Chapter 2. Powered two-wheeler fleet and usage

This chapter analyses the recent evolution in the use of powered two-wheelers (PTWs) and their role in mobility. It highlights the distinction between different types of powered two-wheelers (mopeds, scooters and motorcycles) and describes the main characteristics of riders' journeys in various countries, taking into account geographical differences. It also reviews the policies in place that have a direct or indirect effect on the use of powered two-wheelers.

The fleet of powered two-wheelers

Categories of powered two-wheelers

In this report, the term powered two-wheelers (PTWs) includes all power-driven two- or three-wheeled vehicles but does not include power-assisted or electric bicycles. Classifications of powered two-wheelers were developed by the UNECE in its 1958 Agreement, and by the United Nations in the 1968 Vienna Convention. In this report, for the sake of simplification, we identify two administrative categories of PTWs:

- Mopeds.
- Motorcycles – sometimes with a distinction between light motorcycles and others.

Scooters can belong to either of these categories, depending on their displacement. Electric PTWs are being developed and can belong to either the moped or the motorcycle category.

Mopeds

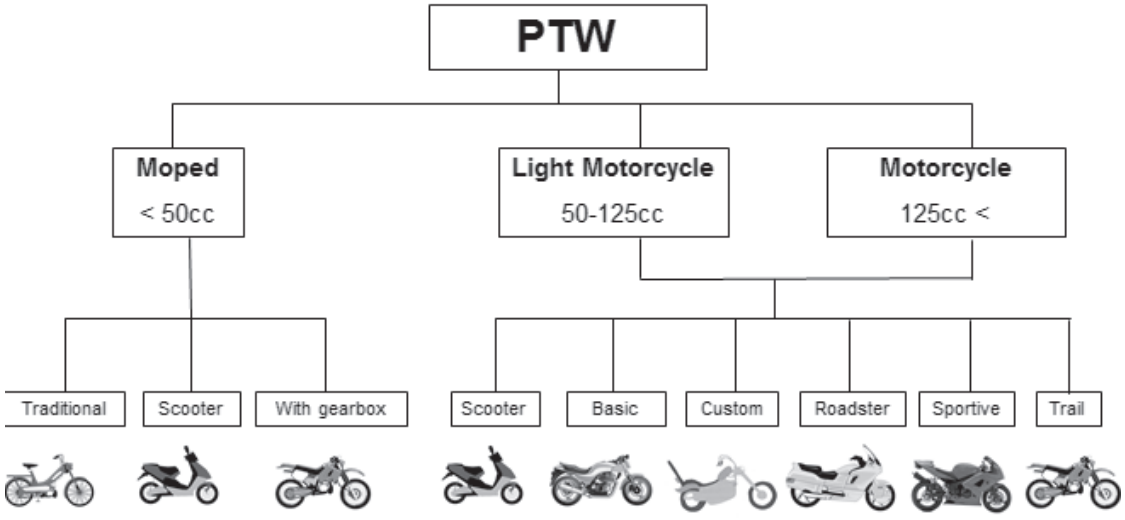
Mopeds are lower-powered, two- or three-wheelers. In most jurisdictions, their engine displacement is less or equal to 50 cm^3. Top speed restrictions often apply and may vary between jurisdictions, but are typically 45 km/h or 50 km/h. Electric mopeds have a power less, or equal to, 4 kW and a maximum speed less or equal to 45 km/h.

Motorcycles

The term "motorcycles" refers to a wide range of vehicles. Some jurisdictions define two categories of motorcycle:

- Light motorcycles, with a displacement less or equal to 125 cm^3;
- Motorcycles, with a displacement above 125 cm^3. This category includes a wide range of motorcycles designed for varying uses. The terms used for particular types of motorcycles differ across the world. Figure 2.1 illustrates a French categorisation developed by Ruscher (2003). In contrast, the US National Agenda for Motorcycle Safety (NAMS, NHTSA/MSF, 2001) categorises motorcycles as traditional, cruiser, sportbike, touring, sport-touring, dual-purpose, scooters, mopeds and nopeds (mopeds without pedals), sidecars and trikes.

Figure 2.1. **Diversity of powered two-wheelers**



Source: Adapted from C. Ruscher, (2003).

Mopeds and motorcycles can be powered by thermal or electric engines. Electric powered two-wheelers are starting to penetrate the market and present a number of advantages in terms of both reduced air pollutant emissions and noise.

Attractiveness of mopeds and motorcycles

The use of PTWs presents a number of advantages for individual users:

- In urban areas, PTWs offer the advantages of individual transport modes with the potential to travel relatively quickly and to have reliable travel times. This is made possible by the capacity to overtake vehicles, allowing riders to get through most traffic jams. In addition, PTW users save time when searching for a parking place, by parking – legally or not – very close to their destination.
- In rural areas, they offer mobility options for users who do not have access to a car and where public transport is sometimes non-existent.
- PTWs are an individual transport mode, offering freedom and flexibility, with almost no constraints on the departure and destination locations.
- Finally, PTWs are a cheaper way to travel than a private car: the purchase cost is lower, maintenance is cheaper, fuel consumption is lower, and tolls and parking are often free or reduced.

At a societal level, PTWs also provide a number of benefits, as they respond to several concerns of governments:

- Providing citizens with efficient transport modes;
- Optimising usage of road space and sharing of limited public space, so the maximum number of people can use it;
- PTWs can bring benefits from an environmental perspective, especially in comparison with passenger cars: less fuel consumption, less CO_2 and NO_X emissions than a private car, but much higher emission levels of HC. The emergence of electric PTWs, which are much cheaper than electric cars, may bring additional environmental benefits (see Table 2.1).

Table 2.1. **Emissions of pollutants by various motorised transport means in cities per km and per passenger**

	Car (1.2 passenger/vehicle)	Urban bus (average occupation)	Motorcycle (urban)	Electric scooter*
CO_2 (g/pax.km)	206	130	129	40.5
SO_2 (g/pax.km)	0.04	0.01	0.04	–
PM (g/pax.km)	0.04	0.05	n.a.	–
HC (g/pax.km)	0.56	0.3	6.82	–
NOx (g/pax.km)	0.65	1.3	0.14	–

* On the basis of an average European electricity mix. With a French mix, CO_2 emissions are: 5.3 g / pax.km

Source: ADEME, France.

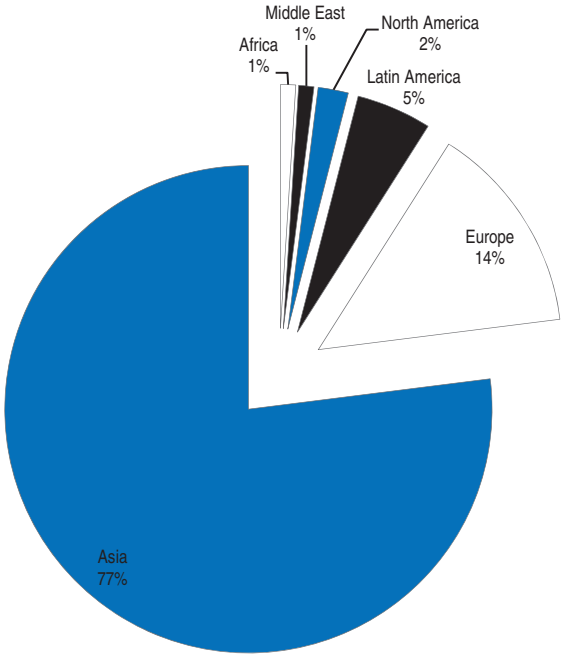
However, PTWs also have a number of drawbacks:

- They are a more risky travel mode (about 20 times riskier than a car).
- They are not emission free. PTWs emit local and global pollutants and are a significant source of noise.
- They do not provide the same level of comfort and service as private cars (e.g., carrying more than one passenger and cargo).

Key figures about the fleet

There is no consolidated data on the global fleet of powered two-wheelers and, in some emerging economies, there is a lack of data. Nevertheless, in 2008, it was estimated that there were 313 million powered two-wheelers in operation in the world, with more than three quarters of the PTW fleet in Asia (see Figure 2.2). Worldwide, the current production of PTWs is around 50 million units per annum, to be compared with around 65 million units for passenger cars.

Figure 2.2. **Geographical distribution of the fleet in 2008**



Source: Society of Indian Automobile Manufacturers (2008)

In most OECD countries, the motorcycle fleet grew much more rapidly than the passenger car fleet in the decade 2001 to 2010 (see Table 2.2).

Table 2.2. **Growth (%) in the PTW and passenger car fleets for a selection of OECD countries**

2001-2010

	Passenger cars	Mopeds	Motorcycles
Australia	25%		88%
Czech Republic	29%	10%	35%
France	11%	-22%	48%
Great Britain	13%	-27%	28%
Greece	52%	-14%	76%
Japan	11%	-20%	14%
Mexico	86%		311%
Spain	22%	27%	82%
Sweden	8%	84%	91%
United States (excl. SUVs)	5%	–	67%

Source: IRTAD; IMT for Mexico.

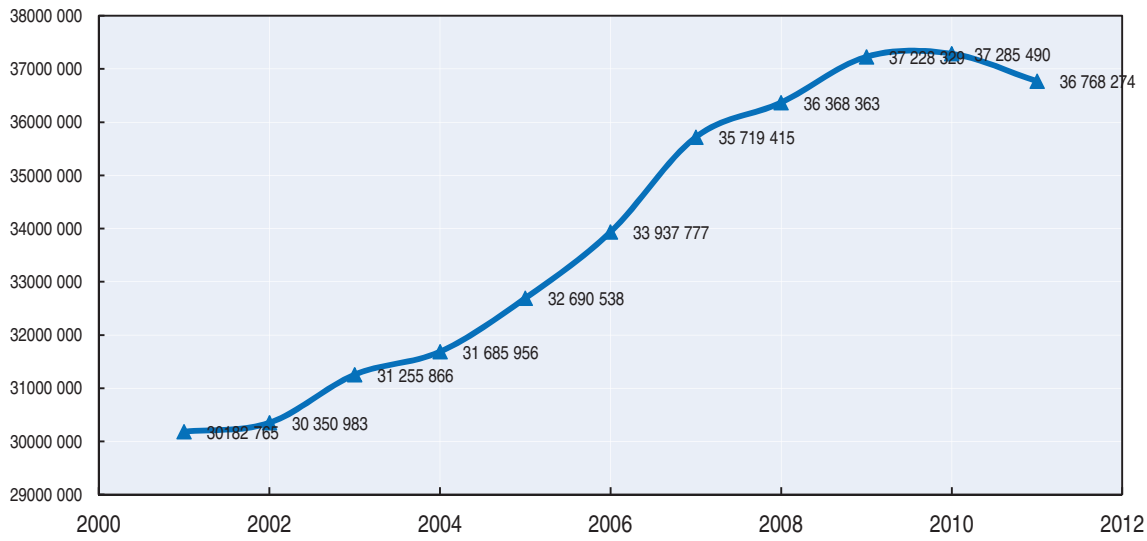
European Union

There were 37 million PTWs in Europe[1] in 2011, of which about 70% were motorcycles and 30% were mopeds (ACEM, 2013). Within the motorcycle fleet, the smallest displacements (between 50 and 125 cm^3) composed more than 60% of the total. The 125 cm^3 class doubled in volume in five years (2003-08). In 2011-12, as a reflection of the overall economic downturn, the growth in sales of new vehicles halted (see Figure 2.3). Mopeds represent between 9% (in the UK) and 60% (in Luxembourg) of the PTW fleet, and their share is declining in most countries.

In large cities, the growing proportion of PTWs in the motorised fleet is marked. In Barcelona for example, PTWs represented 24.7% of the fleet in 2002 (15.3% for motorcycles and 9.4% for mopeds) but rose to 30.2% in 2011 (21.5% for motorcycles and 8.7% for mopeds).

Figure 2.3. **Circulating PTW fleet in Europe***

2001-2011



* European Union + Norway + Switzerland

Source: ACEM.

Russia

In 2011, there were about 2.6 million powered two-wheelers, i.e. 6% of the motor vehicle fleet in the Russian Federation. The large majority (94%) of the fleet is composed of motorcycles; however, the moped fleet is increasing significantly.

United States

In the United States, the number of registered motorcycles rose at the end of the 1970s and early 1980s followed by a sustained decline through the late 1990s. Motorcycle registrations have been on a steady increase since that time. In the United States, a large share of the PTW fleet is made up of powerful motorcycles, with 75% above 749 cm^3 (Motorcycle Industry Council, 2010).

Mopeds are nearly absent from the market, representing less than 4% of the PTW fleet.

Australia

Overall, PTWs compose only a small proportion of the fleet, but their numbers are growing at a faster rate than for other vehicles. PTWs represented 4.1% of the motor vehicle fleet in 2011, an increase from 3.2% in 2006, as PTW numbers grew in this period by 47% (Australian Bureau of Statistics, 2011).

Many motorcycles are larger than 750 cm^3 with a survey of riders in Victoria indicating that approximately 50% had a motorcycle of this size as their main vehicle. In contrast, fewer than 3% of riders reported using a PTW of less than 125 cm^3 as their main vehicle. Scooters represent a small proportion of the PTW fleet, with less than 5% of riders reporting using them as their main choice (VicRoads, 2008).

In Australia, the proportion of mopeds is very low and, in many States, moped data is not separately collected as a full motorcycle licence is required to ride a moped. In the State of Queensland, mopeds may be ridden on a car licence and mopeds constituted 6.9% of registered PTWs in 2003-2008 (Blackman and Haworth, 2013). Given that a car or motorcycle licence is required, access to mopeds is not available to younger riders in Australia (in contrast to Europe), thus reducing demand for these vehicles.

New Zealand

The PTW fleet grew rapidly from 2004 to 2008 and was static in the three following years. The growth categories are concentrated at the extreme of the fleet – the under 60 cm^3, under 250 cm^3 and over 1 000 cm^3 groupings grew the most. The average engine capacity is close to 600 cm^3 and growing (Ministry of Transport, 2013). In 2011, there were 112 000 PTWs, comprising 3% of the motorised fleet.

Asia

PTWs are the principal mode of motorised transport in many Asian countries. PTWs account for up to 85% of the motorised vehicle fleet and the PTW fleet is continually increasing. In many countries, mopeds constitute the biggest market share (see also Chapter 9).

Japan

In Japan, the moped fleet reached a peak in the late 1980s and was at that time twice the size of the motorcycle fleet. It has fallen considerably since, but still represented more than 60% of the PTW fleet in 2010. The relatively high proportion of mopeds in Japan can be explained by the ease in obtaining a licence (car licence holders do not need to take a test), relatively low costs and the fact that automobile insurance covers mopeds for free.

Korea

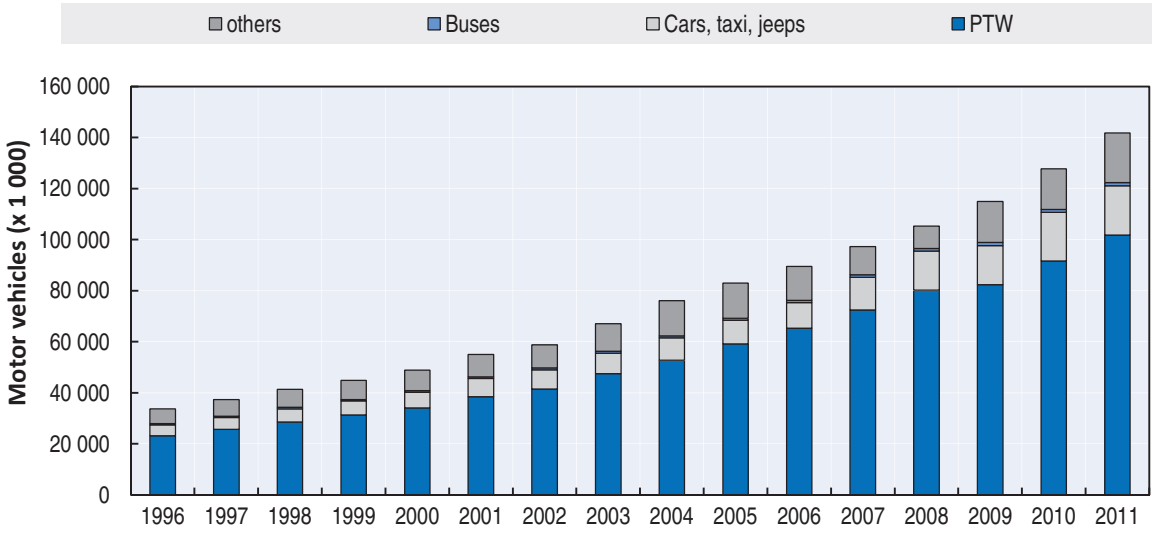
The number of motorcycles is steadily increasing in Korea and reached 1.8 million units in 2011 (with 13.6 million passenger cars). Official statistics are not yet available for mopeds, as registration only became compulsory in 2012 (to increase safety, and also to fight against theft).

India

In 2011, there were 100 million motorised two-wheelers in India, representing 70% of the motorised vehicle fleet. Between 1997 and 2011, the size of the PTW fleet multiplied by four. The significant increase in the PTW fleet across the country is due to the increasing necessity for travel, easy availability, increasing purchasing power, poor public transport and inability to afford personal cars (see Figure 2.4). Mopeds represent 65% of the registered PTW fleet.

Figure 2.4. **Growth in the motor vehicle fleet in India**

1996-2011



Source: Ministry of Roads, Transports and Highways.

China

Based on data from the Traffic Management Bureau of the Ministry of Public Security, the number of motorcycles in China increased by more than 70% between 2003 and 2011 – from 60 million to 103 million units.

Central and Latin America

In many Latin American countries, the mass sales and use of PTWs has been rather recent, and has considerably increased in the past 10 years. The PTW fleet is growing every year by about 10%, slightly faster than the fleet of passenger vehicles. In those Latin American countries for which data are available (see Table 2.3), PTWs make up between 3% (Chile) and 52% (Uruguay) of the motorised vehicle fleet. In Mexico, PTWs represented only 4% of the fleet in 2011, but the fleet is growing rapidly and has almost doubled in 5 years.

Table 2.3. **PTW fleet in Latin America in 2011**

	Estimation of the PTW fleet	% of the motor vehicle fleet
Argentina	3 823 000	21%
Brazil	15 688,000	22%
Chile	113,000	3%
Colombia	3 794 800	50%
Costa Rica	130 500	14%
Equator	329 000	22%
El Salvador	75 000	10%
Guatemala	657 000	30%
Mexico	1 310 000	4%
Nicaragua	134 000	30%
Paraguay	271 900	27%
Peru	1 568 366	44%
Dominic Republic	1 481 200	51%
Uruguay	824 000	52%
Venezuela	985 000	19%

Source: Ibero American Road Safety Observatory (OISEVI).

Africa

There are no consolidated data on the PTW fleet for the African continent. Information gathered from a few countries shows that the use of PTWs as commercial vehicles has substantially increased over the past decade in the big African cities. In particular, the number of moto-taxis has exploded in these cities, as a consequence of the lack of public transport services (Kumar, 2011).

Characteristics of and changes in users of powered two-wheelers

PTW usage and users

It is difficult to analyse the role of PTWs in traffic because there is sparse data on PTW mileage. In most countries, mileage is estimated based on the numbers of registered vehicles; but there is a large difference between owning a vehicle and using it. The most reliable information on PTW usage comes from household surveys. These surveys show that PTW usage has been growing significantly from past levels. Haworth (2012) studied the main reasons for the growth in the use of powered two-wheelers and summarised these as follows:

- Ease of use.
- Efficiency and economy of this mode of transport.
- Their use in businesses.
- Growth in individual leisure.

Mopeds are used mainly in Europe by young people, as there are few access restrictions for this type of motorised vehicle (see next section). Most motorcycle use is for everyday travel, but in mature

markets (e.g., Europe, United States) larger motorcycles are used for leisure riding. In Europe, PTWs are commonly used for commuting, but this is much rarer in the United States, Canada or Australia, where PTWs are largely used for recreational riding.

In many OECD countries, there is an increasing number of "returning" riders – typically males in the 40-50 year age group who stopped riding a PTW for a period of more than 5 years, and usually return to riding on powerful motorcycles.

The PTW rider population is composed mostly of males; but the trend is evolving, with increasing numbers of females now riding.

Box 2.1. **Mobility patterns in Greece**

Results of Greek study, based on national transport survey
(Yannis, 2007)

- Mopeds are mainly ridden by the 16-17 age-group.
- 8-20 years-olds use PTWs as much as private cars.
- Most PTWs riders are male.
- There are more females riding mopeds than motorcycles.
- Average yearly distance travelled increases with the power of PTW: 4 172 km / year for a moped; 11 993 km / year for a PTW > 730 cm3.

Other results from this study show that, contrary to what is often assumed, PTWs are not primarily used for leisure. The average distance travelled (on a yearly basis) by moped or motorcycle on a week day is twice as much as during the weekend. This is not the case for cars, for which the average distance during a week day is only 10% higher than during the weekend. In Greece, PTWs are therefore used mainly to go to school or work, while cars are the preferred travel mode for leisure during the week end.

Mopeds are used in predominantly urban areas (87% of their use, compared to 47% for private cars). This is because young people use them to go to school or to visit their friends, which correspond to trips inside urban areas.

Motorcycles are also used mainly in urban areas (83.5% of the distance travelled) but, given their higher performance, they are more suited than mopeds to drive outside urban areas.

Box 2.2. **Mobility patterns in the United Kingdom**

Results of a British study

A TRL study (Christmas et al., 2009) developed a categorisation of riders on the basis of about 1 000 rider interviews. The classification clearly shows that there are groups among riders who have a focus either on leisure and fun riding, or riding for transport. However, none of the groups does exclusively one or the other.

The typical use of PTW in the United Kingdom:

- 53% of riders ride less than 4 000 miles (6 400 km) per annum (47% ride more);
- 34% only ride in summer;
- 14% ride only for commuting;
- 12% ride as part of the job;
- 72% do all year round leisure riding;
- 71% do all year round fun riding;
- 21% ride only on rural roads, 15% only urban and 64% do both;
- 82% of the riders hold a car licence, 72% use a car on a regular basis at an average of 10 000 miles (16 000 km) per annum., which is at least not much less than an average car user.

Box 2.3. **Mobility patterns in France**

Results of a French survey of national households
(CERTU, 2010)

On average, French people undertake 1.5% of their trips by PTW, using their mopeds or motorcycles for two-thirds of their travel. They rarely travel by car or by foot.

Mopeds are used mainly for commuting or going to school/university, with the second travel purpose being to visit friends or for study-related trips. Motorcycles trips are mainly work-related.

Mopeds users: include many children and young people – below 25 years, and rarely more than 34 years old. They include an important proportion of the labour force, but mainly workers or employees, and few people with high educational backgrounds. Both non-motorised households (for whom the moped replaces the car) and over-motorised households (well-off households, who can purchase one or more mopeds for their children) are over-represented among moped users.

Motorcycles users: often include mature people (35-49 year age group) as well as 25-34 and 50-64 year olds. A high proportion is at the higher educational level, with most working – usually as senior staff or professionals. Their households are less likely to be over-motorised (i.e. the motorcycle usually replaces one car).

Box 2.4. **Mobility patterns in New Zealand**

Results based on New Zealand Household Travel Survey 2003-2009
(Study from the Ministry of Transport)

Highlights:

- Motorcycling makes up approximately 0.5% of total travel time and 0.5% of trips.
- About 120 000 people each year ride more than 100 km (82% male, 18% female).
- 30-44 year olds as well as 45+ years made up the greatest proportion of these riders (at 38% each); while those aged 15-29 made up 25%.
- 65% of motorcycling trips are for commuting: to work or to study. (For car trips, it is 30%.)
- 32% of the distance ridden every year is on urban roads, and 68% on open roads.

Access and training

The training and access policies related to this travel mode influence the choice and use of PTWs.

This is typically the case for mopeds which represent, in many countries, the only motorised individual travel mode accessible for 14-18 year olds. This is less the case in the United States, where it is legal to drive a car from age 16 in many states, and does not apply in most states of Australia where moped riders require a car or motorcycle licence.

Box 2.5. **Influence of PTW access policy on the use and choice of PTW in France**

In France, from 1996 to 2007, anyone who had held a car licence for more than two years was authorised to ride a PTW up to 125 cm3 without an additional test or training. There was an increase in the number of 125cm3 PTWs in the fleet after 1996.

Since 2011, those holding a car-driving licence for longer than two years must now also undertake seven hours of training to be authorised to ride a 125cm3 PTW (this training did not apply to people who could demonstrate having held PTW insurance for more than two years). This measure was immediately followed by a decrease in the sales of 125cm3 and a light increase in the sales of 50cm3 PTWs.

There are different categories of licences for motorcycles, usually based on the power of the engine, aiming to ensure an adequate degree of maturity, experience and education to ride a powered two-wheeler. Licence categories might also be put in place to encourage or ensure a graduated access to PTWs (this is further discussed in Chapter 5). For mopeds, access in most countries is very simple; the age of the rider is often the only criterion, although some countries now also require a test on traffic rules.

European Union

Member states of the European Union have a harmonised licensing system, which still offers various options to the Member states. The 3rd Driving Licence Directive (2006/126/EC) came into force in January 2013. Within this Directive, mopeds were included in the licensing system for the first time and a strict graduated approach was mandated for access to heavier machines.

However, the subsidiarity principle applies and countries can adapt the Directive. As an example, the minimum age to ride an A-class motorcycle in most countries is about 20 or 22 years – not 24 years – as prescribed in the Directive (see Tables 2.4 and 2.5). France and Italy are the only EU countries allowing teenagers to ride a moped from 14 years. In France, there is only seven hours of compulsory training, while in Italy children must pass a practical test to ride a moped. In France, the underlying reason is twofold: first, to give young apprentices living in rural areas access to individual motorised transport. Second, to offer a means of individual motorised transport that is not subject to a licence.

Table 2.4. **Riding licence in Europe**

Age and engine power restrictions within the 3rd Driving Licence Directive
(effective as of January 2013)

Item	3rd directive (2006/126 EC)
Vehicle restrictions	
Category AM (moped)	
Maximum speed (km/h)	45
Minimum age	16 (subsidiary 14 to 18)
Category A1	
Maximum engine power (kW)	11
Maximum power weight (kW/kg)	0,1 max
Maximum. capacity (cm³)	125
Minimum age	16 to 18 (subsidiary)
Category A2	
Maximum engine power (kW)	35
Maximum. power weight (kW/kg)	0,20
Minimum age	18, but A1 min age + 2 years
Category A	
Minimum age for direct access	24

Great Britain

In Great Britain, a system of Compulsory Basic Training (CBT) for new riders was introduced in 1991. Reform of the CBT system is currently being considered. Riders of PTWs of all types must first undertake CBT before being allowed to ride on the road on a provisional licence. The CBT course includes classroom-based theory elements, off-road practice and a road ride, accompanied by a trainer, of at least two hours. Riders must show they are competent before they are issued a certificate.

Riders who have completed CBT are authorised to ride a moped or a motorcycle up to 125 cm^3 unaccompanied, provided they display "L" plates, do not carry pillion passengers, and do not ride on motorways. The CBT certificate is valid for two years, by which time the riders must have passed a test or retake CBT if they wish to continue riding. Riders of larger motorcycles, once they have completed CBT, can only ride on the roads, using L-plates, if they are accompanied by an instructor, in radio contact, for the purpose of training for the test.

Those who passed their car driving test prior to 1 February 2001 have full moped entitlement and are not required to take a CBT course to ride a moped. Those who passed their car driving test after this date need to complete a CBT course to validate their moped entitlement. On completion of CBT they are entitled to ride a moped without L-plates and carry pillion passengers.

United States

In the United States, the licensing rules vary from state-to-stat; ranging from highly regulated systems to no specific licences for PTWs.

Canada

In Canada, the licensing system is defined by each province. Some Provinces have a mandatory rider training requirement while others use a licensing incentive for rider training.

In Ontario, the applicants must be at least 16 years of age and parental consent is not required, while in most other jurisdictions parental consent of age is required until 18 years of age. New drivers applying for a first licence to ride a motorcycle need to enter Ontario's graduated licensing system, described below.

- *Class M1*: After candidates pass a motorcycle knowledge test, they receive a Class M1 licence and an information package for new riders. New motorcycle riders with an M1 licence learn to ride under the following four conditions:
    - blood alcohol level must be zero;
    - ride only during daylight hours (1/2 hour before sunrise to 1/2 hour after sunset);
    - no riding on highways with speed limits of more than 80 km/h (with some exceptions);
    - no passengers.
- *Class M2*: Riders must pass an M1 road test or complete an approved motorcycle safety course before receiving a Class M2 licence. They must hold a Class M1 licence for a minimum of 22 months. If they complete an approved motorcycle safety course, they may reduce this time requirement by four months. With an M2 licence, they gain more privileges – they may ride at night and on any road. However, at this level:
    - their blood alcohol level must be zero;
    - they will be eligible to take a Class M road test after they have completed the required time with an M2 licence;
    - they must pass the on-road test to obtain a full Class M licence.
- *Class M*: Full licence, with no restriction.

Mexico

In Mexico, a car or motorcycle licence is required to ride a PTW. The licensing system is defined by each state; but the main requirements (in terms of medical condition, theoretical and practical tests) are similar throughout the country (see Table 2.5). In most states, the applicants for the restricted licence must be at least 16 years of age (15 in Mexico City) and parental consent and responsibility until 18 years of age is required. For this category, training is usually not compulsory and vehicle insurance is

in most cases not required. Applicants for the full licence must be at least 18 years of age and have passed a theoretical and practical test. Training is compulsory only in a few states.

Australia

The licensing system for PTWs is defined by each State. Some States require a motorcycle licence to ride a moped; others allow a moped to be ridden on a car licence. Western Australia has a specific moped licence. In all States, a motorcycle licence is required to ride a scooter that has an engine capacity exceeding 50 cm^3. The minimum age for operating a PTW ranges between 16 and 18 years, and in several States there is a requirement to hold a car licence before learning to ride a PTW. The underlying principle is to avoid a system that would encourage younger people – who are the most at risk – from using a riskier means of transport. Each State has learner, provisional or restricted, and open licence phases, but riders who have completed the graduated licensing scheme for car licences may skip the provisional or restricted phases in some jurisdictions. Novice riders are subject to restrictions on carrying passengers and blood alcohol concentration. Each jurisdiction has a Learner Approved Motorcycle (LAM) Scheme which restricts novice riders to motorcycles with a power-to-weight ratio that does not exceed 150 kW/ton, and an engine capacity that does not exceed 660 cm^3. In Queensland, additional testing is required to remove this requirement after at least one year.

New Zealand

A car or motorcycle licence is required to ride a moped. All other PTWs require a motorcycle licence. There are three stages:

- *Stage 1:* learner licence: candidates must be at least 16 years old and have passed a road rules theory test. While on a learner licence, riders are not allowed to ride a motorcycle of more than 250 cm^3, carry passengers, or ride between 10 pm and 5 am. The motorcycle must display a learner (L) rear-plate.
- *Stage 2:* restricted licence: candidates must be at least 16½ years old, have held their learner licence for at least six months and have passed a practical test of their driving skills. While on a restricted licence, riders are not allowed to ride a motorcycle of more than 250 cm^3, carry passengers, or ride between 10 pm and 5 am.
- *Stage 3*: full licence: candidates must be at least 18 years of age, or 17½, if they have completed an approved advanced driving skills course. Candidates under 25 years of age can apply after having held a restricted licence for at least 18 months (or at least 12 months for those having completed an approved advanced driving skills course). Candidates above 25 can apply after having held a restricted licence for at least six months (or at least three months for those having completed an approved advanced driving skill course).

Table 2.5 summarises the licensing schemes in OECD countries, based on the European categorisation of powered two-wheelers (see Table 2.4)

Table 2.5. **PTW Licence Categories**

Country	AM (moped) Min age	Terms	A1 (engine power ≤ 11kw) Min age	Terms	A2 (engine power ≤ 35 kw) Min age	Terms	A (no restriction) Min age	Terms
Australia	15.5 (WA)	Only W. Australia has moped licence. Theory test. Sth Australia and Queensland allow moped riding on car licence. Other states require PTW licence.		No distinction A1, A2, A – all require same PTW licence		No distinction A1, A2, A – all require same PTW licence	16-18 depends on state	Learner, provisional/ restricted, and full licences. Some states minimum durations, or mandatory training. Learner Approved Motorcycles are <660 cm3 and <150 kW/tonne
Austria	15		16		18		20	
Belgium	16	*Training:* min. 4 lessons, including specific safety for mopeds and 50% on-road. *Exams:* theory test + private ground	18	Direct access: *Training:* 9 stages (evaluate on 9 hours; min 50% on road) in driving school + choice: 1° Temporary Drive Licence and/or 2° 3 stages in driving school *Exams*: theory test + private ground + public road (in principle of GDE)	20	*Direct access:* (see A1) or *Progressive access*: 2yrs experience of A1 + progressive training (specific and individual training of 4 stages) *Exams:* Private ground + Public way	22	Progressive access: see A2 Direct access: see A1
Canada	14	Alberta and Quebec allow 14-year olds to operate mopeds and e-bikes. Most jurisdictions require 16 years of age for any driver licence types.	16	Mandatory rider training may be required in certain jurisdictions.	16	Progressive engine size applies in some jurisdictions. Licensing test is taken on small engine size motorcycles, scooters or moped.	16	Progressive engine size applies in some jurisdiction. Licensing test is taken on small engine size motorcycles, scooters or moped.
France	14	Theoretical test at school (ASSR) compulsory for all children + 7 hours practical training (BSR)	16	*Training:* 15 hours minimum *Exams:* theory test + private ground + public way (identical to A2 and A licence) *Or*: car licence (from 18 yrs) + 7 hours training	18	*From*: 18 to 24 years *Training*: 20 hours minimum (or A1 +15 hours) *Exams*: theory test + Private ground + Public way	24	*Training:* minimum : 20 hours *Or*: hold A2 during 2 years and training 7 hours (accessible from 20 years old)

Table 2.5. **PTW Licence Categories** *(cont.)*

Country	AM (moped) Min age	Terms	A1 (engine power ≤ 11kw) Min age	Terms	A2 (engine power ≤ 35 kw) Min age	Terms	A (no restriction) Min age	Terms
Greece	16	Exams: theory test + closed area practical test	18	Minimum: 10 motorcycle theory lessons of 45 min, 14 riding lessons of 45 min Theory and driving tests	20	Since 19/01/2013 *Minimum:* 10 motorcycle theory lessons of 45 min, 14 riding lessons of 45 min theory and driving tests *or* holding at least for 2 years the A1 licence + new riding tests	24	*Minimum:* 10 motorcycle theory lessons of 4 mn, 14 riding lessons of 45 min, theory and driving tests. *or* holding at least for 2 years the A2 licence
Israel	No such vehicles		16	Min. 15 lessons. No Pillion allowed until 18	18	Min. 15 lessons. Min. 8 lessons for A1 holders.	21	Must hold A2 for 1 year. Min. 8 lessons.
Italy	14	Since 2005 people that don't have a licence need to obtain a certificate (so-called "mini- licence")	16		18	Passing from A1 to A2 is not automatic. There is always a need for a practical exam	21	Those already having the A2, after 2 years automatically obtain the A without limitations
Japan	16	3 hours of training Theory and aptitude test Car licence holders can ride a moped.			16	PTW =< 400 cm^3: Theoretical, aptitude and skill test. 3 hours of riding lessons. 3 hours of theoretical session.	18	PTW > 400 cm^3. Theoretical, aptitude and skill test. 3 hours of theoretical sessions and 3 hours of riding lessons.
Mexico	No Categories. Minimum age to ride any PTW: 16; Conditional permit and parent consent until the age of 18							
Netherlands	16	Theory test + practical (on road) test	18	Theory test + practical test (closed area) + practical test (on the road)	20	*With A1:* Practical test (on the road) *Without A1:* Theory test + practical test (closed area) + practical test (on the road)	22 24	With A2: Practical test (on the road) *Without A2:* Theory test + practical test (closed area) + practical test (on the road)
Norway	16	14 lessons obligatory training	16	9 lessons obligatory training	18	13 lessons obligatory training	20	7 lessons obligatory training. Minimum 2 year with A2 licence

Table 2.5. **PTW Licence Categories** *(cont.)*

Country	AM (moped) Min age	Terms	A1 (engine power ≤ 11kw) Min age	Terms	A2 (engine power ≤ 35 kw) Min age	Terms	A (no restriction) Min age	Terms
Portugal	14	17 hours of training mandatory	16	If under 18 years old, parents' consent required (also applies to AM category)	18	Min. 16+4 lessons	21	21 years old, or must hold A2 for 2 years.
Spain	15*	Theory + closed area practical tests (for non-holders of another licence)	16	Theory + closed area practical+ "real" driving in traffic	18	Theory + closed area practical + "real" driving in traffic. Staged access (for those drivers holding A1 for over 2 years): the theory test does not apply	20	Minimum 2 year with A2 licence. 9 hours training (4 closed area + 2 "real" driving in traffic + 3 theory and awareness)
Sweden	15	Learners permit including a health declaration. Compulsory education; theoretical and practical exercises including driving in traffic (Minimum time:12 hours included 4 hours of practical training). Theory test (no driving test)	16	Learners permit including a health declaration. Mandatory risk education for motorcyclists. At least 3 hours theoretical risk education and at least 4 hours practical risk education. Theory test + practical test (closed area) + practical test (on the road)	18	Learners permit including a health declaration. Mandatory risk education for motorcyclists if such education is not completed for category A1. Theory test + practical test (closed area) + practical test (on the road) No theory test, only if the candidate already has category A1	24 (20)	Learners permit including a health declaration. Mandatory risk education for motorcyclists if such education is not completed for a lower category. Theory test + practical test (closed area) + practical test (on the road) 24 years for direct access to category A, but 20 years if two years of experience of A2. No theoretical test if the candidate already has category A1 or A2.
United Kingdom	16	Theory test + practical test (on the road). Successful completion of category B test (minimum age 17) will also give AM entitlement, which must be validated by completing a CBT course.	17	Theory test + practical test (closed area) + practical test (on the road)	19	If held A1 licence for 2 years, practical test (closed area) + practical test (on the road). *Direct access:* Theory test + practical test (closed area) + practical test (on the road).	24 (21)	If held A2 licence for 2 years, access at age 21 practical test (closed area) + practical test (on the road). Direct access: age 24, theory test + practical test (closed area) + practical test (on the road)
United States	No federal licensing requirements. Each State in the US develops and enforces independent licensing laws for ages and types of PTWs.							

* Spain: 18 to carry passengers.

Transport and mobility policies for powered two-wheelers

National transport policy which has an impact on PTW mobility

European Union: Green paper "Towards a new culture for urban mobility"

The Green Paper of the European Commission integrates the benefits of PTWs in urban traffic. It states that:

> *"Rethinking urban mobility involves optimising the use of all the various modes of transport and organising "co-modality" between the different modes of collective transport (train, tram, metro, bus, taxi) and the different modes of individual transport (car, motorcycle, cycle, walking).*
>
> *... Experiences from stakeholders show that there is no single solution to reduce congestion. However, alternatives to private car use, such as walking, cycling, collective transport or the use of the motorbike and scooter, should be made attractive and safe."*

Nevertheless, in 2011, few European cities (e.g. Rome, Paris, London, and Barcelona) had a dedicated policy to integrate PTWs in their travel plans (European Commission, 2011).

Often, the development of PTW usage is not managed and in some cases comes as a response to strategies restricting car use (parking policy for example), associated with a certain tolerance for PTWs without any formal position regarding PTWs (PTW parking or filtering may be tolerated).

Sweden

The overall objective of the Swedish transport policy is to ensure the provision of transport for people and businesses throughout the country in a manner that is economically efficient and sustainable in the long term. The overall objective is supported by two main objectives: a functional objective that concerns the accessibility of the journey or transport, and an impact objective that concerns safety, the environment and health. The objectives comprise all modes of traffic, which means that they also concern transport and journeys made by motorcycle and moped.

The moped or motorcycle is needed by many for running necessary daily errands or for improved quality of life during leisure hours.

To respond to the doubling of PTW travel in the past ten years, a full strategy to improve the safety of PTWs was developed and a revised version was released in 2012. The strategy is an integrated part of the work to achieve the interim goals for road safety in the year 2020. The goals were decided by the Swedish Parliament in May 2009.

Australia

Most of the responsibility for transport and transport policy in Australia rests with state governments. The Federal Government seeks to coordinate transport policy through the Transport Infrastructure Council (which includes representatives of all states and the federal government) and the National Transport Commission (www.ntc.gov.au) is charged with "developing national regulatory and operational reform and implementations strategies for road, rail and intermodal transport". A National Transport Plan was agreed to in 2008, but the document does not mention motorcycles – although they are mentioned in some of the underpinning documents, including the National Road Safety Strategy. Various state governments have their own transport strategies (not all of which mention PTWs) and some states have PTW strategies or PTW road safety strategies.

United States

The U.S. Department of Transportation has a policy initiative regarding transportation and liveable communities. Former DOT Secretary Ray LaHood stated:

> *"Liveability means being able to take your kids to school, go to work, see a doctor, drop by the grocery or Post Office, go out to dinner and a movie, and play with your kids at the park – all without having to get in your car."*

This effort involves planning and development of communities with transportation as an important consideration. More compact, connected communities could impact the use and infrastructure considerations for PTWs.

Examples of local strategies influencing PTW usage

Policies encouraging the use of PTWs

- Stringent parking policy for cars and tolerance and free parking for PTWs

The cities of Paris, Stockholm, Copenhagen and Amsterdam have stringent parking policies for cars (e.g. diminution of available space, paid parking), while at the same time no parking restriction for PTWs. The result has been a sharp increase in the number of motorised two-wheelers in operation, seen initially as a better alternative to private car use.

- Use of bus lanes by PTWs

In London, PTWs are allowed to drive in most bus lanes. Vienna has launched a pilot test (see description below).

- High Occupancy Vehicle (HOV) Lanes

High occupancy vehicle (HOV) lanes, or carpool lanes, are reserved for vehicles with a specified minimum number of occupants (usually two or three). U.S. Federal law requires that HOV lanes "must allow motorcycles and bicycles to use the HOV facility, unless either or both create a safety hazard." In some states, certain single-occupant vehicles such as hybrid vehicles or those using alternative fuels may be driven on HOV facilities as well.

- Advanced stop lines

Advanced stop lines provide space for PTWs to stop in front of other vehicles at traffic signals (see more in Chapter 8).

- Filtering

In Belgium, filtering has been authorised since July 2011. PTW riders are allowed to move between two lanes at a maximum speed of 50 km/h and with a speed difference of less than 20 km/h compared to the traffic in the adjacent lanes. On motorways/highways, this manoeuvre is only allowed between the two left lanes. There has not yet been assessment in terms of traffic or crashes.

In the ACT – Australian Capital Territory[2] a lane filtering trial will be conducted for a period of two years commencing 1 February 2015

In France, this issue is on the political agenda and experimentation on filtering could start in 2015.

Policies restricting the use of PTWs

In China, mainly for environmental reasons, gasoline motorcycles are banned from downtown Guangzhou, Dongguan, Shenzhen, Zhuhai and Hangzhou; and restricted in Beijing and Shanghai. Electric two-wheelers – ranging from electric bicycles to electric motorcycles – are however, promoted. Electric bike sales began modestly in the 1990s and started to take off in 2004, when 40 000 were sold. Since then over 100 million have been purchased, with more than 20 million sold each year.

Box 2.6. **City of London - Impact of traffic policy on the use of PTWs**

London has recently adopted a number of urban and traffic measures to reduce the place of cars in the city centre. These measures also affected the use of PTWs.

London Parking charges: Parking charges are the responsibility of the 33 London boroughs and each has its own approach. It is only the City of Westminster (which covers much of central London) which has introduced parking charges for motorcycles, alongside the longstanding parking charges for cars. PTW parking remains free in other parts of central, inner and outer London, though often only in designated parking bays. Short-term car parking is allowed for either two, or four hours, depending on the area. Parking for cars is paid by the minute (20 pence per minute, four pounds per hour). PTW parking is much cheaper, i.e. one pound per day in public areas; there are discounts if longer periods are paid in one go (up to GBP 100 per year).

The ***London congestion charge*** is a fee charged for some categories of motor vehicle to travel at certain times within the Congestion Charge Zone (CCZ), a traffic area in central London. It is run by Transport for London (TfL), the regional authority, not by the boroughs. The charge aims to reduce congestion, and raise investment funds for London's transport system. Though not the first scheme of its kind in the United Kingdom, it was the largest when introduced, and it remains one of the largest in the world. The western extension of the charging zone, introduced by the previous mayor, is being removed by the current mayor. PTWs are exempt from the central London congestion charge, recognising that they do not contribute to the congestion problem in central London. There has been an increase in PTW use in London since the charge was introduced.

Use of bus lanes by PTW

Since January 2012, PTWs are allowed to use most bus lanes in London, with the main objective to smooth traffic, cut CO_2 across London and improve journey time reliability for motorcyclists on the network.

Source: Transport for London.

Box 2.7. **PTWs within traffic policy in Barcelona**

Barcelona has a fleet of 300 000 motorcycles (30% of the vehicle fleet), which is the second largest in Europe behind Rome. From the end of 2004 a new law was passed that allowed car drivers who had held a licence for 3 or more years to drive light motorcycles without any other special requirement. This contributed to a sharp increase in PTW crashes in the period 2005-2010. Despite frequent enforcement, problems of noise and air pollution remained. The practice of uncontrolled parking is to the detriment of pedestrian space. The city of Barcelona has seen the increase in PTW use as an opportunity to address traffic congestion and has implemented a number of measures to better regulate the use of these vehicles.

Advanced zones at traffic lights

The advanced zones at traffic lights allow the users of PTWs to position themselves in front of the car traffic on the traffic intersection. ***Parking policy***

PTWs may be parked on footpaths with a width of more than 5 metres.

The municipality of Barcelona has implemented a taxation system for parking to reduce commuting traffic and to facilitate, prioritise and encourage bicycle traffic. The city is distributed into different areas with varying parking charges. There are parking areas, for parking of the resident's cars and others. Residential car owners receive parking privileges in terms of fees and reserved parking areas. Parking fees are 100% invested into improvement of infrastructure, which means both traffic calming measures such as rebuilding 30 km zones, pedestrian areas and other comparable measures and extending the public bicycle-sharing programme. Parking space for these bikes, other bikes and motorcycles is built up using these funds.

Electric powered two-wheelers

The city of Barcelona is now undertaking an ambitious programme focusing on promoting electric PTWs.

Box 2.8. **Traffic policy and PTW in Vienna (Austria)**

Parking policy, parking fees, bus lane use, sidewalk parking, filtering

Mopeds may be parked on footpaths with a width of more than 2.5 metres.

An area around the city centre of Vienna for short term parking was recently extended. The restrictions are valid Monday to Friday from 9:00 to 22:00, with some exceptions in particular on shopping roads. Cars are charged EUR 2 per hour. Parking is limited to a maximum of two hours. Neither the maximum parking duration nor the charges apply to PTWs.

Filtering and advanced stop lines

PTW are allowed to filter between queues of cars, which have come to a complete stop. However, they must not impede drivers wanting to change direction. This does not apply to motorways and PTWs must not travel on the hard shoulder or within the emergency corridor.

There is an increasing number of “advanced stop lines”. Primarily introduced for the sake of bicyclist safety, PTW riders are in favour of these as well.

Bus lanes

In 2005, a pilot has been launched to allow PTW riders to use bus lanes. PTWs are not allowed on bicycle paths.

Conclusions

The powered two-wheeler fleet (which includes motorcycles, scooters and mopeds) has been constantly increasing and plays a significant role in mobility in many countries, particularly in many of the world's large cities. Some riders use PTWs as their only form of transportation (for example in many emerging countries) for commuting (mainly in European cities), for recreation (for example, in North America, the United States, Canada), or for both commuting and recreational riding.

Access to PTW riding usually depends on their engine displacement and the age of the riders. It requires obtaining a specific licence, subject to minimum training, and a practical test at least for engine capacities above 50 cm^3. There is an effort towards regional harmonisation (e.g. in Europe) of the licensing systems for PTWs, but there is still diversity within Federal environments among their jurisdictions, in particular regarding the minimum age to ride a PTW.

PTWs are becoming an important component of the transport system and in some cities represent up to 30% of the motor vehicle fleet. They present both assets for mobility, and also challenges in terms of traffic management and safety. However, only a few countries have in place a national transport strategy for PTWs; though several measures have been taken at local level.

There would be many benefits – in terms of mobility and traffic management as well as traffic safety – in a better integration of PTWs into mobility plans and in the development of national and local transport strategies.

Notes

1. EU + Norway +Switzerland

2. http://www.justice.act.gov.au/page/view/3733/title/act-lane-filtering-trial

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