procedure would be adapted to suit so that unnecessary requirements would not apply.

Australia has no mechanism for adapting to point 2 above and it should be rejected because the maximum speed permitted is 45 Km /Hr which makes them less safe for riding on shared footways, bikelanes and residential streets with low speed limits

The draft report of the European Parliament on the review of the type-approval was published on 5 May 2011. The Rapporteur, Wim van de Camp, has not yet introduced any provisions for the benefit of electric cycles and light electric vehicles because he is still considering the safety issue because of a dispute between the cycling organisation (ETRA) and the import dealer association. The deadline for such provisions is unknown.

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. They also need to collect exposure data on both bicyclists and pedelec users.

There is a need consider the safety records of large pedelec fleets in the EU. 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 are 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). While the ATRF conference is proceeding watch for the accident reports and complaints by the postmen that they need a mere 50 watts more on their E-bike. Will 250 watts be needed in hilly areas for those over 50? The objective was to cut CO2 emissions by 1,000 tonnes a year and reduce the need to use motor cycles.

In 2011, or early in 2012, the wattage could upped to 250 watts in Australia. The 250 watt power limit already applies to nearly half of the world's population (3.13 billion); the Australian population is only 0.7% of that number. The Chinese government wants its manufacturers to mass produce 250 watt pedelecs to comply with new EU safety standards (Watts 2010). This limits the choice of pedelecs in Australia unless it adopts the EU standards.

3. Perhaps pedelecs are as safe as bicycles in five EU countries but not the US

EU countries' policies on road safety for their citizens have differed greatly in the past. Since 1990 remarkable progress has been made. In all countries fatality risk has been reduced by more than 40%. In 2010, the lowest fatality rates found in the United Kingdom 3.0, the Netherlands 3.7 and Sweden 3.0 deaths per 100.000 persons (IRTAD 2011). Three types of death rates based on IRTAD data are given below in Table 2. In the US there are 16 cities with much lower death rates per 100,000 population than the national death rate of 10.5 for all road users (Garrick & Marshal 2011). All these are cities bicycle and pedestrian friendly.

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. In 2010 Pedelecs and E-bike fatalities are counted in with bicycle fatalities. However, that is likely to change in the near future.

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

However the most reliable measure for pedestrians and cyclists is deaths per 100,000 population. The death rate per 100,000 measure shown on Table 2 does not provide separate data on damage being done to those who do not drive.

Bicycles are not registered and little is known about how far pedestrians travel in countries with high death rates per 100,000 population. Today pedelecs and E-bike accidents are both counted with bicycle accidents. Even less hard data exist on the safety of electric bicycles generally and certainly not the automatic, speed limited pedelec which is a relatively new comer in Europe and the US.

4. **Dutch transport planning is perhaps the most pedelec friendly in the EU**

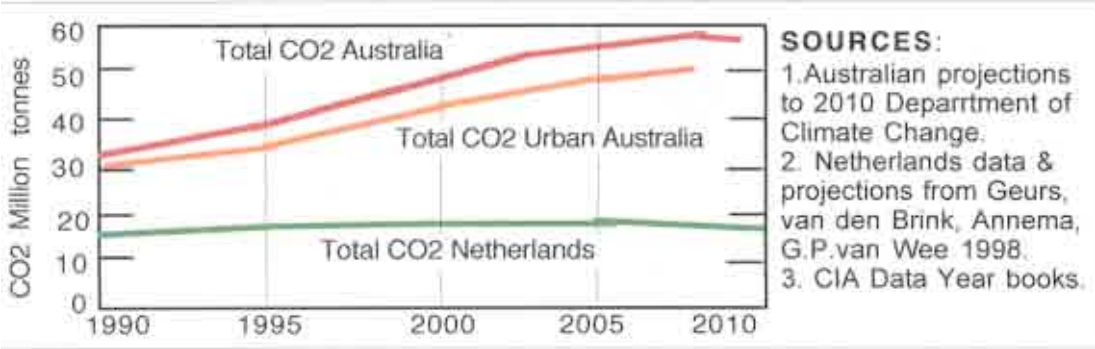
In the Netherlands cyclists' deaths have reduced from 185 in 2009 to 162 in 2010. Since 1970 the reduction in road fatalities has benefited all age groups but the most impressive reduction has concerned young bicyclists (the age group 0 to 14) for which fatalities decreased by 95%, from 459 in 1970 to 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 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), peaked in 1972 (3440) and then declined to 691 in 2010. 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. 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 (IRTAD 2011).

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 is 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. 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).

Using a pedelec in the Netherlands instead of a car uses 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 3: CO2 emissions: passenger cars: Australia and the Netherlands

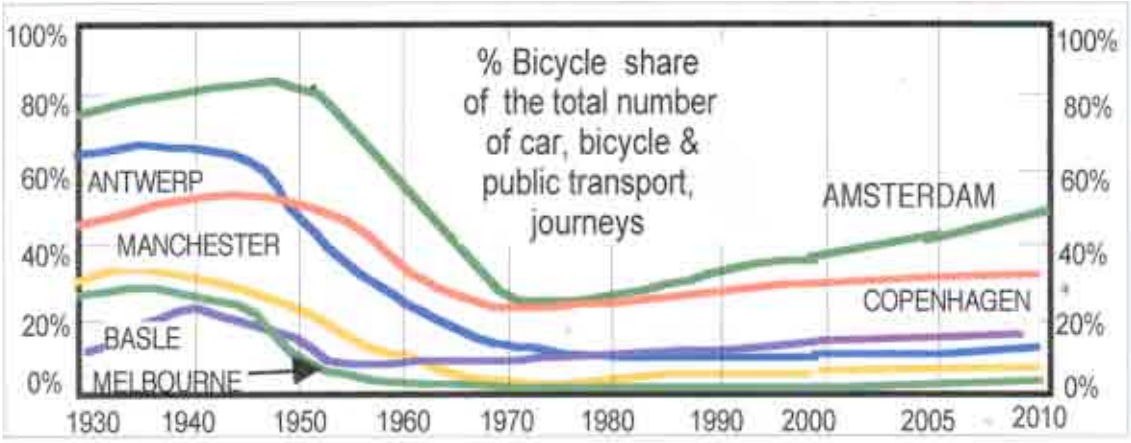


The "green tax laws" in the Netherlands have also resulted in far fewer old cars, fewer four wheel drives and hardly any pedestrian crippling bullbars (Parker 1995 A). The Dutch car fleet has many more newer and smaller cars with a rounder, softer 'crumpable' front end (Parker 2008.) These pedestrian friendly features are particularly beneficial when cars are driven at much lower speeds in built up areas in which there is good traffic law enforcement.

The Netherlands has been moving slowly towards a sustainable transport system. The objective was to slowly decouple the growth of GDP from the growth in fuel consumption The growth in greenhouse gas emissions from passenger cars has been constrained, the proportion of walking trips has not declined, rail patronage has increased and the proportion of "everyday cycling" trips has increased (Parker 1998) (Parker 2004).

Figure 4 demonstrates the historical trends in urban areas Melbourne and five EU cities and makes clear the extent of growth in bike share that has been achieved in the Netherlands since the 1970s.

Figure 4: 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 *1929 Melbourne Transport Plan,* 4. *Metropolitan Town Planning Commission.*

5. Japan's elderly need pedelecs and Japan needs a solar energy future

Life expectancy in Japan is the highest in the world. 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. Pedelec sales increased to 414,000 in 2010 and enhance the mobility of the elderly, This research evidence 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 heavy lead acid batteries in 2000 and another ten years to improve today's light and safe pedelec. With sales of 500,000 in 2012, mostly made in China (CyclePress 2008).

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 1993 B). Japan's experience of successfully enforcing bicycle law became the model for the pedelec law enforcement. In 1993 the Japanese National Police Agency established the rules for speed limitation and controls. The Road Traffic Law Enforcement Regulations established the rules for electric bicycles to operate on roads (Jamerson and Benjamin, 2007).

It took 5 years for Yamaha to perfect the computer chip controls for the throttle driven E-bikes with lead acid batteries produced in 2000. It took a decade to improve the detailed design of today's lightweight and safe pedelecs; 400,000 of them were sold in 2010 with forecasts of 500,000 sales in 2012, and many were made in China (CyclePress 2008).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 will be available complete with a package of solar cells for DIY installation at home.

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.

In the last three years there have been several experiments using solar electricity for the recharging of batteries of a pedelec and other domestic appliances. Production of photovoltaic cell module production in Japan reached 3142 MW by 2011. These cells are used primarily for installing domestically installed solar panels on houses as well as new feed-in tariffs; both requirements are driving demand and will help the introduction of solar charging of pedelec batteries. Solar charged pedelec batteries and quality bicycles will reduce car use and reduce electricity demand on power stations **(**White 2011).

6. 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 are becoming less mobile however 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. 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. Indeed more than 13 percent of the population was over the age of 60 in 2010, up 3% from the 2000 count (China Census 2010).

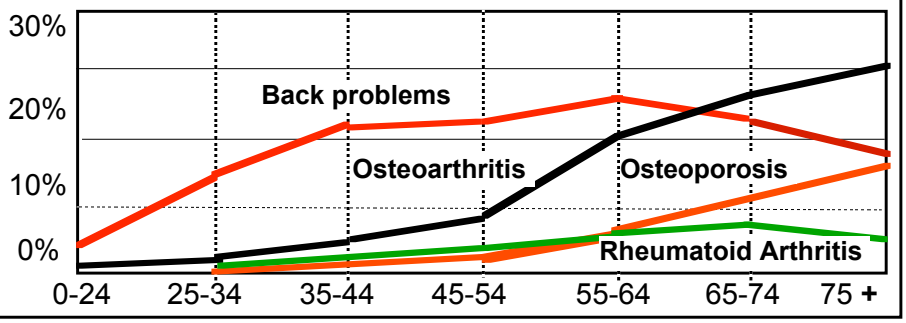
Figure5.

For those with painfull joints. A friendly Pedelec with a low step through frame.

Source .
ETRA (2008)

FIGURE 6 : Musculoskeletal common conditions.

Source: 2003 ABS. ABS 2004-05, Survey of Disability, Ageing and Carers,



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 people with these conditions could benefit from using either two or three wheeled pedelecs.

People with many other conditions could also benefit e.g. asthma, MS, lung heart and muscle illnesses, obesity, alcoholism chronic fatigue syndrome however there is a data vacuum on some conditions.

In 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.

There are many new 250 watt pedelec models on the world market; some of those designed for special applications, such as tricycles for for postmen, for long distance touring, will make life easier for those with health problems. Indeed, Shimano has new components and a computer monitor with riding mode, battery power, gear indicator, speedometer and odometer which will be available soon.

Daimler, a German 250 watt pedelec innovator, offers four levels of power assistance to 25 km per hour with a range up to 90 km; their pedelecs allow users to integrate with smart phones and listen to music. Daimler has a theft prevention measure that many police forces will be pleased with; by removing the pedelec smart phone it effectively locks the drive motor.

Hopefully these new 250 watt pedelec innovations will be available to those who need them. The new pedelecs could be used to bridge the health gap between driving a car and the use of three and four wheel footpath scooters or to avoid the use of a walking frame or walking sticks (as this writer does) (Parker 1993).

7. China our trading partner will mass produce safe pedelecs to EU standards

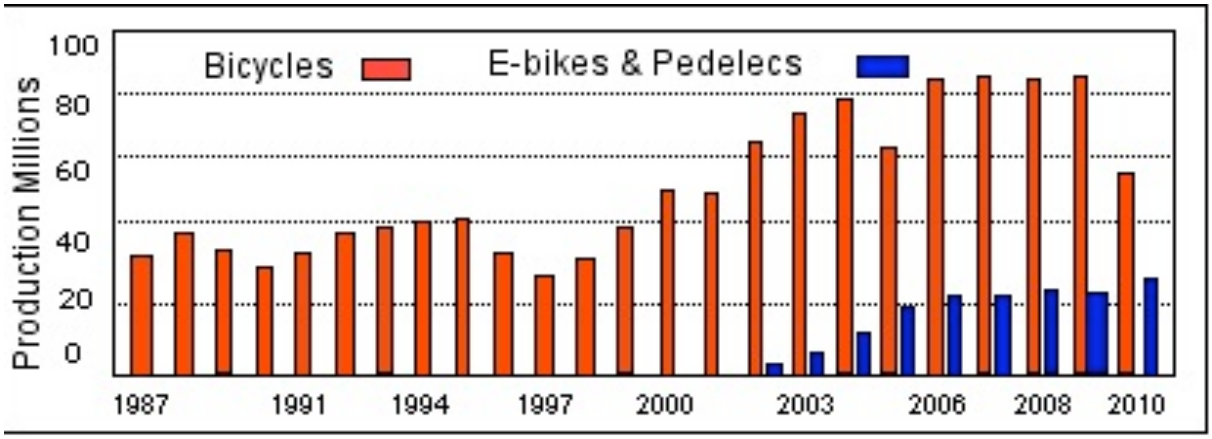
The latest and safest pedelecs, manufactured in China for export, originate from European and Japanese designs and from June 1 2011 will comply with EU safety standard EN 15194. The Chinese government wants all pedelecs and E-bikes made for export to the EU to meet the EU standards because it will soon become China's largest sales market. The production of electric bicycles in China stood at 27 million units in 2010 (see Figure 7) 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 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. China's census found that more than 13 percent of the population was over the age of 60, up nearly three percentage points from the 2000 count (China Census 2010) which is going to greatly increase. For 104 million Chinese over 65, people with less power in their legs, pedelecs provide welcome extra power assistance. China has a potential long term home market for pedelecs of more than a hundred million.

We know China 60 years ago built bicycle friendly infrastructure in most of the large flat cities which partly explains the high demand for power assisted bicycles compared to other Asian cities without bicycle infrastructure (Zang 2007)(Weinert et al 2008). The early petrol power assisted bicycles (PABs) and bicycles used bicycle lanes and parking infrastructure, improved vehicle travel speeds and safety, and enabled convenient parking. Many millions of PABs were in use in China prior to 2004 and most of them are now banned in some large cities and replaced by E-bikes and more recently pedelecs.

A specific example is Shanghai which has a population of 20 million people and had a million licensed PABs which created air pollution, so in 2006 did not renew the PAB licenses and issued licensed for E-bikes and more recently for pedelecs. This policy applies to many cities (Parker 2006).

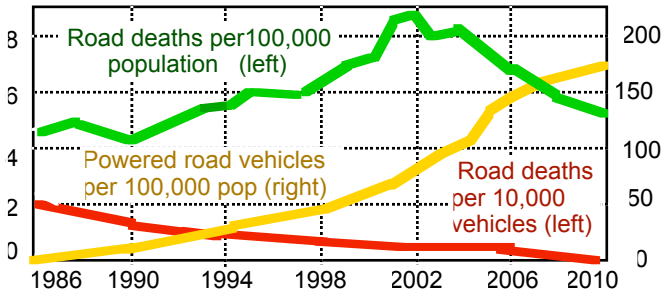
Figure 7: China bicycle: E-bike + pedelec, production in millions



Data source. "2008 Bicycle year book" and Cycle Press Journal 2010 issue No 250 & 25.
Sources. Cycle Press 2011. Cycle Press 2008.

Banning dirty two stroke petrol engines powering PABs, mopeds, scooters, small motor cycles and most cars in central business districts (CBD), reduced air pollution. Even so, in 2009 air pollution killed around 400,000 people (Academy of Science 2007) and there were 70,000 roads deaths of which 40% were cyclists and pedestrians. The introduction of low speed limits, reduced the number and severity of road accidents from 2001, as shown on Figure 8.

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. Enforcement of acciden reporting by the polic underestimates the Data..



Greater use of pedelecs is now planned by improving the bicycle infrastructure and public transport, and following Japan's lead by building high speed rail services between the major cities of more than 10 million population. China needs to constrain the unsustainable demand for carbon intensive imports Including oil and cars mostly used by China's new rich. 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 (IRTAD 2010).

The idea for a common China/EU standard for pedelecs 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: Bafang Motor exported 400,000 hub motors to Europe in 2010 (BIKE Europe 2011 B).

8. Pedelecs enlarge rail and bus access and cross suburban travel.

Cycling rather than walking increases the number of homes with access to stations by around a factor of 10. The pedelec increases the number of homes with access to public transport by at least a factor of 30 over walking. The limitation of radiating rail lines going to the CBD for commuting is largely eliminated by the pedelec which makes cross suburban travel very much easier. Rail and bus stations, modal interchanges need to become a highly visible focal point of surrounding bike networks. 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 (Parker 1999).

Table 4 assumes walking and bicycle riding require the same physical effort of 75 watts for 7.5 minutes but pedelec riding for 25 minutes, within a rectangular street layout similar to that which exists in much of Metropolitan Melbourne. Our capital cities have sprawled In the hilly parts of Australia and 250 watts pedelecs would enable able-bodied people to cycle much more than they do now which is an important safety consideration because of the need to ride up hills without weaving (Parker 1999) (Dobson and Sipe 2005).

Table 4. 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

Source: Parker 1989, Pages 22 to 227. Parker (2006).

Eight bicycles or pedelecs can be parked in one car parking space and use space not suitable for car parking. They should replace some existing car parking spaces at the entrance to rail stations or on the platforms when space permits. The Victorian, NSW, Qld and SA policy of giving priority to car parking in the past 20 years and ignoring the provision of secure bicycle parking at most stations has been a costly waste of funds due to the bigger vehicles needing paving and drainage as well as far more space (Parker 1989).

9. 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).

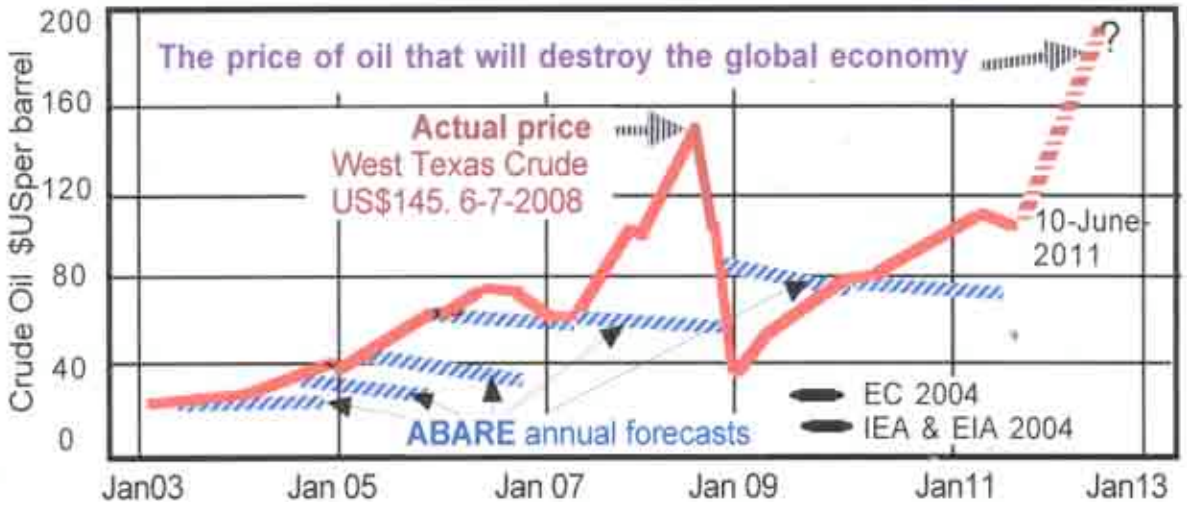
It comes as no surprise that the pedelec invention originates from of a government request to Industry.

The EU, US, Japan, China and India know they have to reduce oil imports and reduce their consumption. In Australia BTRE economists made a 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 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 2011)*

Figure 9: Actual Age oil prices from 2003 to August 2011, with other forecasts super imposed on it by ABARE , IEA, EIA, EC for the year 2010



Source : PEST (2011) Submission to the Inquiry into Carbon Tax. April 2011, see the data forecasts on Table 5 below.

Table 5: 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).

10. Conclusion and recommendations

This paper proposes that Australian government bodies 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 and dumping the States' regulations that are in conflict with each other and obsolete.

China, Japan and EU countries are leading the way 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. All four of these threats need corrective policies according to experts who understand these risks. Indeed China, US and EU scientists are researching these problems (US Academy of Sciences 2007). Fatih Birol, IEA, has spelled out the problem of the growth of fossil fuel based production of electricity oil supplies peaking and a probable dangerous increase in global warming. In Australia we can see road congestion growing worse.

China, Japan and the EU can mass produce safe and sustainable pedelecs to EU regulations and safety standards. Australians should have the right to buy all of them from the low cost chain store seller to the Daimler "Rolls Royce" models In the quality bicycle retailers. These imports will perhaps reduce growing dependence on imported crude oil that will probably increase to US$150 plus per barrel within a year or so (see Figure 8).

By 2015 the solar electric battery charged pedelecs and E-bikes have the potential to be a growing means of transport in cities to replace car trips of less than 10 km and to access public transport for longer trips. The problem in Australia has been the lack of political will and the absence of a future vision to cope with unsustainable transport systems making capital cities less livable.

10. 1 Recommendations

- Reform old state electric bicycle regulations and adopt the new China/EU pedelec regulations by early 2012. Nothing could be as bad as the existing state regulatory problems and the lack of consumer choice we have had for a decade. This would be a small but significant step towards a sustainable transport system.
- Ensure that all new and existing transport infrastructure projects take into account the mobility needs of elderly people
- These recommendations should form part of a revision to the Austroads National Australian Cycling Strategy 2011-2016".

The Australian Bicycle Council should be funded and staffed to coordinate action on these recommendations and to undertake a two yearly review of progress

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