Low Carbon Land Transport and the Climate Bond Standard

Background Paper to eligibility criteria

Low Carbon Transport Technical Working Group

Contents

1 Introduction

The Climate Bonds Initiative (CBI) is an international, investor-focused not-for-profit organization aiming to develop tools to mobilize the bond market for climate change solutions. The Climate Bonds Standard and Certification Scheme aims to develop screening criteria for investors and governments which allow them to easily prioritize climate and green bonds with confidence that the funds are being used to mitigate and/or adapt to climate change.

The green bond market is moving rapidly and in advance of widely accepted standards for use of proceeds, project evaluation and ongoing reporting. Along with many other sectors, CBI is seeking to develop a standard for bonds linked to **land transport**[1] projects in response to current, and in anticipation of future, demand.

This document sets out:

- The issues surrounding certification of transport projects, from discussion with industry experts (our Low Carbon Transport Technical Working Group, TWG) and a review of relevant literature
- A set of proposed criteria for certifying land transport projects and assets, for the purposes of feedback and consultation

The TWG has explored the issues raised in developing eligibility criteria for land transport including:

- Developing criteria that are applicable to the bond market
- Determining appropriate GHG emission thresholds
- Deciding the scope of emissions which can feasibly be considered by the criteria

The suggested criteria propose the use of universal GHG emissions thresholds defined on a per passenger-km (for passenger transport) or per tonne-km (for freight) basis. This allows *all* modes of transport to be compared and qualify should the assets meet the required standard. The primary objective is to ensure that any land transport projects or assets certified by the CBI Standard would contribute to meeting an emissions trajectory consistent with limiting global temperature rises to 2˚ Celsius.

Please refer to the main Climate Bond Standard document on the Climate Bonds website (http://www.climatebonds.net/standards/standard) for discussion of eligibility requirements which are relevant to all technology categories. This covers several issues relevant to both individual assets and portfolios, such as nomination of projects and assets, management of proceeds and traceability.

[1] Please note that the document does not include water-based transport or aviation.

2 Leveraging climate bonds to develop low carbon transport infrastructure

2.1 The scale of the challenge

Transport is the second largest contributor to global GHG emissions after electricity generation; responsible for **23%** of all energy-related CO_2 emissions globally and **14%** of total GHG emissions[2]. Road transportation for passengers and freight remains the primary source of emissions in the sector, responsible for 73% of CO_2 emissions from all transport.

According to the IEA, $15.7 trillion in additional transport investment will be required between now and 2050 to achieve the rapid decarbonisation needed to limit global temperature rises to 2˚ Celsius over a business as usual scenario; on average $450 billion per year, or about a third of current annual global investments in land transport[3]. This compares with a current cumulative total for low carbon transport bonds of $358 billion[4]. Current investment flows are insufficient to meet low carbon transport infrastructure needs. Transport infrastructure drives transport behavior and choice. Choices made today will lock in governments to either a high or low carbon transport future. There is a need to *scale up* and *shift* investment towards low carbon transport infrastructure.

2.2 The role of climate bonds

Leveraging debt capital markets towards sustainable transport infrastructure development and services has significant potential to help achieve this. The demand for green bonds has been growing rapidly with total issuance growing tenfold from $3bn in 2012 to $35bn in 2014. The market has been driven by a strong investor appetite for fixed income products consistent with low carbon and sustainable investment commitments.

Transport currently dominates the universe of climate-themed bonds, with 71% of bonds issued clearly aligned with low carbon transport. This is largely due to a number of rail issuers, usually large state-backed rail entities, which have a long history of using bonds to raise finance. Auto manufacturers also featured for the first time in 2013 with Tesla and Toyota issuing debt instruments to finance electric and hybrid vehicles. There is near-term potential for further green bond issuance from other vehicle manufacturers such as Nissan and General Motors, as well as further potential from rail, especially the urban rail market. It is thought that there is significant potential for climate bonds for both passenger and freight transport.

In terms of assets/projects likely to be suitable for bond issuance, the following areas are most likely to be relevant:

- Vehicle technologies
    a. To increase carbon efficiency (including fuel efficiency, fuel type and other vehicle improvements);
    b. New technologies and hybridization. The growth in e-mobility, the introduction of a wider number of hybrid vehicles and autonomous/semi-autonomous vehicles over the past five years has been significant.

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[2] Sims R. et al. (2014) Transport. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change

[3] IEA ETP 2012; http://www.wri.org/sites/default/files/trillion_dollar_question_working_paper.pdf

[4] http://www.climatebonds.net/bonds-climate-change-2014

- Transport infrastructure
  a. All modes of collective/mass transport and its infrastructure, especially urban rail and Bus Rapid Transport (BRT);
  b. New developments in public transport such as ropeways and cable cars;
  c. Alternative (low carbon) energy refueling distribution infrastructure;
  d. National transport infrastructure to reduce transport emissions and fulfill national climate change commitments.
- System improvements and technologies that encourage overall efficiency (high load, occupancy and flow);
  a. Technologies that allow new behavior (such as car clubs, car/bike sharing)
  b. Better integration of all types of transport.

Climate Bonds Certification will allow both public and private issuers to be part of a broader investment-grade climate bond portfolio including renewable energy, green property and water investments; and will also facilitate the issuance of bonds from issuers who would otherwise find it difficult to gain recognition for their low carbon investments. The goal is to attain a large and liquid market in bonds *for qualifying assets* quickly that attracts mainstream players and helps lower the cost of capital.

Table 1: overview of example bond-types, issuers and revenue streams of low carbon transport bonds that could be eligible for certification

Bond-types	Issuers	Revenue Streams	Purposes	Potential Examples
Public Sector Bonds	Sovereign	Treasury revenues	Support national infrastructure projects to reduce emissions from transport	Sovereign green bonds, sukuk bonds
	Public Agencies Municipal authorities	Treasury revenues	Roll-out of public mass transit systems as part of sustainable cities policies	US muni bonds
Financial Institution Bonds	Development Banks and Commercial Banks	Treasury revenues	Rail system upgrades, new rail infrastructure	World Bank green bonds
		Consumer auto loans	Manufacturing EVs, Hybrids	
Portfolio Bonds	Aggregator: Asset-Backed Securities (ABS)	Auto loan cash flows	New loans for low carbon vehicles	E.g. Toyota
Project Bonds	Project SPV			
Corporate Bonds	Automobile manufacturer,	Treasury revenues	Low-carbon automobile manufacturing facility	E.g. Nissan, Volkswagen, Tesla
	EV supply chain technology providers	Treasury revenues Lease Finance contracts	EV battery production	E.g. Johnson Controls

Notes: Some bonds may be a combination of two approaches e.g. asset-backed securities backed by government agencies or local authorities; or covered bonds with FI and portfolio bond characteristics. 'Treasury' denotes balance sheet finance of issuer

3 Key issues in developing criteria for low carbon transport

3.1 Our starting point

To the maximum degree possible, the Standard aims to adopt a positive technology or asset approach by specifically including:

"projects or assets that directly contribute to:

- *developing low carbon industries, technologies and practices that achieve resource efficiency consistent with avoiding dangerous climate change*
- *essential adaptation to the consequences of climate change"*

Our goal therefore is not only to ensure low carbon credibility through the criteria, but also to ensure criteria are practical for application. For example, full disclosure requirements on GHG emissions reporting for many industries continues to be a challenge and will take time as the market develops. In the early stages, the criteria developed need to be simple and transparent enough to bring both issuers and investors to the table.

For example, criteria that involve project-specific impact assessments, although the most rigorous, are costly, difficult to apply to the bond market due to time constraints, and likely to be questioned in terms of data and methodology. This is especially true for transport (Section 3.2).

The development of eligibility criteria under the Low Carbon Transport TWG have been guided by the following fundamental principles:

- ✓ The criteria should ensure that bonds issued under the standard contribute to a sufficiently stringent emissions reduction trajectory to be credible but not restrictive to the development of this market;
- ✓ The criteria should take into account and align with current academic research and international policy best practice;
- ✓ The criteria should be practically applicable taking into account the differing structures of the current low carbon transport industry and the debt capital market;
- ✓ The criteria should be designed with rigor but with sufficient flexibility to allow for iterative review and updating as research and markets develop.
- ✓ Over time, the criteria should take into account the entire lifespan of assets to ensure that they continue to contribute to emissions reductions.

3.2 Issues of particular relevance to transport

There are a number of issues of particular relevance when developing workable low carbon criteria for the transport sector, and it is worth setting these out to clarify how they have informed decisions.

Only ambitious mitigation will decouple transport emissions from economic growth

There are particularly strong links between economic growth and demand for transport. As people get wealthier, they demand greater quantities of goods, which need to be transported, and are more likely to travel further for both work and leisure. According to the IPCC, transport emissions are expected to increase faster than emissions from any other energy-using sector without "aggressive and sustained" mitigation measures[5]. As it noted in the Transport Chapter of its Fifth Assessment Report:

> *"Reducing global transport greenhouse gas (GHG) emissions will be challenging since the continuing growth in passenger and freight activity could outweigh all mitigation measures unless transport emissions can be strongly decoupled from GDP growth."*

While there is some evidence that this decoupling might have started in some developed countries, it is not expected in the developing world "for the foreseeable future"[5]. Whether the transport sector yields emissions savings depends on whether gains in carbon efficiency are offset by gains in distance travelled. In order to counter this, investment in mitigation options will be required well beyond low carbon vehicles, including:

- *Modal shift*: new and retrofit public transport infrastructure, from intercity rail to local buses; infrastructure to encourage walking and cycling; intermodal freight facilities; investment in terminals to improve journey times and appeal of public transport
- *Journey avoidance*: smart freight logistics; car-sharing; improved ICT to avoid commuting
- *Fuelling infrastructure and supply* for new vehicle technologies: electric vehicle charging infrastructure, hydrogen fuel stations, hydrogen production and storage

Dynamic systems increase the difficulty of estimating absolute emissions savings

Transport systems are dynamic systems subject to well-known feedback effects such as induced demand, fuel efficiency rebound effects and interactions with land use planning. These increase the difficulty of forecasting demand and measuring net emission reductions[6]. The most thorough and accurate low carbon criterion for transport infrastructure projects and products would estimate lifetime emissions savings in absolute tonnage terms, taking such second-order effects and modal shift into account.

In the absence of pre-existing project appraisals, such calculations are unfeasibly complex and onerous for the purposes of the Standard, and much of the data is in any case unavailable. By default, we therefore favor a methodology based on per passenger-kilometer (p-km) and per tonne-kilometer (t-km) thresholds to keep eligibility assessments simple and tractable.

However, we propose that for interurban rail projects (e.g. high-speed rail and dedicated freight rail) an independent project appraisal should be carried out showing that these investments will reduce total transport related carbon emissions in the affected corridor by at least 10% (or 25%) (see Criterion 7). This Criterion has been particularly prompted by concerns around interurban and high-speed rail projects, namely that emissions savings due to modal shift away from road and aviation can be at least partially offset by induced demand and increased terminus traffic.

Decarbonisation of the transport sector requires more than incremental change

A fundamental principle of the Climate Bonds Standard is to **avoid lock-in of carbon-intensive investments.** The right types of investments are required now to facilitate deeper cuts in the future. This means rewarding not only incremental reductions in carbon emissions, but taking a long-term strategic view.

It is vitally important to tackle vehicle emissions, which make up the bulk of transport emissions. Unlike power generation or industry, these emissions originate from millions of individual point sources (private vehicles) controlled by individual decision-makers. Emissions cannot feasibly be

[5] Sims et al. (2014) ibid.

[6] Lee, Douglass B., Lisa A. Klein, and Gregorio Camus. "Induced traffic and induced demand." Transportation Research Record: Journal of the Transportation Research Board 1659.1 (1999): 68-75; Hymel, Kent M., Kenneth A. Small, and Kurt Van Dender. "Induced demand and rebound effects in road transport." Transportation Research Part B: Methodological 44.10 (2010): 1220-1241.

monitored or capped, and forcing technological options is often politically unacceptable. This limits policy drivers mostly to price pressure, and emissions standards for manufacturers. Within this framework, the freedom of individuals to choose lower or higher carbon transport is a political fact of life but also a barrier to decarbonisation. In addition, the impact of new carbon efficient vehicles has an in-built time lag, given that only a proportion of vehicles will be replaced in any given year. In the EU, fleet turnover is about 6% per year[7], meaning that it would take at least 17 years to replace the whole fleet.

The penetration of low carbon vehicles faces further economic and technical barriers in the form of network externalities related to fuelling infrastructure, limited range and cost of components such as batteries. Overcoming these barriers requires innovations and economies of scale that can only be driven by more certain and widespread uptake. Ambitious performance standards communicating the need for transformational, rather than incremental, changes are necessary to achieve this.

Potential for radical decarbonisation is dependent on broader climate policy

Long-term opportunities for radical decarbonisation of land transport are presented by greater use of electrification and by hydrogen. Currently electricity represents only 2% of the total energy demand of transport worldwide[8], but electrification of transport is widely recognized as an area of high potential in both freight and passenger sectors[9].

In both cases the short-term mitigation potential is highly dependent on the supply choices, technologies and policies in the country of use. Well-to-wheel emissions using hydrogen generated by renewables-powered electrolysis are considerably lower than for internal combustion engine (ICE) vehicles, while those using hydrogen from steam methane reforming are comparable[10]. Similarly, well-to-wheel emissions for electric vehicles in countries with high grid emissions can be higher than for ICE vehicles. Incorporating this issue into Standard criteria for private vehicles would be complicated by having to account for grid emissions in not one country, but the many ultimate destinations of vehicle manufacturers' exports.

Clearly in both cases, policy decisions need to be made to opt for the lower carbon production path, and we anticipate this being the case over the medium-to-long term for both technologies. Particularly with respect to hydrogen, given that climate policy will be the primary driver in making it economically viable, it is justified to assume there will be a policy imperative for the lower carbon production method to become predominant. Our position is, given their high potential as sustainable transport fuels in a context of broader long-term mitigation policy, there is a strong case for supporting electrified and hydrogen-powered transport. It is important not to disincentivise investment in long-lived assets related to promising technologies due to what could be transient limitations. For both these reasons, and in order to maintain simplicity at this early stage of the Standard, projects and products related to electrified and hydrogen-powered transport will be automatically considered eligible for certification. This is based on an underlying assumption that, while acknowledging the possibility, circumstances in which certified investments in these technologies do not result in net carbon savings will be insignificant (both in terms of extent and time horizon). This assumption will be kept under review as the Standard matures (see Section 4.4).

Low carbon infrastructure which maintains high fossil fuel consumption patterns

As Table 4 in Section 4 shows, high capacity rail can be one of the lowest carbon modes of land travel, and it is therefore likely that most rail projects will be certified by the Standard. However, a

[7] Calculated from Eurostat data and the International Council on Clean Transportation *European Vehicle Market Statistics Pocketbook*
[8] Sims et al. (2014) ibid.
[9] See discussion in IEA *Energy Technology Perspectives 2014*
[10] See University of California (2014), "Well-to-Wheels Greenhouse Gas Emissions of Advanced and Conventional Vehicle Drive Trains and Fuel Production Strategies"

dilemma is raised by cases of dedicated freight corridors built primarily to transport fossil fuels, as is currently the case in India[11], Indonesia and parts of the USA. In such cases it is considered difficult to justify certifying transport projects that will make heavy fossil fuel use both more economical and likely to be locked-in for the long term.

Alternatively, it could be argued that transporting coal by rail is preferable to transporting it by truck; for example, South Africa's largest coal consumer, the utility company Eskom, is currently investing in rail lines to replace 5,100 daily truckloads transporting coal to power stations[12].

To maintain the credibility of Climate Bonds, it has been strongly recommended by the TWG that in the initial stages of certification, and to reduce the risk of misinterpretation, any investments for infrastructure maintaining fossil fuel use patterns be excluded. This exclusion clause is based on the aforementioned principles of avoiding lock-in and promoting technologies that will contribute to long-term objectives. However, this raises the question of how to determine *whether* a dedicated freight corridor is likely to be dominated by fossil fuel-intensive industries without adding excessive complexity to the certification process. Criterion 5 addresses this.

Similar arguments could be made regarding attempts to build 'green garages'[13] – that if the garage is going to exist, it is preferable for it to have charging infrastructure, energy efficient lighting, etc. than not. We regard establishing the relevant facts in such cases as too onerous and would automatically exclude all infrastructure that encourages high car use from certification.

3.3 Considerations for criterion choice

Rationale for universal threshold

There are two main options on which to base p-km or t-km criteria for accreditation:

- *Emissions saving metric*: assessing whether the new project or product reduces emissions compared to the counterfactual (ΔgCO_2/p or t-km); or
- *Performance metric:* assessing whether the new project or product results in emissions lower than a given threshold (gCO_2/p or t-km). This could either be:
    a. *Universal* for all modes of transport; or
    b. *Mode-specific*

For the reasons outlined in Sections 3.2, incremental emissions reductions in existing technologies are not adequate by themselves. Ambitious performance standards create greater downward pressure and likelihood that (i) low carbon technologies will mature; and (ii) overall (and not just relative) emissions reductions will happen. By adopting a universal threshold approach, it should be possible to qualify all projects that we judge to be an important part of the transport mix needed for a low-carbon economy (rail, low carbon vehicles etc.).

In terms of road vehicle emissions, a threshold approach also follows the precedent of regulatory standards in the EU and California, allowing us to use test cycle information provided by vehicle manufacturers in complying with these regulations.

As mentioned above, it is likely that the vast majority of rail projects will be certified. We note that bonds are a traditional financial mechanism for the rail industry, and therefore issuers are unlikely to go through an arduous accounting process at this early stage of the market just to label "green" or "climate-friendly". It is important not to set the administrative hurdles too high that may disincentivise project development that supports a long-term shift away from private motorized travel.

[11] See http://www.railway-technology.com/projects/dedicatedrailfreight/
[12] See http://www.esi-africa.com/eskom-to-spend-r9-79-billion-to-move-coal-transport-from-road-to-rail/
[13] See http://www.greenparkingcouncil.org/certified-green-garages/certification/

Finally, performance against a universal threshold is simpler and easier to track over time; setting a different metric for each mode based on best in class performance would be difficult to monitor as it would require resources to keep updating it.

Scope of emissions

Possible emissions that could be considered by the criteria are as follows:

Scope 1: direct tailpipe CO_2 emissions from fossil fuel combustion

Scope 2: indirect emissions from electricity consumption

Scope 3: emissions resulting from extraction, manufacture, transportation or disposal of fuels and transport products

We propose only to consider Scope 1 emissions, direct emissions from the vehicle, when comparing products' and projects' performance against the threshold. The reasons for this are as follows:

1. **The dominance of road vehicle emissions.** The certification process is subject to both resource and information constraints, so it is practical to focus our efforts on the areas where both the problem and potential for mitigation are greatest. 97% of all emissions from powering land transport result from fossil fuel combustion in road vehicles, with indirect emissions from electricity consumption contributing less than 3%[14].

2. **The need to send strong signals to vehicle purchasers.** Considering well-to-wheel emissions could mean that a more polluting vehicle manufactured in a country subject to emissions constraints for manufacturers is treated as equivalent to a lower carbon vehicle manufactured in a non-regulated country. This weakens signals to consumers who, as noted above, are key decision-makers in reducing emissions from the transport sector. Furthermore, the evidence comparing gCO_2/km emissions of different vehicle technologies seems to suggest that criteria based on well-to-wheel emissions would have the same results as criteria based on direct emissions, except in a few edge cases[15]. For these reasons, it is judged that considering embedded emissions will result in onerous information requirements with little practical benefit.

3. **The need to promote technologies and infrastructure that have the potential to radically shift emissions trajectories and avoid fossil fuel lock-in.** As noted above, electrified modes have the potential to dramatically lower transport emissions if deployed in conjunction with a decarbonizing electricity supply. In addition, electric vehicles face cost and infrastructure barriers that need widespread uptake to be overcome. Most importantly, private electric and hybrid vehicles will be sold internationally for use in countries with vastly different grid emissions; we do not know what their indirect emissions will be.

An exception in terms of scope is made in cases where a project appraisal predicts a net gain in carbon emissions from a transport project regardless of scope (see Criterion 7).

The standard will be subject to a process of periodic review that will in future consider whether Scope 2 emissions should be included, assessing whether jurisdictions are progressing sufficiently towards lower carbon electricity generation for their inclusion or exclusion to be justified.

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[14] See Figure 8.1 in Sims et al. (2014) ibid.

[15] For example, a battery electric vehicle could have higher well-to-wheel emissions than an efficient diesel vehicle in a country with high grid emissions, as discussed in Section 3.2. However, generally well-to-tank emissions of ICE vehicles are high enough for this not to be concern. See Kromer and Heywood (2007), "Electric Powertrains: Opportunities and Challenges in the U.S. Light-Duty Vehicle Fleet", Sloan Automotive Laboratory, Massachusetts Institute of Technology; and University of California (2014), "Well-to-Wheels Greenhouse Gas Emissions of Advanced and Conventional Vehicle Drive Trains and Fuel Production Strategies"

4 The criteria

4.1 Overview

The primary objective of the standard should be to encourage all land transport emissions under acceptable thresholds, in order to meet climate change targets. Therefore, the proposed approach is to set **universal CO_2 direct emissions thresholds for both passenger and freight transport**, applying to all land transport modes, which **decrease over time**. There are four methodological tasks that need to be undertaken to achieve this:

1. Decide on the appropriate gCO_2/p-km or t-km thresholds for the present and future
2. Create simple methodologies for assessing whether private vehicles and public transport projects met these thresholds
3. Consider how the criteria apply to investments which do not involve vehicles or rolling stock, e.g. infrastructure upgrades
4. Identify any automatic inclusions or exclusions, if any

4.2 Per passenger-kilometer and tonne-kilometer thresholds

The starting threshold should be set according to the global stock-wide average of emissions where, to qualify in 2015, assets need to perform better than the Global Fuel Economy Initiative (GFEI) target[16] accounted for in the IEA 2 Degree Scenario (2DS) emission targets.

Table 2 below presents three threshold options for consideration: a) 2DS targets; b) 10% emissions improvement; or c) 25% emissions improvements over the IEA 2DS emissions targets for p-km/t-km in 2015 through to 2050[17]. The Standard will re-evaluate after the first round of projects.

Table 2: Possible threshold options for new land transport products and projects based on IEA Mobility Model data

Direct emissions	2000	2010	2015	2020	2030	2050
IEA 2DS Passenger Activity (gCO_2 per p-km)	107	94	87	75	56	33
Proposal 10% Below 2DS Average	*97*	*84*	*78*	*67*	*51*	*30*
Proposal 25% Below 2DS Average	*81*	*70*	*65*	*56*	*42*	*25*
IEA 2DS Freight Activity (gCO_2 per t-km)	35	30	27	25	21	18
Proposal 10% Below 2DS Average	*31*	*27*	*24*	*22*	*19*	*16*
Proposal 25% Below 2DS Average	*26*	*23*	*20*	*19*	*16*	*13*

Question 1: We view the 2DS targets as adequate but we are aware that others favor more stringent thresholds.

What, in your view, is an appropriate set of thresholds, and how would you justify a set of thresholds that are more stringent than the 2DS scenario?

[16] 50% better fuel economy for new vehicle registrations by 2030, compared to 2005
[17] Mobility Model (MoMo) data, ibid.

4.3 Individual criteria

Navigating and interpreting the criteria

Whatever threshold trajectory is chosen, it will then be used to guide the criteria by which transport assets are certified. **The purpose of each of the criteria set out below is to classify projects and products according to whether they help achieve the per p-km or t-km emissions thresholds chosen.** Please note the following when interpreting the criteria:

- Whenever an asset is deemed to have passed a criterion, it must also pass any other subsequent relevant criteria to qualify overall.
- The amount of coverage provided for each asset category merely reflects the level of detail required to distinguish between different cases, not the category's importance in terms of investment or mitigation potential.
- **The likelihood of a particular transport mode being certified should not in any way be interpreted as a judgment that it represents a superior mitigation option on cost-effectiveness or any other grounds**.

Because of the wide variety of different assets that come under the scope of 'low carbon transport', we have provided some navigational aids to help the reader clearly identify how the full range of relevant transport investments are covered by the criteria. Table 3 directs the reader to the relevant criteria for certain broad asset categories.

Table 3: Reference table showing the relevant criteria for broad transport asset categories

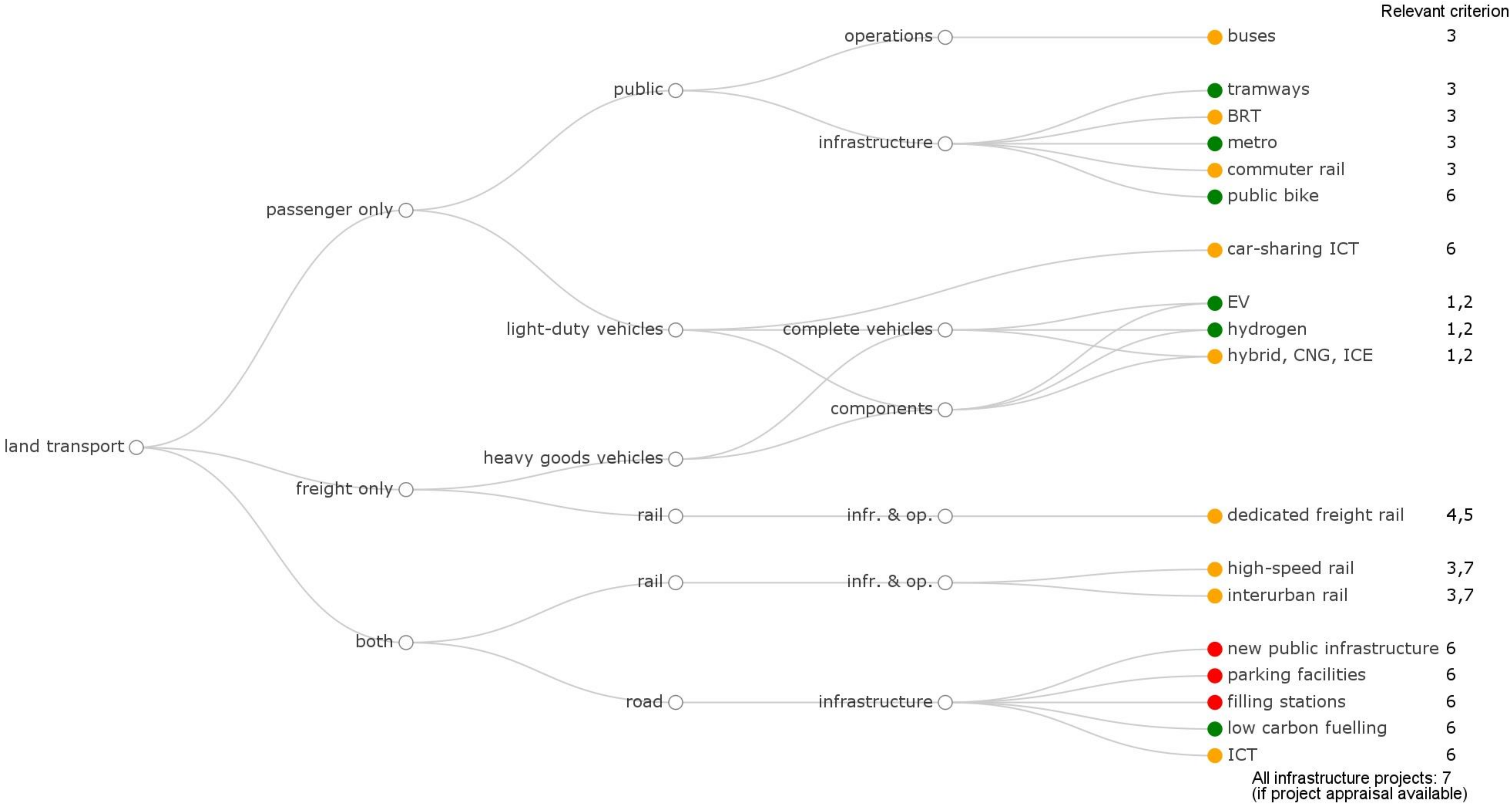
	Private	**Public**
Passenger	Mostly criteria 1 and 2, possibly 6	Mostly criterion 3, possibly 6 or 7
Freight	Mostly criteria 1 and 2, possibly 6	Mostly criterion 4 possibly 5, 6 or 7

Vehicles
Criteria 1 and 2
New infrastructure
Criteria 3, 4, 5 and 6
Retro-fitting infrastructure
Criteria 3, 4, 5 and 6
ICT
Criterion 6

Figure 1 summarizes the criteria that relate to finer detail asset categories; and which types of assets are deemed, according to the relevant criterion, to always, sometimes or never meet the relevant threshold. It uses the following 'traffic light' color-coding:

- **Green:** types of asset that are considered to achieve the threshold under all circumstances (or in almost all circumstances, where edge cases are considered insignificant);
- **Orange:** types of assets that will need to be considered on a case-by-case basis according to rules and formulae set out in the criteria;
- **Red:** types of assets that can be deemed to never qualify

Figure 1: Summary of land transport products and projects that would automatically qualify under the standard (green), automatically not qualify (red), or need further consideration in order to determine eligibility (orange) under the relevant criterion or criteria listed



Private vehicles (passenger and freight)

Criterion 1: Emissions thresholds for private light-duty and heavy goods vehicles

Assets related to the manufacture of light-duty and heavy goods vehicles qualify for certification if the per passenger-km or per tonne-km Scope 1 emissions of the vehicles are estimated to be lower than the appropriate threshold. This will automatically be the case for fully electric and hydrogen vehicles.

The following assumptions are made regarding load factors:
• For *passenger* vehicles, assume one person per vehicle in order to gain the most conservative estimate
• For *freight* vehicles, load factors can vary between countries and data can be difficult to come by. In Europe they are typically 40-50%[18]. We anticipate that the exact load factor to use will not be critical in the vast majority of cases, as road freight using conventional technologies is extremely unlikely to meet the highest threshold proposed. However, in the event of a load factor being required for an assessment against this criteria, we suggest using a conservative 40% figure.

Other relevant criteria to be passed for eligibility: none currently

Criterion 2: Components for private vehicles

Assets related to manufacture of components for private vehicles qualify for certification if, in the overwhelming majority of cases, they are destined for vehicles which would qualify under Criterion 1.

Electric vehicle batteries are an example of components that would qualify; surface coatings that reduce air resistance would not.

Other relevant criteria to be passed for eligibility: none currently

Public passenger transport

An equivalent of Criterion 1 is required for public transport projects.

On average, rail has significantly lower carbon emissions per p-km and t-km than other modes of travel. Table 4 shows various relevant emissions estimates from the literature for rail and road. From these figures it can reasonably be inferred that *direct* emissions from rail will be lower than the universal threshold for the majority of cases.

Table 4: Comparison of different estimates of emissions from rail

Transport type	Source of estimate	Emissions scope	Estimate range
Rail estimates			
All rail, metro, tram	IPCC (2014)[19]	Scope 1 + 2	39-109[1] gCO_2/p-km
Light rail	IEA (2012)[20]	unspecified	4-22 gCO_2/p-km
Metro	IEA (2012)	unspecified	3-21 gCO_2/p-km

[18] See European Environment Agency data http://www.eea.europa.eu/data-and-maps/indicators/load-factors-for-freight-transport/load-factors-for-freight-transport-1. Road freight load factors are typically below 50% due to empty running.
[19] Sims et al. (2014) ibid.
[20] IEA *Energy Technology Perspectives 2012*

Intercity rail	IEA (2014)[21]	Scope 1	6 gCO_2/p-km
High-speed rail	IEA (2014)	Scope 1	0 gCO_2/p-km
Rail freight	IEA (2014)	Scope 1	8 gCO_2/t-km
Road comparisons			
All road passenger	IEA (2014), IPCC (2014)	Scope 1	80-221 gCO_2/p-km
HGV road freight	IEA (2014), IPCC (2014)	Scope 1	70-768 gCO_2/t-km

Notes: [1] The upper limit for this figure presumably incorporates Scope 2 emissions from countries with relatively fossil-fuel intensive grids.

However, ridership is critical in determining per p-km public transport emissions; all else being equal, busy routes have lower emissions per p-km than fairly empty ones. A criterion for public passenger transport therefore needs to incorporate appropriate project-specific passenger load factors. This can be based on historic data, or subsequently reviewed on the basis of new data, which should be available from the relevant public authority and verifiable in relation to ticket revenues.

Criterion 3: Emissions threshold for public passenger transport

All infrastructure, infrastructure upgrades, rolling stock and vehicles for electrified public transport pass this criterion, including electrified rail, trams, trolleybuses and cable cars. Buses with no direct emissions (electric and hydrogen) also pass.

For fossil fuel or hybrid vehicles or rolling stock, the project, product or supporting infrastructure passes if:

$$\frac{\text{vehicle emissions per km when fully loaded}}{\text{passenger load factor} \times \text{no. seats}} < \text{universal passenger (per p-km) threshold}$$

Example

A municipality in the USA borrows money to replace a large proportion of its public bus fleet. Each new bus has 50 seats and emits 437 gCO_2/km when fully loaded[22]. Buses are 30% full on average across all routes and times. A bond issued to pay for the buses is eligible under the Standard if:

$$\frac{437}{0.3 \times 50} = 29.1\ gCO_2/\text{p-km} < \text{universal passenger (per p-km) threshold}$$

(likely to be the case)

Other relevant criteria to be passed for eligibility: 7

Question 2: Uncertainty in passenger load factors may be an issue for some public transport projects. Predicted high load factors resulting from optimism bias may not materialize – an obvious risk to the issuer – while other initially ineligible projects may later see higher take-up than expected.

[21] IEA *Energy Technology Perspectives 2014*

[22] These emissions and ridership figures are taken from one of the lowest-emitting public bus fleets in the USA, Southern Nevada; see US Department of Transportation (2010) *Public Transportation's Role in Responding to Climate Change*

One way of dealing with uncertainty is to rearrange the formula shown for Criterion 3, once the universal p-km threshold is known, in order to give a **minimum passenger load factor** at which the project is considered eligible.

To illustrate using the above US municipal bus example: assume the universal per p-km emissions threshold has been set at 87 gCO_2/p-km. Rearranging the formula, we can see that in order to meet the threshold, the bus must have a passenger load factor of:

$$\frac{\text{vehicle emissions per km when fully loaded}}{\text{emissions per p-km threshold x no. seats}} = \frac{437}{87 \times 50} = 0.1 \text{ i.e. } 10\%.$$

or more. This translates the per p-km threshold into a useful performance indicator. Where load factors have been over-estimated, this makes it clear to investors and managers whether this will materially affect their certification, and precisely what passenger load they need to achieve. It would also clarify what loads initially ineligible projects need to aim for.

Do you have any comments on this approach for dealing with passenger load uncertainty, or any alternative suggestions?

Dedicated freight railway lines

A p-km criterion is clearly not suitable for rail infrastructure that is put in place primarily or exclusively for freight. We propose two further criteria for dedicated freight lines:

- Criterion 4 is similar to Criterion 3, but for freight – freight rolling stock and infrastructure must meet a per t-km threshold
- Criterion 5 addresses the concern described in Section 3.2 that some dedicated freight lines might be built with a primary justification of transporting fossil fuels

Criterion 4: Emissions threshold for dedicated freight railway lines

All infrastructure, infrastructure upgrades and rolling stock for electrified freight rail lines pass this criterion.

On non-electrified lines the project, product or supporting infrastructure passes if:

$$\text{vehicle emissions per t-km when fully loaded} < \text{universal freight (per t-km) threshold}$$

(note that there is no load factor here for the following reasons:
• For simplicity, as freight operations are highly unlikely to fail to meet this criterion
• For rail freight per t-km emissions are less variable with payload (energy usage is broadly proportional to mass, payload mass is a higher proportion of gross mass)

Other relevant criteria to be passed for eligibility: 5 and 7

Criterion 5: Dedicated freight railway lines – fossil fuel exclusion

Infrastructure and rolling stock for railway lines that are built with the over-riding objective of transporting fossil fuels do not qualify under the standard. This will be determined by:
(a) The primary purpose of the lines being clearly described as fossil fuel freight by authoritative government or media sources; or, in the absence of this:
(b) A threshold on the share of fossil fuel freight t-km transported by the line

Other relevant criteria to be passed for eligibility: 7

Other infrastructure

Investments for new and existing public transport infrastructure are covered by Criteria 3, 4 and 5. However, there are a number of other possible infrastructure projects that could be eligible or excluded under the standard. In many cases it is fairly straightforward to assess whether such projects would contribute to meeting the universal threshold or not based on a few simple rules of thumb for certain project types, set out under Criterion 6. This list could be expanded or revised as part of the learning process of applying the Standard.

Criterion 6: All other infrastructure

Is the project or product likely to contribute to achieving the universal threshold or not?

Road

All infrastructure that encourages maintained or increased car use patterns is ineligible. This includes:

- New roads, road bridges, road upgrades etc.
- Parking facilities
- Fossil fuel filling stations

The latter two, even if charging and alternative fuel infrastructure are included

Other

The following other infrastructure types are automatically eligible:

- Dedicated charging and alternative fuel infrastructure (when separable from fossil fuel filling stations and garages)
- Public bicycle schemes

The following are eligible on a case-by-case basis:

- ICT that improves asset utilization, flow and modal shift, regardless of transport mode (public transport information, car-sharing schemes, smart cards, road charging systems, etc.).

Other relevant criteria to be passed for eligibility: 7

Use of pre-existing or parallel appraisals

The above set of criteria is designed to keep information-gathering and analytical requirements to a minimum, given the aforementioned complexities in assessing the net carbon savings of transport projects. However, some infrastructure projects will already be subject to carbon accounting or appraisal procedures that could provide additional information. A final over-arching criterion is therefore proposed to make use of such analysis.

Criterion 7: Use of project appraisals

For inter-urban rail projects (including high-speed rail, dedicated freight lines):

An inter-urban rail project only qualifies if an independent project appraisal demonstrates that the investment will reduce total transport related greenhouse gas emissions (per p-km or per t-km) in the affected corridor by at least 10%/25% (as set out in Table 2).

Criterion 7 is derived from some stakeholders' concerns that interurban rail projects, in particular, present large uncertainties associated with baselines and projected modal shift, as well as second-order effects (such as induced demand), which could produce insufficient emissions reductions, or even net gains[23].

Accounting for asset lifetimes

One issue raised in consultation is how the universal metric approach will account for the lifetime of assets. It has been suggested that any project looking to refinance existing assets that have a long life (e.g. diesel train) should qualify under the expectation that they would not only meet the existing target but also the future targets within the project life.

Under the Climate Bond Standard, assets that meet certification requirements in a given year may not be eligible in future years should those assets not meet a revised version of the Standard or moving emission targets. For example, highly efficient diesel trains may qualify in 2015, but may not in 2025. Eligible projects certified in 2015 would remain, but would not be eligible for new certification in 2025.

Under this framework, proposals that do not look like they will continue, over the project life, to meet the expected decreasing threshold should not qualify. The objective here is not just to gain short-term reductions; rather it is to ensure we push the transport sector toward long-term climate targets.

4.4 For the future

Scope 2 or 3 emissions

As previously mentioned, after an initial period, the Standard will be reviewed to consider whether or not the inclusion of Scope 2 or 3 emissions would be practical and would add sufficiently to the quality of decision-making to justify any additional costs associated with information gathering and analysis. This will depend primarily on the progress of grid decarbonisation in relevant countries.

Asset Management Programs

A full Asset Management Program is *not* required for climate bond certification at this stage. However, we recommend that a company should have in place a strategy and specific plans for managing the long-term sustainability and greenhouse gas emissions of a project or system.

We expect to make this a mandatory requirement for Climate Bonds Certification from 2017 in jurisdictions where asset management programs are common practice (e.g. UK, US) or by 2020 in jurisdictions where asset management programs are not yet common practice (e.g. emerging markets). This requirement is not only important for improving the performance of the system, but also helps to manage risks associated with climate change impacts.

[23] See for example the discussion over uncertainty and secondary effects in the sustainability appraisal for the UK's High Speed 2 rail line: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/370568/HS2_London_to_the_West_Midlands-_sustainability_appraisal.pdf