RICARDO-AEA

Triple

European Commission

Financing Meaningful Mitigation Actions

Part of the Scaling up Climate Finance in 2014 and beyond project

FINAL REPORT

December 2014

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Executive Summary

In order to facilitate the scaling up of investment into the deployment of low carbon technologies necessary to meet the 2 degree target, it will be important to firstly have a greater understanding of the investment required to implement low-emission and climate resilient development strategies, and secondly the most effective way to use climate finance to scale up mitigation ambition. Alongside these, key issues such as transparency and reporting need to be understood.

Ricardo-AEA was contracted by the European Commission (DG CLIMA), with subcontracting services of Triple E Consulting, to undertake a study on 'Financing meaningful mitigation actions'. The overarching objective was to carry out more detailed analysis for a specific group of countries/sectors of:

- Their plans for mitigation action and associated investment plans (where available)
- Possible ways that finance, or financial instruments, could best be employed in the country/sector to help realise their mitigation ambition/pledge

This report analyses the financing of meaningful climate mitigation actions and initiatives across case studies in Chile, India, Vietnam and South Africa in the transport and industrial energy efficiency sectors, as well as the renewable energy sector in Ecuador. In analysing these meaningful climate mitigation actions and initiatives, the work specifically emphasises bankable 'best practices' of equity-based solutions and debt finance options with profitable project returns that have a large potential for upscaling to other sectors and countries. The roles for other types of financial instruments and interventions (e.g. risk mitigation, aggregation, grants) are also considered, as well as non-financial instruments (e.g. policy, capacity-building). The results, outcomes and suggestions in this report are evidence-based, drawing on in-country interviews, literature review and 'real-life' examples.

This report informs financial institutions, institutional investors, and other private sector stakeholders regarding financing options in different countries and sectors, providing a basis for developing future business cases. Policy and regulatory options are provided for potential consideration by national governments (as well as Development Finance Institutions and Multilateral Development Banks), including incentives for engaging private sector actors and institutional investors from both developed and developing countries and the creation of a financially attractive environment for low-carbon investment.

A summary of the findings and recommendations for each sector/country case study is provided, with cross-cutting analysis per sector, as well as five main conclusions for scaling up climate finance:

1. For most sectors/countries, financial and non-financial barriers exist. Hence, for climate finance to be successful, both need to be addressed simultaneously

2. Due to the specific requirements and barriers within each sector climate finance needs to be targeted differently (even inside the same country)

3. While countries share many common barriers , climate finance and financial instruments need to be targeted in a country-specific manner, to take into account the various continuous stages of development of countries, as well as

nuances in barriers (especially institutional/cultural barriers) and climate policy approaches between countries

4. It is recommended that climate finance should increasingly involve the private sector delivering new commercial opportunities while increasing finance available for low carbon and climate resilient development. The status and maturity of the local financial sector is of prime importance, as well as identifying hotspots where local/private interventions are difficult. For example, in countries with a less sophisticated or developed financial sector, green bond issuances may not be successful without financial guarantees or insurance for return on investment. In more financially mature countries, it may be relevant to consider mechanisms for aggregating medium-sized projects to render them bankable

5. Whilst recognising that climate finance should always align with country level priorities, there may be scope to harness additional low-cost emission reduction policies (e.g. through the use of fuel efficiency standards in the transport sector)

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1 Introduction

1.1 Objective

In order to facilitate the scaling up of investment into the deployment of low carbon technologies necessary to meet the 2 degree target, it will be important to have a greater understanding of a) investment required to implement low-emission and climate resilient development strategies and b) the most effective way to use climate finance to scale up mitigation ambition, and c) a number of associated issues of climate finance such as transparency and reporting.

Accordingly, the objective of this study is to carry out more detailed analysis for a specific group of countries/sectors on a) plans for mitigation action and associated investment plans, and b) possible ways that climate finance, could be employed in the country/sector in order to help realise their mitigation ambition/pledge. Specific recommendations are to be made at the country/sector case study level, but the analysis should also allow for the elaboration of cross cutting findings and to identify where financing solutions for a given country might be scaled up and replicated across similar countries.

1.2 Approach

This study addresses the above objective by undertaking an analysis of country- and sector-level information, supplemented with consultation of key in-country experts for each case study, and then undertaking cross-cutting analysis across the case studies. In addition, when appropriate an earlier European Commission project 'Global Climate Finance Needs'[1] has been used to strengthen the analysis.

Case study selection was undertaken in discussion with the European Commission, based on a number of factors, including:

- complementarity with the 'Global Climate Finance Needs' project
- countries for which an Investment Report has been written under the climate investment plans for the Climate Investment Funds (CIFs) or from an international financial institution.

The final case studies selected are provided in Table 1 below, accompanied by summary information regarding the availability of data on investment needs for each country/sector case study.

Table 1: Investment data availability for each country/sector case study

Sector	Country	Availability of investment information
Transport	Chile	CIF plan is available, National Action Plan
	India	CIF plan is available, National 12th Five Year Plan, research studies/lessons learnt reports, press releases
	South Africa	CIF plan is available, MDB websites
	Vietnam	CIF plan is available, MDB websites, press releases

[1] Global Climate Finance Needs: Literature review and preliminary analysis of low emission investment plans associated with mitigation pledges made by developing countries in the UNFCCC negotiations http://www.ecofys.com/files/files/ec-ecofys-2014-global-climate-finance-needs.pdf

Industrial Energy Efficiency	Chile	CIF plan is available, research studies
	India	CIF plan is available, National 12th Five Year Plan, research studies/lessons learnt reports
	South Africa	CIF plan is available, MDB websites
	Vietnam	CIF plan is available, MDB websites
Renewable Energy	Ecuador	CIF plan is not available, some information available in press releases

Section 2 provides the country/sector-level case study analysis. Section 3 provides cross-cutting analysis for each sector. Section 4 provides the overall recommendations for the study. Appendix A provides a summary of investment needs information available for each country/sector. Appendix B provides an excerpt from the relevant climate investment plan for the Climate Investment Funds for each country/sector (where available).

1.3 Scoring methodology

Table 2 below summarises the scoring methodology used to analyse the case studies. Most indicators are qualitative, and hence have been scored based on the literature review, interviews and informed expert judgement.

Table 2: Investment data availability for each country/sector case study

Indicator	Scoring	Data source
Credit rating	S&P scorings	S&P (foreign currency rating). http://www.standardandpoors.com/ratings/sovereigns/ratings-list/en/us?sectorName=null&subSectorCode=39&filter=M
Competitiveness index	Green = 0-49 Yellow = 50-99 Red = 100-148	The Global Competitiveness index http://www.weforum.org/reports/global-competitiveness-report-2013-2014 Assesses the competitiveness landscape of 148 economies, providing insight into the drivers of their productivity and prosperity. Scores range from 7 (excellent) to 1 (poor)
Transparency index	Green = 0-62 Yellow = 63-125 Red = 126-175	CPI's Transparency/Corruption Perceptions Index, http://cpi.transparency.org/cpi2013/results/ Ranks countries and territories based on how corrupt their public sector is perceived to be. The score indicates the perceived level of public sector corruption, from 100 (excellent) to 0 (poor)
HDI	Green = 0-58 Yellow =59-117 Red = 118-187	Human Development Index (HDI) 2013, https://data.undp.org/dataset/Table-1-Human-Development-Index-and-its-components/wxub-qc5k The HDI measures development by combining indicators of life expectancy, educational attainment and income. The scores range from 1.0 (excellent) to 0.0 (poor)
National mitigation potential	High/low/medium scorings represent the relative predominance of the mitigation potential sub-categories *within* a country	Literature review, interviews, informed expert judgement
Policies	0= no policy available 1= policy planned 2= policy implemented but effectiveness unclear 3= policy implemented & proven but not stringent 4= policy implemented, proven and stringent)	Literature review, interviews, informed expert judgement
Barriers	1= low/insignificant barrier 2= moderate-low barrier 3 = moderate-severe barrier 4= severe barrier	Literature review, interviews, informed expert judgement

2 Country case studies

This section provides the case study summaries for each of the countries and sectors reviewed are provided.

2.1 Transport sector

This section summarises the transport case studies undertaken for India, Vietnam, South Africa and Chile.

2.1.1 India

The primary financial instruments used in India so far to fund sustainable transport have been grants and loans, with a small number of innovative financing mechanisms being used to date. Public-private partnerships (PPP) aimed at increasing the use of private finance are increasing in prevalence - with public finance providing either low cost loans and/or seed funding/grants, as well as the provision of risk management instruments such as guarantees or insurance by the public sector. PPP is recommended to be focussed on improving vehicle efficiency (in particular for commercial vehicles), increasing the use of alternative fuels and shifting freight transport from road to rail (the areas with the greatest mitigation potential). These types of financing system could tackle key financial, technical, and institutional/political barriers.

Non-financial interventions are equally recommended – for example, to increase the stringency of India's fuel and transport policies, and drive change in the transport industry. The priorities in this respect are recommended to include: increased policy and regulation (and increased enforcement of the same), as well as a review of the government organisations involved in setting and enforcing transport policy and regulation (supporting increased coordination between national and local government, which in turn may support efficiency improvements across the sector). Further detail is provided in Table 3 overleaf.

Table 3: India transport sector case study

<table>
<tr><th colspan="3">Country: India</th><th>Sector: Transport</th></tr>
<tr><td colspan="4">General indicators</td></tr>
<tr><td>Credit rating</td><td colspan="2">BBB- (S&P)</td><td rowspan="4">Country profile summary: India is a lower middle income country, with 1.2 billion people, and is the world's fourth-largest economy. Economic liberalisation measures, including industrial deregulation, privatisation of state-owned enterprises, and reduced controls on foreign trade and investment, began in the early 1990s and served to accelerate the country's growth, which averaged just below 7% per year from 1997 to 2011. Over the six and a half decades since independence, an agricultural revolution has transformed the nation from chronic dependence on grain imports to now being a net exporter of food.
Life expectancy has more than doubled, literacy rates have quadrupled, health conditions have improved, and a sizeable middle class has emerged. India is now home to globally recognized companies in pharmaceuticals, steel, and information and space technologies. India's passenger vehicle fleet is small (11 per 1,000 people - World Bank, 2009) relative to its large population. As a consequence, thus it has very low transport emissions per capita. However the fleet is growing rapidly due to the country's increasing GDP.</td></tr>
<tr><td>Competitiveness index[2]</td><td></td><td>4.28 (60/148)</td></tr>
<tr><td>Transparency index[3]</td><td></td><td>36 (94/177)</td></tr>
<tr><td>HDI 2013[4]</td><td></td><td>0.55 (136/200)</td></tr>
<tr><td colspan="4">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td colspan="2">Medium/ High</td><td rowspan="4">Summary potential: The overall mitigation potential in the transport sector is medium/high, with the greatest contributions possible from both modal shift and vehicle technologies. The emissions from the transport sector make up approximately 10% of India’s total emissions.
A significant reduction in emissions is possible especially from alternative fuels, i.e. a move to compressed natural gas (CNG) or renewable sources. In particular for freight transport, a shift from road to rail transport could result in significant emission reductions (dependent on an improvement in infrastructure and technologies, including both for freight corridors and urban public transport).</td></tr>
<tr><td>System planning and efficiency</td><td colspan="2">Low/Medium</td></tr>
<tr><td>Modal shift:</td><td colspan="2">Medium</td></tr>
<tr><td>Passenger</td><td colspan="2">Medium</td></tr>
</table>

[2] Competitive index: The Global Competitiveness index assesses the competitiveness landscape of 148 economies, providing insight into the drivers of their productivity and prosperity. The scores range from 7 (excellent) to 1 (poor).
[3] Transparency index: The Transparency/ Corruption Perceptions Index rank countries and territories based on how corrupt their public sector is perceived to be. A country or territory’s score indicates the perceived level of public sector corruption. The scores range from 100 (excellent) to 0 (poor).
[4] Human Development Index (HDI) 2013: The HDI measures development by combining indicators of life expectancy, educational attainment and income. The scores range from 1.0 (excellent) to 0.0 (poor).

Freight	Medium	**Summary of sustainable transport implementation to date**: The Indian transport sector is anticipated to make up 13% of the expected emissions for the country in 2020; hence it is a target mitigation sector for the Indian government. The vehicle mix has a very high proportion of two wheelers (80%), followed by passenger vehicles (14%), three wheelers (3%) and commercial vehicles (3%). Although two wheeler vehicles make up 80% of India's vehicle fleet, they only account for 20% of the Indian transport emissions; whereas the commercial vehicles make up 3 % of the fleet, yet make up over 50% of the emissions. A growing economy is expected to see not only an increase in the number of vehicles on the road, but also a passenger vehicle modal shift from two to four wheel vehicles, with an increased distance travelled per annum. Investment has been undertaken in the larger metropolitan cities to improve public transport, and create sustainable urban transport systems. However, outside of the metropolitan cities little investment/action has been taken to implement public transport. In some of the larger metropolitan cities, public transport has been converted from petrol/diesel to CNG resulting in reduced emissions. With respect to freight transport, limited action has been taken to shift transport from roads to rail/inland waterways. This is due to the underdeveloped infrastructure currently available.
Vehicle technologies:	High	
Vehicle efficiency	High/Medium	
Alternative fuels	High	
Electric vehicles	Low/Medium	
Pledges and policies		
Pledge		
Status	Announcement by the Environmental Minister submitted under the Copenhagen Accord and acknowledged under the Cancun Agreements.	
Date of pledge	04-Dec-09	
Short description	India will endeavour to reduce the emission intensity of its GDP by 20 - 25% by 2020 in comparison to the 2005 level. The emissions from the agriculture sector will not form part of the assessment of emissions intensity. The target was proposed during the Copenhagen negotiations and submitted to the Copenhagen Accord on 30 January 2010. Data underlying the figures were not provided. India earlier provided a climate plan, which provides eight national missions in key areas[5]. It provides several measures, several of which are quantified in terms of resulting emission reductions. Detailed targets on the electricity sector are contained in the 11th five-year plan. Most measures in the climate plan are rather general, e.g. promoting public transport or a fuel switch in industry. The plan does not provide an overall baseline and mitigation scenario.	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2.0	**Summary**: India has mainly implemented policies targeting two and four wheel passenger road vehicles, however it is not clear how stringent or successful these polices have been. Freight vehicles have not been targeted. A high level National Transport Development Policy Committee has been set up to develop a transport policy to 2030. The current transport planning policy focuses for the Indian

[5] NB: there is no dedicated ambition for transport, however it is referred to in the 'National Mission on Sustainable Habitat'

		government are: ▪ improving the share of rail in freight transport ▪ improving the share of non-motorised and public transport in urban passenger transport ▪ fuel efficiency norms for vehicles (standards, regulation, industry-governmental partnerships, fee bates6, fuel prices and taxes) ▪ land-use/trip organisation (e.g. mixed-use zoning, telecommuting). Furthermore, sustainable transport has high priority in the 12th Five Year Plan (2012-2017) – Sustainable Urban Transport Policy (SUTP), freight corridors, reform of HGV, electric vehicles, and transport reforms are needed in pricing and fiscal areas (transport pricing policies). There are multiple pledges/plans/missions developed for the Indian transport sector, across all modes of transport. However, they have not been converted to regulation or standards.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary:** India faces a wide range of barriers to implementing its national mitigation potential within the transport sector. It was highlighted in the research undertaken for this case study that all the barriers are interlinked. Access to financing for more efficient vehicle technologies would help the effective enforcement of legislation. Overall, it was found that the most significant barriers are in the technical and institutional/political categories. The main/significant barriers encountered in each involved needs for the following: 1. increased deployment of energy efficient technologies from national R&D centres as well as developed countries (overcoming the higher costs for more modern technologies), 2. more coordination between national-local governments could be useful, as well inter-Ministerial departments, regarding infrastructure and regulation planning/implementation/enforcement, and, 3. clearer lines of responsibility, improved accountability and greater coordination between national, state and city levels.	
Barrier category	**Score**	**Summary**
Institutional/ political	3.2	One of the biggest institutional/political barriers is that adopted legislation is challenging to enforce nationwide, e.g. national vehicle standards such as the Bharat stage emission standards. The monitoring and enforcement falls on state and local institutions. There is therefore a lack of common enforcement across the country, mainly due to resource limitations. Regulation in larger cities is better than in semi-urban areas. However, there are a significantly higher number of vehicles in urban areas to monitor. Other forms of transport in India are yet to be regulated (i.e. heavy freight/ rail, ships/inland boats etc.). As a consequence, there could be greater drivers for improving performance.

[6] A 'fee bate' means levying a fee on higher emitting vehicles and giving customers a rebate on lower emitting vehicles. Depending on the fee and rebate structure, this can therefore be revenue neutral.

Financial/ economic	3.5	Investment in transport infrastructure for all modes of transport is very limited - including roads (especially in smaller cities outside the larger metropolitan areas), railways, inland water ways and ports. Furthermore, the population's affordability of a technology dictates their purchase. This is also applicable to small private businesses when investing in commercial vehicles - due to limited available capital, companies opt for cheaper, less efficient models.
Technical	3.5	Although passenger vehicle technology in India has improved over the last decade (mainly for two-wheeler vehicles and smaller cars that now sell on fuel efficiency as they compete on low long term running costs), the technology for commercial vehicles requires updating to increase, efficiency and reduce carbon intensity. This is supported by the fact that commercial vehicles make up 3% of India's vehicle fleet, yet contribute over 50% of the emissions. Increased technology cooperation is needed on commercial vehicles (which includes freight vehicles, trains and ships), to improve the efficiency of the technology. High upfront costs for more efficient technology reduces its uptake.
Informational/ capacities	2.3	Based on our findings from the stakeholder interviews, an increase in the knowledge/technical capacity of those designing sustainable transport systems could improve the design of efficient transport systems. In small cities/semi-rural areas with new public transport systems, providing information on the scheduled services and routes could increase their uptake.
Social, cultural and behavioural	2.0	Outside the large Metropolitan cities (i.e. in smaller cities/semi-urban areas), improving the convenient of public transport may attract potential passengers and improve the perception of these services – including addressing. Infrastructure planning and management of services/coordination. Additionally, due to the substantial increases in the number of vehicles on the road (rising GDP and economic growth, along with the low purchase and running cost of two-wheelers, means more people can afford personal vehicles), road safety concerns exist.
Matching financing requirements and barriers with instruments		
Financing needs	**Summary**: Two ambitious freight corridor projects, the Eastern Dedicated Freight Corridor and Western Dedicated Freight Corridor have been priced at US$ 4.1 trillion including US$ 2.7 of foreign investment (Clean Investment Plan, 2011), and US$600 million (media reports) respectively.	
Financial instruments		
Equity based instruments	Direct investment of capital from private organisations is recommended to be targeted towards modal shift categories - with investors having a stake in the assets, or a guarantee of return revenue, for example toll/congestion charges, fare collection on public transport routes etc. Public bodies could provide seed finance for infrastructure projects or technology companies.	

Loans	The use of soft loans (zero/low cost) could help the dissemination of low-emission technology in the transport sector. An increase in the provision of microfinance could assist smaller businesses to develop and in addition assist develop the economy and infrastructure around transport nodal points. Debt/viability funding by the government will continue to be a key financing instrument to catalyse private sector involvement, in the form of public private partnership schemes to improve freight transport infrastructure including railways, seaports and inland waterways, ultimately enhancing modal shift.
Risk management instruments	Risk management tools such as guarantees/insurance could have a significant effect on unlocking the mitigation potential for the transport sector in India; especially to encourage and support private sector investment in low carbon technologies and large scale transport infrastructure.
Policy incentives	The introduction of higher taxes for less efficient vehicles, such as road tax/increased tolls/ higher fuel premiums could incentivise the uptake of more efficient technologies.
Non-finance interventions	Stricter vehicle emission and fuel regulations and standards are strongly recommended - as well as procedures to ensure increased compliance with these regulations and standards. Enhanced coordination between national, regional and local levels of government could support infrastructure developments, as well as environmental planning policies and regulations (e.g. mandating the usages and environmental requirements for different land 'zones' and transport corridors). Furthermore, a consolidation of information in one location to ensure easy access to the relevant documents, along with the training (via technical assistance) of key planning and design staff within key Ministries and local governments could improve the efficiency and longevity of transport systems.
Other-finance interventions	Advertising space in public transport systems (both on services and on the infrastructure) could provide an additional source of revenue, which could be used on low carbon improvements in the transport infrastructure.

Summary: To date, the primary financial instruments used in India to fund sustainable transport have been grants and loans, with a small number of innovative financing mechanisms being used to date. Public-private partnerships (PPP) aimed at increasing the use of private finance are increasing in prevalence - with public finance providing either low cost loans and/or seed funding/grants, as well as the provision of risk management instruments such as guarantees or insurance by the public sector. PPP is recommended to be focussed on improving vehicle efficiency (in particular for commercial vehicles), increasing the use of alternative fuels and shifting freight transport from road to rail (the areas with the greatest mitigation potential). These types of financing system could tackle key financial, technical, and institutional/political barriers.

- Non-financial interventions are equally recommended – for example, to increase the stringency of India's fuel and transport policies, and drive change in the transport industry. The priorities in this respect are recommended to include: increased policy and regulation (and increased enforcement of the same), as well as a review of the government organisations involved in setting and enforcing transport policy and regulation (supporting increased coordination between national and local government, which in turn may support efficiency improvements across the sector).

2.1.2 Vietnam

To ensure sufficient funding is available to develop a sustainable transport sector in the long term, Vietnam could consider diversifying its means of funding transport infrastructure projects. The private sector, especially via public-private-partnerships (PPPs), could be encouraged to take an active role, coupled with a more developed bond market (government and corporate). Clearer information on the financial return from such projects (e.g. toll and usage fees), along with guarantees from the government and international donors could enhance private sector engagement. Further enforcement of appropriate regulations could be considered, in particular to increase the fuel efficiency of the vehicle fleet. Other options could include incentives (tax, cost/difficulty of parking) for modal shift both in an urban and broader context, as well as providing more effective public information. Further detail is provided in Table 4 below.

Table 4: Vietnam transport sector case study

<table>
<tr><th colspan="3">Country: Vietnam</th><th>Sector: Transport</th></tr>
<tr><td colspan="4">General indicators</td></tr>
<tr><td>Credit rating</td><td colspan="2">BB (S&P)</td><td rowspan="4">Country profile summary: Vietnam is a lower-middle income country, which has continuously maintained economic growth over the last 20-25 years, with a significant reduction in poverty levels. Economic growth patterns have relied heavily on natural resource extraction with outdated technology and as a consequence environmental pollution problems. In particular, rapid urbanisation (e.g. Ho Chi Minh City and Hanoi) coupled with strong population growth has exerted pressure on urban transport systems. However, economic growth has been relatively stable in terms of GDP (Purchasing Power Parity). Vietnam is a member of Association of South-East Asian Nations (ASEAN). Its main greenhouse gas (GHG) emission sources are agriculture, energy, transport and other land use.</td></tr>
<tr><td>Competitiveness index</td><td></td><td>4.18 (70/152)</td></tr>
<tr><td>Transparency index</td><td></td><td>31 (116/177)</td></tr>
<tr><td>HDI 2013</td><td></td><td>0.617 (127/200)</td></tr>
<tr><td colspan="4">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td colspan="2">High</td><td rowspan="4">Summary potential: The share of GHG emissions from the transport sector has increased significantly to over 25% of total emissions in Vietnam. In 2005, Vietnam was ranked 10th (out of 11 countries) in terms of transport energy efficiency in Southeast Asia. Therefore, there is a high potential in the transport sector for climate mitigation activities. The greatest potential could come from a modal shift in passenger transport and use of more efficient vehicle technologies. The passenger vehicle fleet is largely dominated currently by motorcycles (over 35 million), however with increasing economic development, it is anticipated that the number of cars will increase significantly. A significant reduction in GHG emissions could especially be made through a modal shift from road/air (air to a lesser extent than road) to railways (north-south travel), inland waterways and coastal shipping - and, to a lesser extent, via the use of more fuel efficient vehicles and alternative fuels, i.e. a move to natural gas (CNG in taxis, buses) or renewable sources.</td></tr>
<tr><td>System planning and efficiency</td><td colspan="2">Medium</td></tr>
<tr><td>Modal shift:</td><td colspan="2">High</td></tr>
<tr><td>Passenger</td><td colspan="2">High</td></tr>
</table>

Freight	Medium	**Summary implementation to date**: The dominant mode of transport in Vietnam is road transport: It accounts for 94% of all passenger transport, and 76% of all freight transport. Of this passenger transport, motorbike use accounts for the majority share of this mode of travel, making up 80-90% compared to other types of vehicle use. Congestion in urban areas is a major problem and therefore mitigation actions in the transport sector are currently focussed on the introduction of mass transport schemes (such as Metro Rail Transit lines and Bus Rapid Transit systems) in Hanoi and Ho Chi Minh City. To date, investments have mainly been undertaken in the larger metropolitan cities to improve public transport, and to create sustainable urban transport systems. There is scope for more investment to be undertaken in rural areas outside of Ho Chi Minh City and Hanoi in public transport. A number of alternative fuel initiatives are underway: electrical/hybrid buses, and CNG taxis and buses (Ho Chi Minh City). In case the pilot schemes are successful and sufficient cost-effective supply of clean fuels are available, the programs will likely be expanded according to stakeholder interviews (i.e. ADB and UNDP). A modal shift from roads to railways and/or waterways has still to occur – with key challenges including Vietnam's geography and the (freight and passenger) transport mainly taking place within the urban areas of Ho Chi Minh City and Hanoi. With respect to freight transport in particular, some action has been taken to shift transport from roads to rail/inland waterways but this could be accelerated if more infrastructure was available.
Vehicle technologies:	High	
Vehicle efficiency	High	
Alternative fuels	High	
Electric vehicles	Medium	
Pledges and policies		
Pledge		
Status	No pledge	
Date of pledge	-	
Short description	-	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2.0	**Summary**: Vietnam has implemented a few policies targeting transport (such as the early retirement of polluting vehicles). In addition, action plans and strategies have been developed to harness the mitigation potential. In some cases, increased coordination and efficiencies could support greater policy implementation and law enforcement (for example, a central budget line for climate mitigation actions). An overarching Transport Development Strategy until 2020 developed by Ministry of Transport, together with the National Strategic Program on Energy Savings and Effective Use (VNEEP), are the main (low-carbon) transport development documents. The National Climate Change (and Green Growth) Strategy are governed by MONRE, but do not foresee concrete transport policy implementation. It should be noted that concrete transport (policy) implementation is governed by the federal agencies and city governments. The current national transport planning policy focus areas for the Vietnamese

		government are: ▪ improving the share of non-motorized and public transport in urban passenger transport ▪ developing of mass transit systems (MRT lines) and bus rapid transit (BRT) systems in urban areas, in particularly in Ho Chi Minh City and Hanoi ▪ fuel efficiency norms for vehicles (standards, regulation, fuel prices and taxes) ▪ low emission fuels are used for traffic vehicles: 20% and 80% of buses or taxis run on CNGs or LPGs by 2020 and 2050. Overall, there are multiple plans/missions developed for the Vietnamese transport sector, in particular for road and rail transport, however most of these have yet to be converted to regulation/standards yet.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary:** Barriers to greater implementation of fuel efficiency technologies and modal shifts (railway) include: ▪ Long administrative processes, which can lead to challenges in financing outside of conventional Official Development Assistance (ODA) concessionary loans ▪ There are important technological challenges in the development of public transport systems. Over the past two decades, it has been challenging to keep the transportation infrastructure updated in line with the country's sustained level of development. Road infrastructure has been the focus but especially in metropolitan cities, these can sometimes be overloaded with emissions intensive vehicles. ▪ Inland waterways and railways can have a lower emissions intensity. However, they require long-term planning and significantly large amounts of financing. ▪ A greater emphasis on long-term planning could increase the implementation rate of many large urban and country-wide projects, thus reducing potential delays in the improvement of the transport network. Currently, financing of transport projects is dominated by low cost ODA loans coupled with grants.	
Barrier category	**Score**	**Summary**
Institutional/ political	2.9	The administrative processes could be more efficient with increased coordination between Government departments having the potential to stimulate a greater level of inter-departmental coordination between the Ministries. Further experience in coordinating large projects at the Government level could also be helpful for creating synergies. Increasing capacities for the implementation of new regulations at various levels, as well as a strengthened transport legal system could provide further benefits.
Financial/ economic	3.3	Financing of transport projects in Vietnam has seen a large reliance on ODA concessionary loans and grants to date. The number and size of potential transport projects (e.g. modal shift to railways and waterways) is a significant challenge to source corresponding finance.
Technical	2.6	Technology is an important component of efficient mitigation projects. This is in particular the case for motor vehicles (the Vietnamese fleet could be younger and with a lower emissions intensity). Technical challenges also exist with modern public transport construction or smart road management systems. Similarly, there are multiple technical challenges associated with further developing railways and waterways, in particular modal nodes.

Informational/ capacities	2.0	An increased understanding of the mitigation potential, as well as increased technical capabilities, would help see more sustainable transport systems designed and implemented. The public could benefit from increased knowledge and understanding of regulations and standards (e.g. EU standards for vehicles applied in Vietnam) for more informed purchasing decisions to be made.
Social, cultural and behavioural	2.0	Social success can be associated with the use of car vehicles or even motorbikes versus public transport or bicycles. This helps explain an often lower acceptance of less luxurious fuel efficient vehicles among private households.
Matching financing requirements and barriers with instruments		
Financing needs	**Summary**: Vietnam has developed a climate investment plan (CIP) in coordination with the Asian Development Bank, members of the World Bank Group (International Bank for Reconstruction and Development, International Finance Corporation) and key Vietnamese stakeholders to tap US$250 million from the Clean Technology Fund (CTF). An additional US$3.64 billion in public and private sector support is expected to be leveraged to achieve 97.5 $MtCO_2e$ GHG emissions savings and reduction. The CIP for Vietnam particularly targets the transport sector. Nearly 75% of this budget in the CIP (more than US$ 3 billion) is earmarked for two transport related projects, which the CTF is expected to contribute with US$ 150 million. The first project is the Ho Chi Minh City Sustainable Urban Transport that aims to develop an Urban Mass Rapid Transit system (CTF funding: US$ 50 million from total (indicative) US$ 144 billion). The second project, Hanoi Sustainable Urban Transport, plans to build a Metro Rail System in Hanoi (CTF funding: US$ 100 million from total (indicative) US$ 1.63 billion). The goal of both projects is to increase access to and use of public transport.	
Financial instruments		
Equity based instruments	Investment from private sources (local or foreign companies) in infrastructure projects and transport companies could be encouraged to a greater extent. There is scope to significantly increase private investment, for example, with a combination of revenue (toll / usage fees / congestion charges, fare collection) and guarantees (from local government or foreign multilateral development bank) for projects. Regulations on Public Private Partnerships (PPPs) are currently being developed.	
Loans	Low-cost loans play an important role in transport infrastructure finance. However, a diversification of finance sources could progressively happen in favour of government and corporate bonds. Co-financing by government enhances commitment to the project and could allow it to run more efficiently. Long-term finance, such as loans, could be targeted towards areas such as urban public transport, railway or multimodal nodes. Coordination with current large projects in urban areas (e.g. metro construction) could be undertaken to realise the full value of the loans.	
Risk management instruments	Guarantees for private sector actors seeking to investment in transport infrastructure and vehicle technologies could be instrumental in engaging private investors. The guarantees could be provided by local government or multilateral and bilateral organisations.	
Policy incentives	Existing policy incentives have already helped reduce emissions (e.g. second-hand cars with 5+ years' lifetime are not allowed to be imported). Taxes could be applied to reduce the large fleet of old vehicles – e.g. tax incentives may be applied on use of fuel efficient vehicles, and/or higher road taxes on less efficient vehicles.	

Non-finance interventions	Given the challenges in enforcing regulations, education could be a useful tool (for both government officials and the wider public), e.g. on driving habits or information on the standards of fuel efficiency of cars and motorcycles. In addition, modern forms of transport such as public transportation (metro, new buses) may provide a good alternative to existing transportation (motorbikes) to overcome any negative cultural perceptions regarding the use of public transport.
Summary: To ensure sufficient funding is available to develop a sustainable transport sector in the long term, Vietnam could consider diversifying its means of funding transport infrastructure projects. The private sector, especially via public-private-partnerships (PPPs), could be encouraged to take an active role, coupled with a more developed bond market (government and corporate). Clearer information on the financial return from such projects (e.g. toll and usage fees), along with guarantees from the government and international donors could enhance private sector engagement. Further enforcement of appropriate regulations could be considered, in particular to increase the fuel efficiency of the vehicle fleet. Other options could include incentives (tax, cost/difficulty of parking) for modal shift both in an urban and broader context, as well as providing more effective public information.	

2.1.3 South Africa

The greatest mitigation potential in the South African transport sector sits with vehicle technologies and, in particular, efficiency improvements to conventional-fuel vehicles. Policy instruments, such as fuel efficiency standards, could be more effective than financial instruments. However, financial instruments could still be important in developing longer term vehicle technology options such as charging infrastructure for electric vehicles and grants to increase the affordability of electric vehicles. Debt instruments such as syndicated loans are already used extensively in South Africa (e.g. to fund freight rail infrastructure development) and could potentially be considered for large-scale and long-term infrastructure investments also. Lastly, there may be additional scope for grants to subsidise public transport and hence encourage a greater demand 'pull' from customers. Further detail is provided in Table 5 below.

Table 5: South Africa transport sector case study

Country: South Africa		**Sector: Transport**
General indicators		
Credit rating	BBB- (S&P)	**Country profile summary:** South Africa has a relatively strong recent economic record and reasonably active in international finance markets, and space for further economic transformation (Commonwealth Business Council, 2013). A range of enduring legacy issues from the apartheid system presents challenges for economic efficiency and job creation (Commonwealth Business Council, 2013). South Africa is the largest greenhouse gas (GHG) emitter in Africa and ranks 11th globally. Per capita, South Africans emit 10 tonnes of CO_2/year, placing them eighth highest in the world. South Africa has committed to a peak-plateau-decline GHG trajectory, with emissions starting to fall in absolute terms from 2035. South Africa is likely to be hit hard by climate change. Much of it is arid or semi-arid and the whole country is subject to droughts and floods. Even small variations in rainfall or temperatures would exacerbate this already stressed environment. South Africa's approach to climate change (both mitigation and adaptation) is set out in the National Climate Change Response White Paper, published in October 2011. This commits the South African
Competitive index	4.4 (53/148)	
Transparency index	42 (72/177)	
HDI 2013	0.63 (121/187)	

		government to developing carbon budgets and mitigation plans for significant emitting sectors and/or sub-sectors.
National mitigation potential and implementation to date		
Overall score	Low /medium	**Summary potential:** Transport made up around 9% of total GHG emissions in 2000 and 13% of energy emissions from combustion in 2000 (South African Second National Communication). The National Climate Change Response White Paper suggests that in the medium term, the transport mitigation options with the greatest mitigation potential include transport modal shifts (road to rail, and private to public transport) and switches to alternative vehicles (e.g. electric and hybrid vehicles) and lower-carbon fuels. Analysis showed that the greatest mitigation potential will come from improved vehicle efficiency. This is not expected to have negative cost in 2020 (i.e. it will not provide a net benefit), although it is expected to do so by 2050 and in 2020 it is relatively cost effective - USD $47 per tCO2e. It is the cheapest of the measures other than CNG vehicles, which contributes a very small amount of abatement in 2020. There is significant abatement potential also from alternative fuels and from modal shift (where the greatest potential comes from shifting freight to rail). Note the low to high ratings to the left are based on an assessment across the transport sector. When compared to other sectors, the abatement potential in transport would be classed as 'low to medium' - significantly lower than power and industry, but slightly more than waste and AFOLU.
System planning and efficiency	Medium	
Modal shift:		
Passenger	Low	
Freight	Medium	**Summary implementation to date:** Road transport dominates the transport GHG emissions profile in South Africa (94%). There is a high share of trips by walking (23% of trips) and taxi (25% of trips from minibus taxis). It is expected that road traffic will increase over time as the population becomes more wealthy and more people purchase cars. Some measures are in place to encourage more fuel efficient vehicles (e.g. taxation and labelling) but there are currently no incentives for more advanced technologies such as fully electric vehicles.
Vehicle technologies:		
Vehicle efficiency	High	
Alternative fuels	Medium	
Electric vehicles	Low	
Pledges and policies		
Pledge:		
Status	Announcement of the president submitted under the Copenhagen Accord and acknowledged under the Cancun Agreements.	
Date of pledge	The target below was proposed during the Copenhagen negotiations in December 2009 and submitted to the Copenhagen Accord on 29 January 2010.	
Short description	South Africa will undertake mitigation actions which will result in a deviation below the current emissions baseline of around 34% by 2020 and by around 42% by 2025. This level of effort enables South Africa's emissions to peak between	

	2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2.0	**Summary**: Much of South Africa's policy development on the mitigation of transport emissions has been focused on strategies. For example, the Transport Flagship Programme sets out the overarching strategy on tackling GHG emissions from transport, and includes a suite of mitigation programmes reducing GHG emissions from vehicles and road freight by shifting commuters to public urban transport alternatives and by shifting freight from road to rail. Alongside this strategy work, there is substantial activity on public transport, e.g. Bus Rapid Transit (BRT), at municipality level and there are some national-level measures in place to support consumers in choosing more fuel efficient vehicles (e.g. vehicle labelling, vehicle CO_2database and a CO_2tax on new vehicles). There has been little assessment of effectiveness of these strategies and policies to date. The Department of Environmental Affairs (DEA) is currently working on a monitoring and evaluation system that will track the impacts of mitigation policies.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary**: The key barriers to the increased use of public transport related to concerns about journey times (due to issues with reliability, lack of integrated services and safety). Unless concerns are addressed (especially about safety), it is possible that these concerns could become more significant barriers as car ownership increases with increased incomes and more people have the freedom to choose other forms of transport. The major financial barrier is a lack of available capital for investment in infrastructure and vehicle conversions (e.g. to compressed natural gas, CNG).	
Barrier category	**Score**	**Summary**
Institutional/ political	2.0	It is possible that perceptions regarding a lack of clarity regarding regulatory support and concerns over energy security could be inhibiting vehicle technology improvements.
Financial/ economic	1.8	Capital could support investment, especially CNG conversions of existing technologies.
Technical	2.5	Technical barriers could include challenges around service reliability, limited routes, and inter-modal connections which could be improved and infrastructure for new fuels.
Informational/ capacities	2.0	The main informational/capacity barriers were regarding capacity of authorities at the metro level (e.g. expertise in policy design and appraisal) and on information for public transport
Social, cultural and behavioural	3.0	Strong preferences for car ownership may decrease public transport demand. As more of the population are able to afford cars, more people may choose to avoid public transport (particularly for personal safety concerns, but also for aspirational reasons).

Matching financing requirements and barriers with instruments	
Financing needs	**Summary**: The Government stated in 2011 that South Africa needs up to 468 billion Rand (66.9 billion USD) to address the investment needs of the country's roads and rail sector (People's Daily Online, 2011).
Financial instruments:	
Equity based instruments	Equity finance can play a key role in supporting transport infrastructure projects, especially within public-private partnerships and can also be important in the demonstration phase for new technologies, such as new electric vehicle charging infrastructure. Sweat equity (a party's contribution to a project in the form of effort, as opposed to financial equity) and in-kind contributions can be a way of addressing capacity gaps such as physical labour and intellectual capital.
Loans	Syndicated loans can play a key role in large infrastructure projects where the long pay back is attractive in terms of a secure return on the loan. The use of zero and low cost loans for the purchase of more efficient technologies and especially for the development of large scale infrastructure would be most applicable. Small private businesses may also require low cost loans for investing in more efficient commercial vehicles, as the technologies are more expensive due to the lack of competition in the market. Debt/viability funding by the government will continue to be a key financing instrument to catalyse private sector involvement, in the form of public -private partnership schemes to improve freight transport infrastructure including railways, seaports and inland waterways - and hence enhance modal shifts.
Risk management instruments	Promoting the development of risk management instruments could support increased financing for low-carbon technologies and large scale transport infrastructure projects (especially to support private sector investment) – especially guarantees/insurance. For example, to improve transport links between cities.
Policy incentives	Policy incentives can provide strong incentives for shifting to more efficient technologies such as lower carbon vehicles. Examples such as the introduction of higher taxes for less efficient vehicles, in the form or road tax/increased tolls/ higher fuel premiums could incentivise the uptake of more efficient technologies. The use of subsidies in public transport ticket prices could increase the uptake in services.
Grants	Grants to generate consumer demand, e.g. through subsidisation of public transport, were identified as a possible key option for encouraging modal shift. Grants could encourage more cities and metropolitan municipalities to pilot public transport measures such as BRT schemes. Grants could also tackle other barriers such as capacity and safety on public transport.
Non-finance interventions	The introduction of higher taxes for less efficient vehicles, in the form or road tax/increased tolls/ higher fuel premiums could incentivise the uptake of more efficient technologies. Government support could also be extended to working with financial industry stakeholders to help develop the venture capital investment market in South Africa.
Summary: The greatest mitigation potential in the South African transport sector sits with vehicle technologies and, in particular, efficiency improvements to conventional-fuel vehicles. Policy instruments, such as fuel efficiency standards, could be more effective than financial instruments. However, financial instruments could still be important in developing longer term vehicle technology options such as charging infrastructure for electric vehicles and grants to increase the affordability of electric vehicles. Debt instruments such as syndicated loans are already used extensively in South Africa (e.g. to fund freight rail infrastructure development) and could potentially be considered for large-scale and long-term infrastructure investments also. Lastly, there may be additional scope for grants to subsidise public transport and hence encourage a greater demand 'pull' from customers.	

2.1.4 Chile

The primary financial instruments used in Chile to date for funding sustainable transport have included: subsidies, tax incentives, standards and labelling. All these instruments provide platforms for a more complex and sophisticated blending to occur to steer Chile's transport sector towards a more sustainable and low-emission future. This mix of policy instruments and financial interventions are recommended to be continued, with extensions possibly considered so that additional modes of transport are included (e.g. more types of vehicles), as well as addressing other areas of the transport sector where efforts are not currently being targeted. Similarly, national soft credit schemes could cover additional energy efficiency options and the use of debt instruments by multilateral development banks (MDBs) or other (regional, bilateral) development financial institutions (DFIs) be encouraged to support sustainable transport in Chile. In this context, Chile could be a good candidate for (testing) secondary market instruments. Lastly, measures could be implemented together with incentives to attract private investments –collaborations with the private sector, building on the first experiences with joint public private initiatives in the transport sector could enhance the overall sustainability of the sector. For more detail, see Table 6 below.

Table 6: Chile transport sector case study

<table>
<tr><th colspan="3">Country: Chile</th><th>Sector: Transport</th></tr>
<tr><td colspan="4">General indicators</td></tr>
<tr><td>Credit rating</td><td colspan="2">AA- (S&P)</td><td rowspan="4">Country profile summary: Chile has been an OECD country since 2010, with strong ongoing economic growth. Chile is considered an emerging economy, rich in natural resources and a minor producer of fossil fuels. The use of renewable energy sources is high, primarily relying on hydropower. Energy needs are met to a significant degree by imported fossil fuels. Chile's market-oriented policies have created significant opportunities for foreign investors to participate in the country's steady economic growth.</td></tr>
<tr><td>Competitiveness index</td><td></td><td>4.61 (34/148)</td></tr>
<tr><td>Transparency index</td><td></td><td>71 (22/177)</td></tr>
<tr><td>HDI 2013</td><td></td><td>0.82 (40/208)</td></tr>
<tr><td colspan="4">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td colspan="2">Medium</td><td rowspan="4">Summary potential: Chile’s transport sector accounts for 30% of the country’s greenhouse gas (GHG) emissions (or 16,013 Gg CO_2), not taking into account international transport (3,059 Gg CO_2). The most effective mitigation measures to date have been focussed on biofuels (with a usage increase from 2% in 2015 to 15% in 2030) and retrofitting aerodynamic improvements to existing trucks (40% of the current fleet does not include these aerodynamic features).</td></tr>
<tr><td>System planning and efficiency</td><td colspan="2">Low</td></tr>
<tr><td>Modal shift:</td><td colspan="2"></td></tr>
<tr><td>Passenger</td><td colspan="2">Medium</td></tr>
<tr><td>Freight</td><td colspan="2">Low</td><td rowspan="2">Summary implementation to date: Chile's transport sector accounts for a high percentage of national GHG emissions because of its high consumption of fossil fuels. According to the Second National Communication to the UNFCCC, emissions in the transport sector are caused mainly by road transport</td></tr>
<tr><td>Vehicle technologies:</td><td colspan="2"></td></tr>
</table>

Vehicle efficiency	High	(92.3%), followed by domestic aviation (5.1%), maritime transport (2.2%) and finally rail transport (0.4%). In Santiago, the modal split is 58% private transport and 42% public transport. Policy focus is on road transport. The market penetration of electric vehicles still remains very limited, even though incentives to increase the uptake were provided in the past.
Alternative fuels	High	
Electric vehicles	Medium	
Pledges and policies		
Pledge:		
Status	20% below Business as Usual (BAU) by 2020 through nationally appropriate mitigation actions (NAMAs)	
Date of pledge	23-Aug-10	
Short description	Chile proposes to undertake NAMAs to reach 20% below BAU in 2020 (as projected in 2007). To accomplish this Chile may need a relevant level of international support. Climate Action Tracker estimates the absolute level of the pledge is equivalent to emission levels of 115 Mt CO_2e in 2020.	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2.5	**Summary**: Currently, implemented policies are a first step towards significantly reducing GHG emissions. Chile has implemented general policies, action plans and strategies. However, they have not yet been evaluated. The related main documents include the National Energy Strategy 2012-2030, the National Climate Change Action Plan 2008-2012, and the Energy Efficiency Action Plan 2020. A National Transport Policy is under development. These are all nationwide umbrella strategy documents, however implementation for the transport sector remain limited (with the exception of the Energy Efficiency Action Plan). This Plan foresees energy efficiency improvements in both heavy and light vehicles, as well as modal shift and introduction of new technologies. Chile is leading in emission standards in the region. It has implemented an energy label for light vehicles. Since September 2014, Chile is applying EURO-5 standards (for diesel EURO-5 has been applied since 2011). A tax for the most polluting imported vehicles is also being considered under the new tax reform. At a local level, there are multiple plans developed for the transport sector (including local Transport Master Plans) in particular for road and rail transport.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary:** Overall, a clear policy for sustainable transport and related support from the national government would be helpful. For passenger modal shift in particular, the main barrier is the quality current of the public transport system, which affects the uptake by the public. For electric vehicles (and other new technologies) the two key barriers are the high investments required to purchase the technology, and 2) a good post-sale strategy for new technologies to improve the public's perception and uptake.	

Barrier category	Score	Summary
Institutional/ political	3.5	A clear national policy for sustainable transport and support from the national government for sustainable transport (with the exception of vehicle standards) is a key factor in stimulating the uptake in mitigation potential. In addition, the public transport system could be more reliable and improved in terms of user comfort. This would help change negative perceptions/experiences and lead to an increase in use of the services.
Financial/ economic	2.5	The main financial barrier is the high up-front investment costs (particularly for electric and hybrid vehicles). Fleet and car owners do not take into account the operational/life-cycle costs when making an investment, and instead focus on the initial investment (thus often deciding for an option that is initially cheaper but more expensive in the long run due to high energy consumption). In the public sector, energy efficiency is not considered in the investment decisions regarding public transport.
Technical	0.0	No technical barriers were identified.
Informational / capacities	2.0	Besides the energy label for light vehicles, there is limited information for passenger vehicle users and/or fleet owners on the costs and benefits of new technologies. Furthermore, co-benefits such as impacts on health and pollution are often unknown or not taken into account when making purchasing decisions.
Social, cultural and behavioural	3.0	There is reluctance to try new technologies even if more cost efficient options are available, for both personal car users and fleet owners. Transport operators are reluctant to invest in low carbon vehicles since this would require changing their fleet operation/maintenance processes. They are used to more traditional technologies.
Others	3.3	There is currently no transport industry association, and this prevents energy efficiency programs/measures from being effective. A good post-sale strategy (providing support and maintenance) could help increase the trust in new technologies, in particular for electric vehicles and other new technologies such as aerodynamic elements for trucks. These are strong barrier hindering investments in hybrid and electric vehicles at the moment.

Matching financing requirements and barriers with instruments	
Financing needs	**Summary**: Comprehensive and verifiable data on financing needs for mitigation actions in the transport sector is currently not available. However, the most advanced and relevant project is the Santiago Green Zone Transport NAMA seeking US$ 17.7 million (70% to be covered from international (NAMA) funds and 30% by local stakeholders), which conducted an economic evaluation as part of feasibility study. This initiative consists of four components: 1. Promotion of Zero and Low Emission Vehicles (ZLEV): Cost of this initiative is estimated to be US$ 3.69 million; of which US$ 1.19 million will come from local stakeholders and US$ 2.5 million from NAMA international funds. 2. Low Carbon Emission for Public Transport Buses: Cost of this initiative is estimated to be US$ 6.46 million, of which US$ 2.7 million will come from local stakeholders and US$ 3.76 million from NAMA international funds. 3. Promotion of Bicycle Use: Cost of this initiative is estimated to be US$ 1,371,400, of which US$ 416,000 will come from local stakeholders and US$ 955,400 from NAMA international funds. 4. Traffic Re-design and Traffic Management: Cost of this initiative is estimated in US$ 6,244,000, of which US$ 790,000 will come from local stakeholders and US$ 5,454,000 from NAMA international funds.
Financial instruments	
Equity based instruments	Private investments can help to improve the image of public transport by complementing the limited public finance available. This could be further supported by additional public incentives, in particular the implementation of sustainable transport policies and clear guidance. If other incentives and finance mechanisms are in place, such as the loan instruments and risk instruments (described below) and levels of capital allow it, the private sector could be encouraged to (co-)invest in public transport projects. The abovementioned transport NAMA shows an innovative approach to share initial high investment costs through the combination of local sources and international climate finance against mitigation contributions. At the same time, such a well-designed concept can ensure that the introduction of energy efficiency /sustainable transport factors is piloted and facilitated as they are required to achieve emission reductions. Such new public-private transport mitigation schemes co-financed by public and private sector make it possible to address informational barriers ensuring that co-benefits are valued. This is what the transport NAMA Santiago Green Zone Transport tries to do through demonstration projects serving as showcases and improving the confidence in new technologies. Private investments could also have post-sales strategies (support & maintenance) for electric vehicles/other technologies in place and spur related market development.
Loans	Existing loan instruments by multilateral development banks, regional development finance institutions (see interest by CAF - Development Bank of Latin America - in transport NAMA) or national soft credits for truck fleet renewal (i.e. loans from a dedicated national financial service provider with no interest or a below-market rate of interest spurring truck fleet renewals), are helping to overcome financial barriers supporting the purchase of sustainable transport vehicles and technologies (e.g. aerodynamic elements for trucks). National soft credit schemes could be expanded to cover other renewals or retrofitting activities. Chile could also benefit from a green bonds market, which has already been discussed in the past (National Program of Decontamination Bonds). This is also reflected in the National Green Growth Strategy of Chile.
Risk management	The establishment of guarantees (to be provided by the government and/or multilateral development banks) will encourage the private sector in taking sustainable transport and energy efficient transport options into account when

instruments	making investment decisions.
Policy incentives	It is recommended that existing subsidy schemes, such as the renewal of freight transport fleets and the purchase of hybrid vehicles, as well as vehicle fuel economy labelling, continue as they provide clear economic incentives. In addition to the existing tax incentives, differential vehicle taxation could be considered. Further economic incentives will be introduced with the planned carbon tax and sectoral crediting or trading later on. Tax incentives do create co-benefits, such as in the case of lower tax rates for low-emission vehicles, and congestion charges make users pay for using road infrastructure and causing emissions. They also show that there are clear policies behind sustainable and low-emission transport strategies. Targeted subsidies, relevant tax incentives and new mechanisms (carbon tax on fuels, sectorial carbon crediting/trading allowing for international carbon finance flows beyond NAMAs and Clean Development Mechanism (CDM) projects) can provide some guidance and political direction could encourage behaviour change in business' and industries' as well as consumer behaviour in the transport sector. Subsidies can also be tailored to support development of post-sales strategies for e-vehicles and other technologies and support related market development. Value capture mechanisms (i.e. instrumentalising taxes, fees or charges to encourage low-carbon/green growth related developments) could be encourage to provide finance for public transport infrastructure. Sustainable transport options in public transport systems could help to improve the image of public transport.
Non-finance interventions	Non-financial interventions such as training measures, standards and labelling can improve the public's awareness of sustainable transport options. Concessions can also address this issue through the introduction of private sector services standards. Regulation provides additional confidence to the public that there are clear policies behind improving the energy efficiency of the transport sector. Concessions, regulations as well as standards and labelling facilitate investment decisions and help to introduce energy efficiency aspects into investment decisions. Standards and labelling support awareness about co-benefits of certain transport means and sustainable/energy efficient transport. Fleet/vehicle procurement manuals can ensure co-benefits are valued. Fleet/vehicle procurement manuals, training measures/programmes, standards and labelling, regulation and concessions could also help overcome the reluctance in investing in new technologies (from a purchasing perspective). Regulation could support the development of post-sales strategies for e-vehicles or other energy efficient traffic technologies and vehicles/means of transport and related market development.
Summary: The primary financial instruments used in Chile to date for funding sustainable transport have included: subsidies, tax incentives, standards and labelling. All these instruments provide platforms for a more complex and sophisticated blending to occur to steer Chile's transport sector towards a more sustainable and low-emission future. This mix of policy instruments and financial interventions are recommended to be continued, with extensions possibly considered so that additional modes of transport are included (e.g. more types of vehicles), as well as addressing other areas of the transport sector where efforts are not currently being targeted. Similarly, national soft credit schemes could cover additional energy efficiency options and the use of debt instruments by MDBs or other (regional, bilateral) DFIs be encouraged to support sustainable transport in Chile. In this context, Chile could be a good candidate for (testing) secondary market instruments. Lastly, measures could be implemented together with incentives to attract private investments –collaborations with the private sector, building on the first experiences with joint public private initiatives in the transport sector could enhance the overall sustainability of the sector.	

2.2 Energy efficiency in the industrial sector

This section summarises the industrial energy efficiency case studies undertaken for India, Vietnam, South Africa and Chile.

2.2.1 India

Several types of financial instruments for addressing barriers for industrial energy efficiency financing in India have recently been introduced, with additional instruments in the design phase. Existing instruments include: loans, including concessional loans backed by donor and multilateral agencies and commercial loans; grants and subsidies set up by central and local government agencies, Government-supported industrial energy efficiency funds; and schemes such as the Perform, Achieve and Trade (PAT) Scheme, and the Partial Risk Guarantee Fund for Energy Efficiency.

Achieving India's full potential from industrial energy efficiency will require a significant scaling up of energy efficiency financing – both existing mechanisms and new, innovative mechanisms may be needed. These could include:

- Establishing state-level clean energy funds using the public benefit charge concept
- Regulatory schemes to acquire industrial energy efficiency resources using a Standard Offer Program (similar to the Feed-in-Tariff for renewable energy resources)
- Promoting utility financing of industrial energy efficiency projects by establishing energy efficiency obligations
- Encouraging Indian banks and Financial Institutions to mainstream industrial energy efficiency in corporate loans
- Creation of a facility to provide energy savings insurance
- Establishment of a 'Clean Energy Financing Facility' to facilitate financing of industrial energy efficiency projects on a pilot basis
- Designation of energy efficiency financing as Priority Sector Lending

Some of these mechanisms could potentially be combined for implementation. For example, creation of state-level clean energy funds could be combined with standard offer programs as mechanisms to fund implementation of energy efficiency obligations, and thereby stimulate industrial energy efficiency investment and project implementation at the state level.

Remaining barriers could potentially be addressed by capacity building for enterprises, financial institutions and governmental bodies around topics such as governmental coordination, lifecycle costs, and energy efficiency skills; assistance to the Bureau of Energy Efficiency with designing, implementing and monitoring Phase 2 of the PAT scheme could be of particular benefit; as well as considering what measures could usefully target micro small and medium sized enterprises (including potentially extending existing schemes). Further detail is provided in Table 7 overleaf.

Table 7: India industrial energy efficiency sector case study

<table>
<tr><th colspan="2">Country: India</th><th>Sector: Industrial energy efficiency</th></tr>
<tr><td colspan="3">General indicators</td></tr>
<tr><td>Credit rating</td><td>BBB- (S&P)</td><td rowspan="4">Country profile summary: India is a lower middle income country, with 1.2 billion people and the world's fourth-largest economy. Economic liberalisation measures, including industrial deregulation, privatisation of state-owned enterprises, and reduced controls on foreign trade and investment, began in the early 1990s and served to accelerate the country's growth, which averaged just under 7% per year from 1997 to 2011. India is now home to globally recognized companies in pharmaceuticals, steel, and information and space technologies.
Over the past four decades, India’s total primary energy demand has grown over four fold; in 2010 it was ranked the third-largest consumer of coal in the world after China and the USA. In 2013, India was the fifth highest electricity producer in the world, of this approximately 70% was produced from fossil fuels.
Industry is the largest GHG emitter in India, accounting for 44% of emissions (including electricity related emissions). The Indian industry energy mix is dominated by coal, oil and electricity (mainly generated from coal). The top two GHG emitting industries are cement and iron & steel. Each accounted for about 30% of the (non-electricity) combustion and process emissions from the Industry sector (Planning Commission Government of India, 2011).
In 2014, Prime Minister Narendra Modi was elected on a manifesto focussed on accelerating economic development. There are currently mixed signals as to whether this development will take a high or low carbon path. The manifesto proposes an ‘all-of-the-above’ energy strategy - maximising the potential of oil, gas, solar, hydro power, ocean, wind, coal and nuclear sources, including a responsible and comprehensive National Energy Policy, a focus on development of energy infrastructure, energy efficiency and conservation, as well as oil, gas, and coal exploration and production.</td></tr>
<tr><td>Competitive index</td><td>4.28 (60/148)</td></tr>
<tr><td>Transparency index</td><td>36 (94/177)</td></tr>
<tr><td>HDI 2013</td><td>0.55 (136/200)</td></tr>
<tr><td colspan="3">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td>Medium</td><td rowspan="2">Summary potential: The industrial sector, which includes manufacturing and mining but not commercial buildings, is the largest GHG emitter in India, accounting for 44% of emissions (including electricity related emissions). The mitigation potential from improved energy efficiency in industrial processes is estimated to be about 125 Mt</td></tr>
<tr><td>Energy management</td><td>Medium</td></tr>
</table>

Waste heat recovery	Medium	CO_2e/year in 2020. Measures include efficiency in paper, steel and cement industries, as well as more energy efficient pumps in various sectors. The majority of industrial energy efficiency measures will pay back over the medium term, however investment is constrained by a number of barriers including local skills and competing demands on companies' limited pool of investment capital. The mitigation potential from alternative production routes, such as blended cement, steel recycling and gas-based direct reduced iron is between 40 and 125 Mt CO_2e/year in 2020. Measures such as blended cement can be achieved at negative cost, whereas the measures related to steel industry have higher costs and fewer co-benefits. There is an additional potential from measures combining alternative processes and energy efficiency of up to 75 Mt CO_2e/year in 2020 (Umweltbundesamt, 2013).
Energy efficiency	High	
Process emissions	Medium	**Summary implementation to date**: The industrial sector has seen greater energy efficiency improvement since the late 1980s than any other sector in India, with most sectors having reduced their energy and emissions intensity. Greater competition has contributed to this trend (following liberalisation, high energy prices and government policies since the introduction of the Energy Conservation Act in 2001). While some modern industrial units display efficiencies paralleling global best available technology (BAT) levels, the average energy usage in industry is not yet as efficient as its counterparts in developed countries and there is considerable variability between facilities. Large peak power and energy deficits mean that there is a high risk of black outs and many industrial plants may run inefficiently on-site diesel-powered generators. India's emissions intensity is set to improve 35% relative to 2005 levels by 2020 if India continues with its business as usual (BAU) trajectory. However, continued strong economic growth, means that even with significant improvement in energy efficiency, GHG emissions from India's industrial sector are expected to increase in future.
Replace outdated equipment	Medium	
New innovative technologies	Medium	
Pledges and policies		
Pledge		
Status	Announcement by the Environmental Minister, submitted under the Copenhagen Accord and acknowledged under the Cancun Agreements	
Date of pledge	04-Dec-09	
Short description	India's is a key player in the international climate change negotiations and central to achieving an ambitious global agreement in 2015. During the Copenhagen negotiations, it proposed the following intensity based pledge. "India will endeavour to reduce the emission intensity of its GDP by 20 to 25% by 2020 in comparison to the 2005 level. The emissions from the agriculture sector will not form part of the assessment of emissions intensity. "This target was submitted to the UNFCCC on 30 January 2010. Data underlying the figures were not provided and while its climate change pledge does not exploit the full technical mitigation potential, it is in line with what most effort sharing approaches suggest	

	(Umweltbundesamt, 2013).	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2	**Summary**: India had earlier provided a National Acton Plan on Climate Change, which provides eight national missions in key areas. It provides several measures but only a few of them are quantified in terms of resulting emission reductions. However, detailed targets on the electricity sector are contained in the 11th 5 year plan. Most measures in the climate plan seem to be rather general, e.g. promoting public transport or a fuel switch in industry. The plan does not provide an overall baseline and mitigation scenario. Several policies and initiatives specifically to accelerate industrial energy efficiency have been introduced: The Energy Conservation Act (2001) requires large energy consumers to adhere to energy consumption norms; the National Electricity Policy (2005) made periodic energy audits compulsory for energy intensive industries; and in 2008 the Government of India released the National Action Plan on Climate Change (NAPCC), which consists of eight national missions, including the National Mission on Enhanced Energy Efficiency (NMEEE). The NMEEE seeks to upscale efforts to create a market for energy efficiency. In 2012, the Government of India introduced its flagship energy policy: the Perform, Achieve and Trade (PAT) scheme. PAT is a compulsory scheme for large, energy intensive industries and is intended to enhance the cost effectiveness of improvements through certification of energy savings that can be traded. There have been some efforts to help MSMEs to obtain finance for adopting energy efficient machinery and equipment. For example, through GIZ's support to the Small Industries Development Bank of India (SIDBI) and Ministry of Micro, Small and Medium Enterprises.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary**: Limited capacities (financial, institutional and technical) in national and local government bodies, industrial companies, energy service providers and banks/financial institutions are constraining greater implementation of industrial energy efficiency. A need for more reliable baseline energy data can hinder energy management at all levels. It also makes implementing and monitoring energy efficiency policies challenging, especially impacting on companies and energy service companies (ESCOs) who wish to develop energy saving performance contracts. A perception by bankers that energy efficiency projects are risky means that good industrial energy efficiency projects that would pay back over time can be challenging to develop. It is possible there is a 'communication gap' between banks (who have limited knowledge and awareness about industrial energy efficiency project characteristics) and industrial energy efficiency project developers (who may be unaware of the requirements of the financial community). The nearly 3 million micro, small and medium enterprises (MSMEs) in India comprise over 80 percent of the total number of industrial enterprises. Challenges can arise around both technological and financial capabilities, impacting on the	

	adoption of BAT and energy efficient technologies (Planning Commission Government of India, 2011).	
Barrier category	**Score**	**Summary**
Institutional / political	3.3	An institutional structure for energy efficiency has been created (e.g. bodies like the Bureau of Energy Efficiency) to help enable energy efficiency in India. Those organisations, as well as local level bodies (such as the state designated agencies), could have more capacity, to support implementation of industrial energy efficiency projects at the scale envisaged under the NMEEE. Improved understanding and communication between project developers and bankers would also support the implementation of industrial energy efficiency projects. To further support the ESCO market, there is also scope of improving the consistency of enforcement of energy saving performance contracts.
Financial/ economic	3.3	Limitations in internal financing as well as access to external finance (due to constraints on balance sheet strength) and other collateral is a key barrier for MSMEs. Availability of internal and external financing is less of an issue for large enterprises. However, even in large enterprises, other more conventional investments are usually seen as a higher priority for a firm's internal funds and borrowing capacity. Industrial energy efficiency projects are in competition with other investments for finance. From a bank's perspective, typical industrial energy efficiency projects are small to medium scale and have relatively high project development and transaction costs, making them less attractive. In addition, banks may have difficulties in evaluating financial returns from industrial energy efficiency projects; industrial energy efficiency financing has not been mainstreamed in India.
Technical	3.0	Lack of reliable baseline data presents challenges for energy management at all levels. It makes implementing and monitoring energy efficiency policies more difficult and can seriously hinder the ability of companies and ESCOs to develop energy saving performance contracts.
Informational/ capacities	2.8	There is scope to improve the capacities of project hosts, energy service providers and banks, to further enable industrial energy efficiency projects at all project lifecycle stages. Priority topics for capacity building could include awareness of industrial energy efficiency options (particularly in MSMEs) and accounting for lifecycle costs.
Social, cultural and behavioural	3.0	Encouraging industrial enterprises to conduct energy audits and develop and implement energy management systems is important to attract industrial energy efficiency investments. However, industrial management may not always trust the recommendations of energy audits. In addition, a culture of 'Jugaad innovation' (finding a work around to keep old technology running) can be prevalent in MSMEs. This prolongs the working life of outdated equipment, inhibiting the introduction of newer, more efficient technology.

Matching financing requirements and barriers with instruments	
Financing needs	**Summary**: The Asian Development Bank has estimated that, for India to meet its pledge to reduce the emissions intensity of GDP by 20 to 25% from the 2005 level by 2020, a total investment of US$68 billion, or roughly US$4.5 billion per year will be required (ADB 2013). This estimate includes all sectors of the economy, not just industry. Total funding for energy efficiency (including climate finance and other sources) in India was approximately US$9.5 billion in 2011, of which US$200 million came from multilateral development banks (IEA 2012). Of the US$775 million approved under Phase 1 of India's Clean Technology Fund investment plan, US$125 million was for energy efficiency.
Financial instruments	
Equity based instruments	The private equity market for energy efficiency is at an early stage in India since most private equity funding is presently focused on renewable energy. Equity funds are generally provided by venture capital or private equity funds to finance development and/or deployment of new industrial energy efficiency technologies. There are some limited examples of equity funds established by the public sector for financing ESCO projects, or investments in ESCOs. Public equity funds are designed to partner with private sector venture funds to leverage their expertise and resources.
Loans	Several debt-based financing mechanisms have been implemented in India. These mechanisms are either backed by bilateral and multilateral donor financing, commercial bank lending, or government support. However, access to finance remains a key barrier for industrial energy efficiency, especially for MSMEs, which account for a significant proportion of India's industrial sector. Achieving India's full potential will require a significant scaling up of energy efficiency financing. The relatively small size and high transaction costs typical of industrial energy efficiency projects make them unattractive to commercial banks. Innovative ways of financing of small projects, such as through state level clean energy funds, could be considered; or to standardise and aggregate projects to make them more attractive to investors.
Risk management instruments	India has implemented a Partial Risk Guarantee Fund, which aims to address barriers related to limited commercial industrial energy efficiency financing and lack of collateral or guarantees to eliminate repayment risk and a Partial Risk Sharing Facility for Energy Efficiency which will provide commercial banks with partial coverage of their risk exposure, thereby helping investors to take on loans at a lower cost. In addition, the Credit Guarantee Scheme is intended to encourage banks to gradually move away from a completely risk-averse stance towards small industrial instillations. However, industrial energy efficiency investments, particularly with Micro, Small and Medium Enterprises (MSMEs) are still regarded as risky. There is scope to introduce further measures such as an Energy Savings Insurance (ESI) facility that would essentially "guarantee" the technical performance of industrial energy efficiency technologies, backing up the ESCO's performance guarantee and providing risk protection to the bank issuing the loan repayment, thereby enhancing the ability of ESCOs to obtain bank financing.
Policy incentives	Phase 1 of the PAT scheme is experiencing challenges due to issues with reliable baseline data and there is scope to improve the scheme for Phase 2. In addition, there may be benefit in developing policies to target industrial energy efficiency in micro, small and medium enterprises.
Non-finance interventions	Industrial energy efficiency could be further enhanced with capacity building targeting governmental coordination and energy efficiency skills and knowledge within operators, financial institutions and government bodies.

Summary: Several types of financial instruments for addressing barriers for industrial energy efficiency financing in India have recently been introduced, with additional instruments in the design phase. Existing instruments include: loans, including concessional loans backed by donor and multilateral agencies and commercial loans; grants and subsidies set up by central and local government agencies, Government-supported industrial energy efficiency funds; and schemes such as the Perform, Achieve and Trade (PAT) Scheme, and the Partial Risk Guarantee Fund for Energy Efficiency.

Achieving India's full potential from industrial energy efficiency will require a significant scaling up of energy efficiency financing – both of existing mechanisms but also new, innovative mechanisms. These could for example include

- The establishment of state-level clean energy funds using the public benefit charge concept
- Regulatory schemes to acquire industrial energy efficiency resources using a Standard Offer Program (similar to the Feed-in-Tariff for renewable energy resources)
- Promoting utility financing of industrial energy efficiency projects by establishing energy efficiency obligations
- Encouraging Indian banks and Financial Institutions to mainstream industrial energy efficiency in corporate loans
- Creation of a facility to provide energy savings insurance
- Establishment of a 'Clean Energy Financing Facility' to facilitate financing of industrial energy efficiency projects on a pilot basis
- Designation of energy efficiency financing as Priority Sector Lending.

Some of these mechanisms could potentially be combined for implementation. For example, creation of state-level clean energy funds could be combined with standard offer programs as mechanisms to fund implementation of energy efficiency obligations, and thereby stimulate industrial energy efficiency investment and project implementation at the state level. Remaining barriers could potentially be addressed by capacity building for enterprises, financial institutions and governmental bodies around topics such as governmental coordination, lifecycle costs, and energy efficiency skills; assistance to the Bureau of Energy Efficiency with designing, implementing and monitoring Phase 2 of the PAT scheme could be of particular benefit; as well as considering what measures could usefully target micro small and medium sized enterprises (including potentially extending existing schemes).

2.2.2 Vietnam

Industrial energy efficiency Vietnam has a significant mitigation potential available for exploitation. Increased technical awareness and willingness among industry project developers and local banks to develop and support industrial energy efficiency projects could help stimulate mitigation uptake. Sustained capacity-building efforts would also be required for this to take effect. Additional financial incentives within the policy and regulatory framework could include tax incentives or subsidies, with policy options including equipment standards and industry targets.

The financial robustness of industrial energy efficiency in Vietnam could be progressively demonstrated via pilot projects coupled with bringing appropriate technologies and making loans (at reduced rate conditions) more accessible to local project developers. Finally, enhanced development of expert intermediaries (e.g. energy service companies - ESCOs) and consultants could improve significantly the wider use of industrial energy efficiency and will signal more maturity in the market. Further detail is provided in Table 8 below.

Table 8: Vietnam industrial energy efficiency sector case study

<table>
<tr><th colspan="3">Country: Vietnam</th><th>Sector: Industrial energy efficiency</th></tr>
<tr><td colspan="4">General indicators</td></tr>
<tr><td>Credit rating</td><td colspan="2">BB (S&P)</td><td rowspan="4">Country profile summary: Vietnam is a lower-middle income country having continuously maintained economic growth over the last 20-25 years, with a significant reduction in poverty levels. Economic growth patterns have relied heavily on natural resource extraction with outdated technology and as a consequence environmental pollution problems. In particular, rapid urbanisation (e.g. Ho Chi Minh City and Hanoi) coupled with strong population growth has exerted pressure on urban transport systems. Vietnam is a member of Association of South-East Asian Nations (ASEAN). Its main greenhouse gas (GHG) emission sources are agriculture, energy, transport and other land use.</td></tr>
<tr><td>Competitiveness index</td><td></td><td>4.18 (70/152)</td></tr>
<tr><td>Transparency index</td><td></td><td>31 (116/177)</td></tr>
<tr><td>HDI 2013</td><td></td><td>0.617 (127/200)</td></tr>
<tr><td colspan="4">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td colspan="2">High</td><td rowspan="4">Summary potential: It is estimated that the power utility, Electricity of Vietnam (EVN, Vietnam's sole state-governed power supplier), will face a threefold increase in demand over the next 10 years, from 26.600 GWh in 2005 to over 70.400 GWh by 2015, with annual demand growth of 10-13%. The share of GHG emissions from the industrial sector contributes over 40% to Vietnam’s total emissions. 85% of industry GHG emissions are from process emissions (i.e. non-energy related), especially from the cement, steel, chemicals and paper & pulp sectors. Overall, the mitigation potential in the industrial sector is high, with the greatest mitigation potential coming from improved energy management, energy efficiency and the replacement of outdated equipment. In particular there could be more knowledge amongst government industrial enterprises and commercial banks (improvement could be achieved via capacity building). Moreover, further expanding the energy service company (ESCO) market to new industries and increasing their capacity to provide finance could encourage the further adoption of energy efficiency improvements.</td></tr>
<tr><td>Energy management</td><td colspan="2">High</td></tr>
<tr><td>Waste heat recovery</td><td colspan="2">Medium</td></tr>
<tr><td>Energy efficiency</td><td colspan="2">High</td></tr>
<tr><td>Process emissions</td><td colspan="2">Medium</td><td rowspan="3">Summary implementation to date: Only a minor portion of the large mitigation potential for energy efficiency improvements in Vietnam's industrial sector has been realised so far. There could be more coordination and expertise within the public and private sectors (at industrial enterprise level), as well as increased law enforcement. In April 2006 the Prime Minister approved the National Energy Efficiency Program (VNEEP) for the period of 2006-2010. In this program, industrial energy efficiency is identified as one of the priority measures to be pursued in connection with energy conservation efforts. So far, main efforts have been put in capacity building for energy management and developing projects/programmes for energy efficiency improvements (co-financed by international donors) to set-up an infrastructure towards monitoring and evaluation of energy performance of the heavy GHG-intensive industries.</td></tr>
<tr><td>Replace outdated equipment</td><td colspan="2">Medium</td></tr>
<tr><td>New innovative technologies</td><td colspan="2">Medium</td></tr>
<tr><td colspan="4">Pledges and policies</td></tr>
</table>

Pledge		
Status	No pledge	
Date of pledge	-	
Short description	-	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2	**Summary**: Vietnam has developed a number of action plans and strategies, with some policies targeting industrial energy efficiency also having been implemented. Administrative procedures could be faster, and communication between Government departments as well as knowledge on industrial energy efficiency improvements could be enhanced and improved, resulting in a stronger uptake of policy implementation and law enforcement. The National Strategic Program on Energy Savings and Effective Use (VNEEP), developed by the Ministry of Industry and Trade in coordination with international donors, is Vietnam's main instrument to deploy industrial energy efficiency improvements as part of the National Target Programme on Energy Efficiency (NTP-EE). The strategy could be improved by including specific (sector) targets for industrial energy efficiency. In addition, while the National Strategy on Climate Change, Law on Energy Efficiency and Conservation, and Green Growth Strategies anticipate improvements in overall energy management in key industrial sectors, they do not seem to propose further policies to support these improvements. Overall, improving law enforcement would significantly benefit the uptake of energy efficiency improvements in Vietnam. State-owned enterprises (SOEs) could use more incentives to start working in a more innovative and dynamic environment. Providing further incentives to SOEs could support the challenge that the Ministry of Industry and Trade (MOIT) has to successfully track the implementation of the VNEEP and the overall industrial energy efficiency agenda in Vietnam.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	There are multiple barriers for industrial energy efficiency in Vietnam. Initial energy efficiency regulations are in place, however, they could be improved to target specific sectors or industries, such as pulp and paper, chemical, or energy. Furthermore, the enforcement of targets and regulation currently in place could be improved. Financial aspects mostly relate to loans originated from international banks (and donors) and distributed by local banks. However, an increase in awareness and understanding of industrial energy efficiency projects may prevent finances from being rendered ineffective. Also ESCOs in place could be a range of sizes and increased expertise to enhance their efficiency. Another significant barrier is related to information and technical capacity knowledge it could be useful to have an increased understanding, as well as availability of (improved) energy efficiency technologies. From a corporate perspective, various players, project developers and banks focus on business growth rather than energy savings.	

Barrier category	Score	Summary
Institutional/ political	3.3	Current energy efficiency laws and regulations (in place since 2006 and strengthened in 2011) could be more effective if they included specific requirements for individual industry sectors and at sub-national level; monitoring and evaluation of the legislation has not been undertaken to assess effectiveness for the time-being, allowing for laws and regulations to be enforced more stringently. Additional capacity-building efforts may improve the expertise and resources of the Government. Incentives for industrial energy efficiency could be better provided.
Financial/ economic	3.5	Loans for industrial energy efficiency projects may originate from international donors and could be distributed down to companies via local banks. Local banks could improve their understanding and familiarity within the sector and energy efficiency concepts, which would allow them to offer attractive loan products for energy efficiency. Issues of non-performing loans (based on previous other sector experiences) reduce the confidence that the Government has in local banks to lend to local companies, and therefore in some cases the Government has slowed down the provision of such loans. Local ESCOs currently do not have the size, expertise or financial capabilities to fully play their role as market facilitator.
Technical	2.5	Access to industrial energy efficiency technologies and an understanding of what may be the best energy efficiency technology for a particular situation is challenging for local industrial companies. The availability of energy efficiency technologies is often limited within the local market, and may need to be sourced from outside Vietnam, which adds further complexity to project implementation for local companies. There could be more technologies available in the country for specific sectors such as the chemical industry.
Informational / capacities	2.7	Management of national industrial energy efficiency data, including monitoring & evaluation, could be improved. This may include the initiation of a National Energy Database to centralise all energy statistics and data. Despite capacity building contributions from international donors, further improvements could be made at Government, company and local bank levels to increase familiarity and awareness with industrial energy efficiency projects, in particular their implications post-implementation.
Social, cultural and behavioural	3.0	Local industrial companies in Vietnam are strongly focussed on financial growth and increasing production volumes, there is often reluctance to implement energy efficiency initiatives due to a perception that this will result in lower production levels and significant investment costs. Energy savings are not valued by industry due to the long payback periods and high upfront investment costs. Access to information on energy efficiency, as well as to successful pilot projects could be increased for accelerating energy efficiency uptake.

Matching financing requirements and barriers with instruments	
Financing needs	**Summary:** Finance from international donors such as the World Bank's International Finance Corporation provides necessary capital at reduced rate to lend to industrial companies for the implementation of industrial energy efficient projects. However, additional finances could be devoted to influence the mentality within companies (SOEs and private companies) to consider energy efficiency as an alternative way to make profit and to grant finance pilot projects within selected industries. Further finances may also be needed to provide capacity building local banks and government official and to improve the access to energy efficiency technologies.
Financial instruments	
Equity based instruments	A few equity instruments are currently available for industrial energy efficiency in Vietnam. In particular, ESCO initiatives and intermediaries could be useful when supported by international donors. Existing ESCOs are generally too small and could benefit from further technical expertise on industrial energy efficiency and capacity-building. Further development is required for ESCO offerings to be made available to industry. Joint Ventures, with large international ESCOs such as Schneider have been favoured. In addition, exchanges with 'best practice' ESCOs from China could create some good knowledge transfer. International donors could support more of these types of joint ventures and transactions.
Loans	Loans are an essential component of financing industrial energy efficiency, due to the heavy upfront investment required with only a medium-term return period. Loans are currently being offered by local retail banks (with capital originating from low-cost loans provided by multinational or bilateral donors), who have the necessary network to reach local companies. In addition, training and capacity building with local banks is currently being provided by the World Bank's International Finance Corporation to support them in creating and delivering appropriate loan products to the local market. However, more could be done to further enhance local banks' familiarity with an understanding of international energy efficiency projects in order to increase the volume of energy efficiency loans delivered to industry.
Risk management instruments	Guarantees, provided by government or international donors, will increase the financial attractiveness of energy efficiency projects and hence incentivise industrial companies to implement energy efficiency projects. Also, risk management instruments in an industrial energy efficiency context may be beneficial to project developers as it would entail a better decision process for industrial energy efficiency technologies to mitigate such risks. Capacity building on such guarantees and risk management instruments could also benefit government officials to improve appropriate long-term planning in their industrial energy efficiency improvement actions.
Policy incentives	Although laws and regulations have been developed, enforcement and compliance could be stronger. Options could include clear policy disincentives to penalise companies who do not comply with regulations and (financial) incentives to companies who venture into industrial energy efficiency projects. These (financial) incentives could continue to be financed by the Government and international donors.

Non-finance interventions	Capacity building directed towards industry and focussed on how industrial energy efficiency can help to grow and expand their businesses needs to be continued (at present, this is largely delivered by international donors). In addition, providing project developers with information regarding available industrial energy efficiency technologies will be beneficial to adequately address the industrial energy efficiency opportunity. In order to increase the number of suppliers of such technologies (now mostly international consultants) a capacity building programme would be needed. Also, industrial energy efficiency could benefit from being coupled with initiatives in the wider energy efficiency domain (building/housing, public lighting, etc.) to create a general awareness and synergies, and momentum of the values of saving and conserving energy.
Summary: Industrial energy efficiency Vietnam has a significant mitigation potential available for exploitation. Increased technical awareness and willingness among industry project developers and local banks to develop and support industrial energy efficiency projects could help stimulate mitigation uptake. Sustained capacity-building efforts would also be required for this to take effect. Additional financial incentives within the policy and regulatory framework could include tax incentives or subsidies, with policy options including equipment standards and industry targets. The financial robustness of industrial energy efficiency in Vietnam could be progressively demonstrated via pilot projects coupled with bringing appropriate technologies and making loans (at reduced rate conditions) more accessible to local project developers. Finally, enhanced development of expert intermediaries (e.g. energy service companies, ESCOs) and consultants could improve significantly the wider use of industrial energy efficiency and will signal more maturity in the market.	

2.2.3 South Africa

The primary financial instruments used to fund industrial energy efficiency in South Africa to date have been concessional loans and grants. Some medium-sized energy efficiency projects can have challenges in attracting finance because they fall into a 'funding gap' between the type of project considered by development agencies and those that are attractive to commercial banks - hence development agencies could consider especially supporting medium sized projects from corporates. Alternatively, mechanisms that group a number of medium-sized projects together to make them more attractive to commercial banks could be considered.

The uptake of available concessional loan funds by the private sector could be increased by reducing the costs associated with the monitoring, evaluation and reporting required by international donors (e.g. through standardisation of such requirements between different international lenders). Even where concessional loans are available, companies may be unwilling to take them on because a loan can weaken a company's balance sheet. Developing innovative financial instruments, including strengthening of the ESCO model, could see companies increasingly move towards investing in energy efficiency.

Capacity building and technical support to industrial operators, financial institutions and government body could help build their skills and capacity and increase coordination and communication between these parties. For example, this could include support to industrial operators with energy management and developing robust investment business cases; support to banks and financial institutions with evaluating industrial energy efficiency projects more effectively; and support to government bodies in implementing and enforcing regulations. There is a good network of national programmes in South Africa such as the National Business Initiative (NBI), the National Cleaner Production Centre (NCPC) and the South African National Energy Development Institute (SANEDI) which are well placed to help deliver capacity building interventions.

Lastly, further mitigation gains could be found from enhancing policy coordination between government departments (e.g. Department of Environmental Affairs (DEA), and the Department of Energy (DoE)), and strengthening the capacity of local administrations tasked with implementation of national policies. The introduction of the National Energy Efficiency Action Plan (NEEAP) for the post 2015 period presents an opportunity address some of the barriers identified in this case study including a potentially stronger set of compulsory measures in order to realise the high mitigation potential associated with industrial energy efficiency in South Africa. Further detail is provided in Table 9.

Table 9: South Africa industrial energy efficiency sector case study

<table>
<tr><th colspan="2">Country: South Africa</th><th>Sector: Industrial energy efficiency</th></tr>
<tr><td colspan="3">General indicators</td></tr>
<tr><td>Credit rating</td><td>BBB- (S&P)</td><td rowspan="4">Country profile summary: South Africa has a relatively strong recent economic record and reasonably active in international finance markets, and space for further economic transformation. A range of enduring legacy issues from the apartheid system presents challenges for economic efficiency and job creation. South Africa is the largest greenhouse gas (GHG) emitter in Africa and ranks 11th globally. Per capita, South Africans emit 10 tonnes of CO_2/year, placing them eighth highest in the world. South Africa has committed to a peak-plateau-decline GHG trajectory, with emissions starting to fall in absolute terms from 2035. South Africa is likely to be hit hard by climate change. Much of it is arid or semi-arid and the whole country is subject to droughts and floods. Even small variations in rainfall or temperatures would exacerbate this already stressed environment.</td></tr>
<tr><td>Competitive index</td><td>4.4 / 7</td></tr>
<tr><td>Transparency index</td><td>42/100</td></tr>
<tr><td>HDI 2013</td><td>0.63</td></tr>
<tr><td colspan="3">National mitigation potential and implementation to date</td></tr>
<tr><td>Overall score</td><td>Low to medium</td><td rowspan="4">Summary potential: South Africa's approach to climate change (both mitigation and adaptation) is set out in the National Climate Change Response White Paper, published in October 2011. This commits the South African government to develop carbon budgets and mitigation plans for significant emitting sectors and/or sub-sectors. The industrial sector, which includes manufacturing and mining but not commercial buildings, accounted for 38% of South Africa's total energy consumption in 2009. The National Climate Change Response White Paper indicates that in the medium term there is significant mitigation potential in upscaling industrial energy efficiency. Various publications have reported that industrial energy efficiency measures typically pay back over the medium term, however investment is constrained by a number of barriers including local skills and competing demands on companies' limited pool of internal investment capital.
Analysis of South Africa's emission reduction targets (Winkler 2010) estimate that the overall mitigation potential from industrial energy efficiency in 2020 will be 61 Mt CO2e (8% below business as usual (BAU)) and, in 2025, will be 83 Mt CO2e (9.2% below BAU). Estimates vary, but most sources indicate that the largest mitigation potential relates to improved energy efficiency in boilers & steam systems and electrical motor systems & drives. These technologies are applicable to most industry sectors. Other measures with high mitigation potential relate to innovative technologies such as on-site clean power</td></tr>
<tr><td>Energy management</td><td>Medium</td></tr>
<tr><td>Waste heat recovery</td><td>Low</td></tr>
<tr><td>Energy efficiency</td><td>High</td></tr>
</table>

		generation, and sector-specific measures like greater use of secondary production in the iron & steel sector. Improved energy management is the enabling force required to drive the implementation of mitigation measures in the industrial sector.
Process emissions	Medium	**Summary implementation to date**: Following the introduction of the National Energy Efficiency Strategy in 2005, uptake of energy efficiency in industry was initially rather slow. However, since an energy crisis in 2008, when generation capacity could not meet demand, the government has allowed electricity prices to increase. This has significantly raised energy awareness and led to acceleration in the implementation of energy management and energy efficiency measures in the past five years. The available literature indicates that there has been some progress in recent years with implementation of industrial energy efficiency (REEGLE Country Profile). However, reliable, publicly available data is limited, partly due to the lack of an enforced, mandatory monitoring and reporting framework. In 2012, the South African Government introduced the Regulations on the Mandatory Provision of Energy Data. However, this is not yet effectively enforced. Currently, a National Energy Efficiency Action Plan is being developed, which will set sectoral energy efficiency improvement targets for the post-2015 period. It remains to be seen whether it will include a stronger set of compulsory measures in order to realise the high potential for reducing emissions through energy efficiency measures. In 2011, South Africa adopted SANS/ISO 50001 as the national standard energy management system and the first lead auditors graduated in September 2013. Uptake could be greater as companies have yet to achieve the standard.
Replace outdated equipment	Medium	
New innovative technologies	High	
Pledges and policies		
Pledge		
Status	Announcement of the President submitted under the Copenhagen Accord and acknowledged under the Cancun Agreements.	
Date of pledge	06-Dec-09	
Short description	South Africa has pledged to undertake mitigation actions which will result in a deviation below the current emissions baseline of around 34% by 2020 and by around 42% by 2025. The target was proposed during the Copenhagen negotiations and submitted to the Copenhagen Accord on 29 January 2010. This level of effort enables South Africa's emissions to peak between 2020 and 2025, then plateau for approximately a decade and decline in absolute terms thereafter.	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2	**Summary**: In 2011, the South African Government published the National Climate Change Response White Paper, which set out eight Near-term Priority Flagship Programmes, including Energy Efficiency and Energy Demand Management. A range of programmes and incentive schemes have subsequently been put in place to boost industrial energy efficiency, including a national standard for energy management, tax breaks for energy efficiency, and grants for capital investment in equipment upgrading through the Manufacturing Competitiveness Enhancement Programme. In addition, a number

		of national programmes have been established to raise awareness and build capacity. However, the majority of policy interventions to encourage industrial energy efficiency to date have been both voluntary and introduced relatively recently, and hence their effectiveness is not yet clear. There has been a recognition of the need for greater emphasis on introducing an enforced, mandatory monitoring and reporting framework to quantify progress and this is being addressed through a GIZ-funded project for the DEA to design a draft climate change response monitoring and evaluation system. The DEA is now seeking to implement the system following approval by Cabinet. In 2014 a number of the schemes under Eskom's[7] long running demand side management programme have been put on hold due to financial constraints. The introduction of a carbon tax, originally planned for 2015, has been postponed until 2016 with a proposed phased introduction that means real savings that can be accounted to the tax may not be realised until 2020. The National Energy Efficiency Strategy is currently being revised and will be replaced by a National Energy Efficiency Action Plan (NEEAP) for the post 2015 period. It remains to be seen whether the NEEAP will include a stronger set of compulsory measures, including a carbon tax. .
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary**: The key barriers to further improvements in industrial energy efficiency in South Africa were observed to relate to enhancing capacity and skills at a local level (to identify and implement energy efficiency measures). Greater emphasis could be placed on the importance of energy management as part of normal business practice. The largely voluntary nature of energy efficiency policies does not provide an imperative as strong as mandatory policies. Many energy efficiency measures will pay back over the medium term, but energy efficiency projects have to compete on an equal footing with other demands on companies' internal resources - noting that some competing demands may have shorter payback periods. Sources of external funding for energy efficiency are available, but enterprises may require additional time, resources and knowledge in order to make successful applications.	
Barrier category:	**Score**	**Summary**
Institutional/ political	3.0	Mandatory measures may have a greater impact than existing voluntary measures. The translation of high level political targets to local administration, as well as the coordination of action between strategies, policies and departments, and coordination between commercial banks and development finance institutions, could be greater
Financial/ economic	2.7	Sharp electricity price rises over the past five years have made electricity efficiency measures more attractive. Access to capital for medium sized energy efficiency projects at attractive rates could be improved as many companies are unwilling to take on debt finance, even at concessional rates. Some evidence indicates that the costs associated with monitoring, evaluation and reporting requirements tied to concessional loans is preventing greater uptake by South African commercial banks.

[7] Eskom is a South African electricity public utility

Technical	3.5	Electricity grid capacity at a local level could be greater and may restrict the expansion of industrial facilities that would be accompanied by equipment and efficiency upgrades. Uncertainty associated with new technology, particularly where there is a lack of service infrastructure for implementation, logistics and maintenance of the technology e.g. where equipment suppliers are based overseas and only represented by local sales agents in South Africa.
Informational/ capacities	3.0	Increased industrial energy efficiency skills/trained personnel, particularly at a local level could reduce informational and capacity barriers, addressing all stages of an energy efficient project lifecycle - from opportunity identification and business case development, to applying for funding, and maintaining the new technology once implemented.
Social, cultural and behavioural	3.0	There can be a perception within some enterprises that energy efficiency will disrupt production; hence the need for energy management skills as part of normal business practice may not be universally accepted at all facilities.
Matching financing requirements and barriers with instruments		
Financing needs	**Summary**: While information on the climate finance needs for South Africa to achieve its industrial energy efficiency mitigation potential is limited, some data is available regarding existing financing for energy efficiency overall, and industrial energy efficiency in particular. Total funding for energy efficiency (including international climate finance and other sources) in the South Africa was approximately US$ 570 million in 2011 (IEA 2012). Of the US$500 million approved under South Africa's Clean Technology Fund investment plan, the majority was for renewable energy. Only US$15 million was specifically targeted at industrial energy efficiency. 2% of donor funding in 2009 in the area of climate change was targeted exclusively towards energy efficiency (however 51% of projects focussed both on energy efficiency and renewable energy). One project directly focused on industrial energy efficiency – meaning that much low-hanging fruit exists in this sector in South Africa.	
Financial instruments:		
Equity based instruments	Equity based instruments are mainly focussed on either large infrastructure projects, or young companies involved in early stage technology development. Much of South Africa's industrial energy efficiency potential could be achieved through medium-sized private sector projects deploying existing technologies. However, such projects are less suited to equity investment.	
Loans	Concessional loans can be one of the most important instruments for financing industrial energy efficiency. However, many medium sized energy efficiency projects can struggle to attract finance because they fall into a 'funding gap' between the type of project considered by development agencies and those that are attractive to commercial banks. Even where concessional loans are available, some companies are unwilling to take them on because a loan weakens a company's balance sheet. During the stakeholder interviews, it was identified that the costs to the banks associated with monitoring, evaluation and reporting requirements tied to concessional loan funds provided by international donors are preventing greater uptake by South African commercial banks.	
Risk management instruments	Promoting the development of risk management instruments (such as risk guarantees, technical performance guarantees and energy savings insurance) could encourage and support private sector investment in low carbon technologies, unlocking significant mitigation potential.	

Policy incentives	A range of programmes and incentives have been introduced, including tax breaks for investment in energy efficiency linked to a new national standard for measurement and verification of energy savings. However, many of these policies are yet to bed in.
Non-finance interventions	Capacity building and technical support to industrial operators, financial institutions and government body could build their skills and capacity and increase coordination and communication between these parties. For example, this could include support to industrial operators with energy management and developing robust investment business cases; support to banks and financial institutions with evaluating industrial energy efficiency projects more effectively; and support to government bodies in implementing and enforcing regulations. There is a good network of national programmes in South Africa such as the National Business Initiative (NBI), the National Cleaner Production Centre (NCPC) and the South African National Energy Development Institute (SANEDI) which are well placed to help deliver capacity building interventions.
Other financial instruments	Innovative financial instruments could have an important role to play in engaging the private sector - such as mechanisms to aggregate a number of medium sized projects together to make them more attractive to commercial banks, or ways to allow companies to move investment in energy efficiency off their balance sheets, or strengthening the ESCO model in South Africa.

Summary: The primary financial instruments used to fund industrial energy efficiency in South Africa to date have been concessional loans and grants. Some medium-sized energy efficiency projects can have challenges in attracting finance because they fall into a 'funding gap' between the type of project considered by development agencies and those that are attractive to commercial banks. Hence, development agencies could consider supporting medium-sized projects from corporates. Alternatively, mechanisms that group a number of medium-sized projects together to make them more attractive to commercial banks could be considered. The uptake of available concessional loan funds by the private sector could be increased by reducing the costs associated with the monitoring, evaluation and reporting required by international donors (e.g. through standardisation of such requirements between different international lenders). Even where concessional loans are available, companies may be unwilling to take them on because a loan can weaken a company's balance sheet. Developing innovative financial instruments, including strengthening of the ESCO model, could see companies increasingly move towards investing in energy efficiency. Capacity building and technical support to industrial operators, financial institutions and government body could build their skills and capacity and increase coordination and communication between these parties. For example, this could include support to industrial operators with energy management and developing robust investment business cases; support to banks and financial institutions with evaluating industrial energy efficiency projects more effectively; and support to government bodies in implementing and enforcing regulations. There is a good network of national programmes in South Africa such as the National Business Initiative (NBI), the National Cleaner Production Centre (NCPC) and the South African National Energy Development Institute (SANEDI) which are well placed to help deliver capacity building interventions. Lastly, further mitigation gains could be found from enhancing policy coordination between government departments (e.g. Department of Environmental Affairs (DEA), and the Department of Energy (DoE)), and strengthening the capacity of local administrations tasked with implementation of national policies. The introduction of the National Energy Efficiency Action Plan (NEEAP) for the post 2015 period presents an opportunity to address some of the barriers identified in this case study including the potentially stronger set of compulsory measures in order to realise the high mitigation potential associated with industrial energy efficiency in South Africa.

2.2.4 Chile

A number of financial instruments targeting industrial energy efficiency in Chile have been recently introduced, with additional instruments currently in the design phase. Existing instruments to address barriers to industrial energy efficiency financing include:

- Subsidies by Chilean Energy Efficiency Agency (extension of the scheme to be considered), debt instruments by multilateral development banks such as the World Bank's International Finance Corporation
- Bilateral and unilateral development finance institutions (i.e. KfW and Chilean Development agency)
- Equity funding opportunities through regional funds like EELAF II (Emerging Energy Latin America Fund II).

To harness additional mitigation potential, Chile could consider:

- Expanding existing programmes and schemes (in scope and/or scale) to capture additional industrial energy efficiency measures and activities such as grant programmes promoting energy efficiency in a very specific area (e.g. fruit growers), RESSEE (Renewable Energy Self-Supply and Energy Efficiency Program) which provides another existing platform to add energy efficiency support and promotion programs, or expanding debt instruments through a national clean energy facility.
- Similarly, existing standards and labels could also potentially be expanded from the specific sectors currently covered, to potentially include energy efficient measures.
- Investigating, properly designing and implementing additional policy incentives could provide further support such as the staggered introduction of the upcoming carbon tax and sectoral crediting trading, further tax incentives and an Energy Efficiency Services Fund.
- A comprehensive financing strategy for energy efficiency could include supporting market aggregation and the establishment of a mechanism(s) providing risk capital (i.e. investment that may be lost in part or completely) for further market development. Further detail is provided in Table 10 below.

Table 10: Chile industrial energy efficiency sector case study

Country: Chile		**Sector: Industrial energy efficiency**
General indicators		
Credit rating	AA - (S&P)	**Country profile summary:** Chile has been an OECD country since 2010, with strong ongoing economic growth. Chile is considered an emerging economy, rich in natural resources and a minor producer of fossil fuels. The use of renewable energy sources is high, yet primarily relying on hydropower. Energy needs are met to a significant degree by imported fossil fuels. Chile's sound, market-oriented policies have created significant opportunities for foreign investors to participate in the country's steady economic growth.
Competitiveness index	4.61 (34/148)	
Transparency index	71 (22/177)	
HDI 2013	0.82 (40/208)	

National mitigation potential and implementation to date		
Overall score	High	**Summary potential**: In Chile energy consumption in industries contributes 23% of the total national GHG emissions. An additional 8% of the country emissions come from industrial processes including metal production and mineral processes. The mining and industry sectors provide the highest greenhouse gas emission (GHG) reduction potential (half of the overall national potential), followed by transport, which is in line with the energy consumption at the national level. The industrial energy efficiency potential is linked to energy efficiency improvements in the following sub-sectors: paper, iron & steel, petrochemical, cement, copper & sugar industries; particularly with respect to the replacement of motors, use of electric devices, heat recovery and recycling. However, this is only estimated since potential data is available per sector but not per technology/mitigation category.
Energy management	Low	
Waste heat recovery	High	
Energy efficiency	High	
Process emissions	High	**Summary implementation to date**: There is almost an even split between the use of biomass-based energy, electricity and oil in industry. There is very limited use of gas and other energy sources. The government has implemented a number of emission limits but the focus is on non-GHGs. There is also a tax reform project, which considers the inclusion of a CO_2 tax, though only for selected sources, including some in the industry sector.
Replace outdated equipment	High	
New innovative technologies	Low	
Pledges and policies		
Pledge		
Status	20% below Business as Usual (BAU) by 2020 through nationally appropriate mitigation actions (NAMAs).	
Date of pledge	23-Aug-10	
Short description	Chile proposes to undertake NAMAs to reach 20% below BAU in 2020 (as projected from 2007 base levels). To accomplish this, Chile may require a relevant level of international support. Climate Action Tracker estimates the absolute level of the pledge is equivalent to emission levels of 115 Mt CO_2e in 2020.	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	2.0	**Summary**: Currently, implemented policies are a first step towards significantly reducing emissions. However, these policies could be scaled up substantially to lead to mitigation at scale. Chile has implemented general policies, action plans and strategies. However, they do not seem to be evaluated yet. The main documents include the National Energy Strategy 2012-2030, the National Climate Change Action Plan 2008-2012, and the Energy Efficiency Action Plan 2020. These are all nation-wide umbrella strategy documents. The Energy Efficiency Action Plan includes substantial policy implementation for the

		industry sector. In addition, voluntary Clean Production Agreements, which strengthen energy efficiency, have been agreed between Government and industry. Implemented policies are a first step towards a significant reduction of emissions. To be aligned with Chile's mitigation ambitions and commitments, plans to meet increasing energy demand with additional coal fired power plants, drawing from national resources instead of relying on imports, less carbon intensive natural gas or renewable sources may need to be reviewed. Activities in the energy sector could provide solutions leading to a long-term transformation of the sector.
Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary:** Improving the regulatory framework for developing industrial energy efficiency projects could address the main barriers for industrial energy efficiency. Behavioural and cultural barriers are also relevant as there seems to be reluctance towards the adoption of new and emerging technologies and companies do not prioritise energy efficiency.	
Barrier category	**Score**	**Summary**
Institutional/ political	4.0	Energy efficiency remains voluntary. Additional financial incentives directed towards industrial companies for energy efficiency improvements could be beneficial.
Financial/ economic	2.0	Financial and economic barriers were relevant a few years ago. However, there are now several instruments addressing these such as a guarantee fund, grants and co-financing lines. Remaining barriers include limited budget within companies for energy efficiency, difficult access to financial instruments due to behavioural issues, and a focus on investment costs instead of life cycle costs, which hinders investments in energy efficiency measures.
Technical	2.5	The main technical barriers include the perception that implementing industrial energy efficiency measures will result in potential interruptions in production (linked to behavioural barriers), there is insufficient infrastructure and technical support for new technologies (such as co-generation), and that there is currently a rather small-scaled market that provides comprehensive solutions in energy efficiency (both on the technical level and financial models) to comply with industry's requirements.
Informational / capacities	1.9	While all companies in the Chilean energy-intensive industry are aware of the high energy prices (electricity prices in Chile are among the highest in Latin America), information and knowledge sharing on energy efficiency measures, costs and benefits could be improved. On the other hand, support could be provided to banks, where specialised evaluations are required when dealing with energy efficiency projects and to consultancies / engineering / auditing companies for 'selling' such projects.
Social, cultural and behavioural	2.5	There seems to be reluctance toward the adoption of new technologies that are not already widely spread in the country (consumers could increase their trust in the emerging market for industrial energy efficiency for those technologies that have not been proven locally). Furthermore, industrial companies do not consider energy efficiency a priority or as the core business, limiting their engagement in these activities.

Matching financing requirements and barriers with instruments	
Financing needs	**Summary:** Data on investment needs is not available, only the Baseline Study for the Elaboration of the National Energy Efficiency Action Plan 2010-2020 provides insights into costs related to implementing energy efficiency measures during this period. The projected costs of pursuing energy efficiency measures at scale and as part of an overall energy efficiency strategy total just over US$904 million. The costs for the Government related to measures in the industry and mining industries are over US$21.2 million. The long-term financial benefits of energy efficiency strategies far outweigh the short-term costs of implementing them. Direct and indirect economic benefits of potential energy efficiency improvement are estimated between US$ 12 billion and US$ 23 billion. Even under the most pessimistic scenario for Chile's adoption of the identified energy efficiency measures, the costs were just 7% of the potential economic benefits.
Financial instruments	
Equity based instruments	There are international/regional instruments such as EELAF II (Emerging Energy Latin America Fund II), a private equity fund, that provide equity-based finance to mid-market companies (i.e. companies with revenues between US$100 million and $3 billion per year fulfilling an intermediary function) supporting and providing energy services to the industry. Furthermore, the establishment of a venture capital fund to provide risk capital to energy service companies (ESCOs) and other energy efficiency goods and services investors could be considered. Both options would help overcome the financial and economic barriers to energy efficiency uptake.
Loans	Loans can help overcome institutional and political barriers. The available (International Climate Fund (ICF) and credit lines offered by KfW and the Chilean Economic Development Agency) and proposed (National clean energy facility managed by a development bank, e.g. CAF) debt instruments provide financial incentives to industrial companies for energy efficiency investments addressing financial/economic barriers. Some of these instruments, in particularly those involving international or regional finance institutions, can also help address capacities in local banks to manage such energy efficiency projects. Offering and promoting sophisticated financial instruments could also support behavioural change, establishing trust and appetite encourage industry players.
Risk management instruments Policy incentives	Provision of loan guarantees could also help overcome institutional and political barriers. A loan guarantee programme could make industrial energy efficiency measures more attractive to lenders addressing financial/economic barriers. Offering and promoting such sophisticated financial instruments could also support cultural and behavioural change, establishing trust and appetite among certain industry players. Policy incentives could help address most of the barriers listed. Standards and labelling are also signals to industry that the way energy is generated and used is changing, and that improvements can bring about energy savings. Tax incentives, a carbon tax and sectoral crediting/trading at some point, and an Energy Efficiency Services Fund could further encourage reluctant sector actors to implement energy efficiency measures and facilitate market creation (and provide further financial incentives). Such a fund could be designed to help them increase their energy efficiency through such assistance as information, financial incentives, technical assistance, and installation— and create a fund for these services collected through electricity tariffs. An Energy Efficiency Services Fund could address infrastructure and technical support issues, as well as assisting in developing bankable energy efficiency projects. Such offers could also address capacity barriers and increase information availability and sharing. Energy efficiency pre-investment programs

	such as the measures described above in the context of the Fund could assist removing barriers for the deployment of energy efficiency measures in the private sector, in particular for SMEs.
Grants	Either the abovementioned Energy Efficiency Services Fund and/or another mechanism providing catalytic grant finance could send a strong signal to industry and businesses that energy efficiency is a national priority. Grant programs providing finance for energy efficiency project development and preparation, and finance for training measures related to the benefits of energy efficiency measures could provide additional financial incentives for market actors to engage in energy efficiency measures. Accompanying incentives to the abovementioned policy measures could encourage broader engagement of relevant sector actors, such as from the emerging ESCO market as well as end-users from key sectors such as mining, transport or other industrial consumers in implementing energy efficiency measures and projects through financial incentives. The proposed grant programs could assist in developing market creation, where targeted trainings could also support developing bankable energy efficiency projects. Grant programs providing support for project development (e.g. to buy expertise/consulting services) and finance for training and awareness raising measures on energy efficiency and its benefits increase information availability and sharing, and reduce capacity constraints.
Non-finance interventions	Financial instruments, in particular those offered by commercial and development finance institutions could be used for programmatic approaches aligning with parties who can act as market aggregators to create a critical mass through bundling smaller projects and therefore helping to overcome financial barriers. Such instruments could also address technical issues taking care of some development and implementation steps and could assist in establishing a market for energy efficiency improvements. Smaller players could be encouraged to engage in energy efficiency projects with some aspects being handled by a market aggregator. Smart meter systems could help to establish trust in adopting new technologies, in particular when they help and demonstrate that this helps to safe energy and reduce costs in combination with energy efficiency measures.
Summary: A number of financial instruments targeting industrial energy efficiency in Chile have been recently introduced, with additional instruments currently in the design phase. Existing instruments to address barriers to industrial energy efficiency financing include: subsidies by Chilean Energy Efficiency Agency (extension of the scheme to be considered), debt instruments by multilateral development banks such as the World Bank's International Finance Corporation, and bilateral and unilateral development finance institutions (i.e. KfW and Chilean Development agency) or equity funding opportunities through regional funds like EELAF II (Emerging Energy Latin America Fund II). To harness additional mitigation potential, Chile could consider the expanding existing programmes and schemes (in scope and/or scale) to capture additional industrial energy efficiency measures and activities - such as grant programmes promoting energy efficiency in a very specific area (e.g. fruit growers), RESSEE (Renewable Energy Self-Supply and Energy Efficiency Program), which provides another existing platform to add energy efficiency support and promotion programs, or expanding debt instruments through a national clean energy facility. Similarly, existing standards and labels could also potentially be expanded from the specific sectors currently covered, to potentially include energy efficient measures. Investigating, properly designing and implementing additional policy incentives could provide further support – such as the staggered introduction of the upcoming carbon tax and sectoral crediting trading, further tax incentives and an Energy Efficiency Services Fund. A comprehensive financing strategy for energy efficiency could include supporting market aggregation and the establishment of a mechanism(s) providing risk capital (i.e. investment that may be lost in part or completely) for further market development.	

2.3 Renewable energy within the electricity sector

2.3.1 Ecuador

While Ecuador has been successful in securing substantial amounts of finance for large hydropower projects (with recent projects financed using loans from China), these may not be replicable for other renewables technologies. There are six new plants under construction that should be operational in 2016, with more projects potentially in the pipeline. While policy makers do not currently foresee large risks in hydropower (such as adverse impacts of climate change on water resources, or adverse environmental and social impacts from large hydropower) it may be considered desirable to diversify the energy mix in the future.

A number of next steps could be considered for diversifying the energy mix (a goal especially for technologies like solar and geothermal, which have a strong potential):

- Green bonds
- The replication of successful public-private partnerships
- R&D development grants (particularly for geothermal energy)
- Guarantees and loans may not be the most effective tools in Ecuador - the centralised nature of the energy sector may not see these instruments as necessarily increasing market access for new players.

Further detail is provided in Table 11 below.

Table 11: Ecuador renewable energy within the electric sector case study

Country: Ecuador		**Sector: Renewable electricity**
General indicators		
Credit rating	BBB (S&P)	**Country profile summary:** Geographically, Ecuador is comprised of coastal, mountainous, forest (Amazonia), and insular (including the Galapagos islands) ecosystems. The population is 15.5 million. The economy is solidly in recovery from the global economic crisis, with growth reaching 7.8% in 2011 and 5.1% in 2012. Ecuador is the smallest oil producing member of the OPEC, with the oil sector accounting for a sizeable portion of all export earnings as well as for about one-third of all tax revenues. Both energy end electricity production in Ecuador are centralised. Hydrocarbon resources are exclusively owned by the state, as are most power generation facilities. In addition, there is a very limited role for independent power producers (only small private projects are allowed to operate). Ecuador's primary energy consumption (including power, industry and transport) is largely dominated by oil (76%) followed by hydropower (19%), natural gas (4%) and non-hydropower renewable fuels (1%). Ecuador's electricity production, however, is relatively low carbon as hydropower accounts for more than 50% of the country's generation. The other large sources of electricity are conventional oil-powered thermal power plants. Ecuador has transmission grid interconnections with Colombia and Peru from which the country imports a small amount of its electricity needs.
Competitive index	4.18 (71/148)	
Transparency index	35 (102/177)	
HDI 2013	0.724 (89/200)	

National renewable energy generation potential and implementation to date		
Overall score	Medium	**Summary potential**: Hydropower has a mitigation potential that is several orders of magnitude greater than the potential of any other renewable technology and is forecasted to grow dramatically to represent around 90% of the total electricity generation in 2016 (from around 50% in 2012). Ecuador's location in a geologically active region brings a technically feasible potential of up to 6500 MWe. Other important renewable technologies are solar energy and biomass.
Marine	Low	
Solar	Medium	
Wind	Low	
Hydro	High	**Summary implementation to date**: Current penetration of renewable technologies is high. The power generation mix is split nearly 50:50 between hydropower and thermoelectric generation. The deployment of renewable energy technologies in addition to hydropower is not substantial. Biomass is the only other renewable technology (i.e. after hydropower) making a significant contribution to the electricity sector, with bagasse (a residue of sugarcane processing) being used to produce about 1.3% of national electricity. Solar energy has received some interest from the private sector with 200 MW of solar power to be installed by the end of 2014.
Biogas	Low	
Landfill Gas	Low	
Geothermal	Medium	
Biomass	Medium	
Pledges and policies		
Pledge		
Status	No pledge	
Date of pledge	-	
Short description	-	
Policies summary (Scoring: 0= no policy available, 1= policy planned, 2= policy implemented but effectiveness unclear, 3= policy implemented & proven but not stringent, 4= policy implemented, proven and stringent)		
Overall score	3.0	**Summary**: Ecuador's constitution acknowledges the importance of renewable energy, and there is a strong ongoing policy support for hydropower, with hydropower expected to dominate the energy mix in the future. Small hydropower plants are eligible for a feed-in-tariff scheme (capacity threshold is 30 MW) and large new hydropower projects are financed with a mixture of government funding and Chinese loans. The policies to date have not consistently promoted other renewable energy sources. For example, the eligibility for feed-in-tariffs was changed in 2013 (only small hydropower, biomass and biogas are eligible for support and as a consequence wind, photovoltaic (PV), thermal and marine energy are not eligible anymore). The geographical spread of new hydropower plants may help reduce hydropower's previous vulnerability to periodic droughts (i.e. El Nino) and it is claimed that the applied technology avoids inundation of large areas of land (Escribano, 2013). However, it may still be beneficial to consider support for other renewable technologies to further reduce these risks.

Barriers (Scoring: 1= low/insignificant barrier, 4= severe barrier)		
Summary of barriers	**Summary**: Ecuador has implemented very effective policies to support large scale hydropower and the country is on track to increase the share of hydropower to approx. 90% in the electricity mix. However, there exist some institutional barriers to promote renewable energy further, particularly regarding non-conventional technologies (i.e. other than large scale hydropower). Policies to support other technologies have not been consistent and subsidies for fossil fuels decrease the incentive to use renewable energy. As an example, cooking fuel is subsided, decreasing the incentive to switch to renewable electricity. Regarding information barriers, some technologies lack comprehensive market studies on their potential (especially marine energy). A lack of understanding of the impacts of climate change may impact householders' willingness to switch from gas to renewable electricity in cooking. Ecuador has secured foreign funding for large scale hydropower plants but there is some evidence that other projects may find it difficult to secure funding. The business model may not be replicable to other technologies. In addition, non-conventional technologies (particularly other than hydropower and biomass) could require additional project developers, installers and maintainers.	
Barrier category	**Score**	**Summary**
Institutional/ political	1.9	Ecuador has implemented very effective, sustained and consistent policies to support large scale hydropower, but support for other renewable energy technologies may be less strong. Renewable energy projects need to be authorized by the state (with generally only small-scale projects being authorised). There have been recent changes to the requirements, creating uncertainty for the developers. In addition, other renewable technologies are less competitive when pre-tax subsidies for petroleum products are taken into account (petroleum products represent over 6% of GDP and over 15% of Government revenues). Finally, more coordination among government agencies and donors are needed.
Financial/ economic	2.0	Ecuador has recently been able to raise funding for 8 large hydropower plants (most of the credit was provided by China. In return, Chinese companies are constructing the plants and Ecuador is also exporting oil to China). The large hydropower plants are owned by state-owned companies. For example, the large Coca-Codo-Sinclair is owned by Cocasinclair EP. The business model for large scale hydropower is different than other renewable technologies and the extent to which this could be replicated with other technologies is not clear. It is not entirely clear to what extent access to finance is a barrier for other technologies. There is some evidence that developers of non-conventional renewable energy technologies find it challenging to access affordable finance.
Technical	1.8	The costs of other non-conventional renewable energies are high compared to hydropower because, apart from hydropower and biomass, there is a lack of experience and knowledge to develop technologies at scale (and hence bring the costs down). In addition, the electricity distribution network may require upgrading to fully support renewables.
Informational/ capacities	1.0	Comprehensive studies on the market potential are limited for some technologies, such as marine technology. In addition, while there are strong skills to operate and maintain hydropower plants, less capacity is available for other renewable technologies.

Social, cultural and behavioural	1.0	The benefits of renewable energy, as well as the costs and impacts of climate change, may not be widely appreciated within society overall. To address this barrier, measures such as an education campaign could impact positively on householders' willingness to switch from cooking with fossil fuels to renewable electricity.
Matching financing requirements and barriers with instruments		
Financing needs	Summary: All large hydropower plants currently under construction have already received financing. No estimates are available regarding the financing needs for additional hydropower or other renewable energy investments going forward.	
Financial instruments		
Equity based instruments	Applicable equity-based instruments include PPPs, where both the public and private partner provide capital for a return on the equity holdings in the project (this model has been tested in a landfill gas project in the city of Cuenca). In addition, large hydropower projects have been financed with a mix of foreign loans and equity finance from the Government. Capital expenditure could help improve the grid and provide better access for small scale renewable energy projects.	
Loans	The government could issue green bonds to mobilise finance in renewable energy, particularly for non-conventional technologies (i.e. other than large-scale hydropower). Low-cost loans could be provided to small-scale producers of renewables (private developers), being careful to consider whether any additional measures are needed to boost market access for new players (loans are usually most effective in a deregulated environment).	
Risk management instruments	The government could promote the diversification of the renewable energy portfolio (for example solar, biomass and geothermal) by sharing the risk for example through guarantees. Guarantees are generally the most effective in a deregulated market (where access to new players can be boosted). Hence, some caution may be needed due to the strongly regulated and centralised nature of the energy sector in Ecuador.	
Policy incentives	A more comprehensive and transparent tax incentive scheme for renewable energy could be implemented, to increase incentives for renewables relative to fossil fuels. The costs and benefits of a feed-in-tariff for technologies with a strong good potential (such as geothermal or solar) could be assessed, with consideration to re-introducing the feed-in-tariff for these technologies. Elimination of the fossil fuel subsidies could be an option for creating a more enabling environment for renewable energy. For example the removal of the cooking oil subsidy could provide incentives to use of renewable electricity for cooking.	
Non-finance interventions	Capacity building and training could enhance local capability in the development, operation and maintenance of renewable energy technologies, especially non-hydropower technologies. A potential public awareness campaign could be implemented on the benefits of renewable energy generation, low-carbon economy and the impacts of climate change. This could promote the buy-in among the public to switch from cooking with fossil fuels to (renewable) electricity.	
Summary: While Ecuador has been successful in securing substantial amounts of finance for large hydropower projects (with recent projects financed using loans from China), these may not be replicable for other renewables technologies. There are six new plants under construction that should be operational in 2016, with more projects potentially in the pipeline. While policy makers do not currently foresee large risks in hydropower (such as adverse impacts of climate change on water resources, or adverse environmental and social		

impacts from large hydropower), in the future it may be considered desirable to diversify the energy mix.
A number of next steps could be considered where diversifying the energy mix was a desired goal (especially for technologies like solar and geothermal, which have a strong potential): green bonds, the replication of successful public-private partnerships, and R&D development grants (particularly for geothermal energy). Guarantees and loans may not be the most effective tools in Ecuador - the centralised nature of the energy sector may not see these instruments necessarily increase market access for new players.

3 Cross-country sector analysis

This section provides a cross-cutting analysis and main findings from across the nine case studies, identifying common lessons learnt, as well as barriers and financing solutions which could be scaled up and replicated across other countries and sectors.

3.1 Transport sector

The transport sector's financial/non-financial potential and barriers were considered in four countries: India, Vietnam, South Africa and Chile.

3.1.1 Mitigation potential, implementation of mitigation potential to date and policies

- Generally, the four case study countries were relatively advanced in terms of (sustainable) transport strategies but may be making less progress in implementation on the ground. A common challenge seems to be a need for increased coordination between the national and local level and between national ministries (e.g. between environment and transport ministries)
- The mitigation potential was generally the highest for vehicle technology improvements, in particular for improving the efficiency of conventional vehicles and the use of alternative fuels, closely followed by modal shift (in terms of both passenger and freight transport). It was found that there was less potential in system planning and efficiency (such as infrastructure development) and, electric vehicles, with the potential for electric vehicles expected to increase over the medium to long term, with economic development and urbanisation
- In Vietnam and India electric vehicles have some mitigation potential but are perceived in a negative light as expensive and unable to cover the same mileage as a combustion engine. Electrical motorcycles have a strong mitigation potential in both these countries, however efficient technologies are either too expensive or, in some cases, the quality could be improved. As a consequence, they have not been mainstreamed into practice. The promotion of alternative fuels in developing countries can potentially generate higher emission savings (compared to electric vehicles) such as the conversion of engines from diesel (with a high sulphate content) to CNG
- Chile stood apart from the other countries as having much higher electric vehicle potential due to the high share of hydropower in the electricity mix
- Mitigation activity in India and Vietnam has largely focused on passenger modal shift, especially within cities, but a large un-exploited mitigation potential still exists for passenger modal shift, in particular between road to railways or waterways. In Chile, on the other hand, activity has been focused on reducing local pollution, particularly in the capital. Measures such as vehicle standards and restriction of vehicle use are designed to address local pollution, but also to have a positive mitigation effect. Pilot initiatives on vehicle efficiency and modal shift have been tested, but large mitigation potentials remain untapped. Much of South Africa's policy development on mitigation of transport GHG has been focused on strategies and less on implementation. However, alongside this work there is some activity on public transport, e.g. BRT, at municipality level and there are some national-level measures in place to support consumers in choosing more fuel-efficient vehicles (e.g. vehicle labelling, vehicle CO_2database and a CO_2tax on new vehicles)
- While the un-exploited mitigation potential in India, Vietnam, South Africa and Chile is the greatest in vehicle technologies, this does not always align completely with policy and development priorities in the countries. Financial and non-financial interventions need to be targeted in a nuanced way, to ensure alignment with country priorities and interests

3.1.2 Barriers

- A number of common barriers (including institutional/political, financial, technical, social, cultural and behavioural barriers) were emphasised across the case studies. Financial barriers were deemed to be a significant limiting factor, especially for India and Vietnam. The types of barriers encountered were primarily due to a lack of capital for investment. This is for example the case for infrastructure development, and in vehicle technology improvements (e.g. to enhance modal shift in both passenger and freight transport)
- Affordability of more fuel efficient vehicles is a common barrier. This is particularly the case for electric vehicles but fuel efficiency standards also tend to lead to increased costs for vehicle manufacturers that get passed on to consumers. On the other hand, the more fuel efficient vehicles will lead to reduced running costs over the period of the life of the vehicle.
- In Chile, the higher cost of electric vehicles (compared to traditional ones) is the main barrier preventing private users to acquire them. In Vietnam, despite substantial financial contribution from international donors (mainly in urban areas) seeing a modal shift from road transport to either rail or waterway transport would require expensive infrastructure development as the current infrastructure is either not present, or is badly maintained
- Institutional/political barriers were also found to be important, most notably in Chile. The main institutional barriers were found to be (for all four of the case studies) the lack of a clear policy for sustainable transport and support from the government to unlock the existing mitigation potential. Other barriers in this category were identified as:
    - time-consuming government decision making processes
    - challenges with adopting and enforcing legislation nationwide
    - a need for increased coordination between government departments (at a national level
    - for some countries, transparency and corruption.
- Technical barriers, such as vehicle fuel/engine efficiency and technical aspects of modal shift and smart road systems were also found to be important in India and South Africa particularly. The lack of knowledge sharing from developed to developing countries was also highlighted as a barrier
- India is an interesting case with respect to technical barriers, since it has a highly efficient and developed technical capacity and market for small vehicles (two and three-wheel vehicles and small four-wheel vehicles). Because the market is driven by price, fuel efficiency is a key driver for consumers. The technology for commercial vehicles, however, may need updating to increase fuel efficiency (commercial vehicles make up 3% of India's fleet, yet contribute over 50% of the emissions)
- Whilst non-finance interventions, and in particular fuel efficiency standards, are some of the best options for encouraging greater fuel efficiency, many of the countries have issues with enforcement. For example, in Vietnam, standards are in place but enforcement appears insufficient. Addressing this barrier will require finance for capacity building and training
- Behavioural barriers were important across the countries, with public transport, bicycle or even motorbikes considered less socially acceptable than private cars (especially in Asian countries). This barrier will become even more significant as GDP increases over time and more of the population is able to afford their own vehicles. The reluctance to try new technologies, such as electric vehicles or aerodynamic improvements for trucks, was also found to be a key behavioural barrier
- Furthermore, concerns around safety of public transport were also a factor in some countries, both in terms of road safety and the safety of some passengers (especially women) when travelling alone. This is particularly the case in South

Africa and in India (where recent high profile cases may have heightened those concerns)

- To ensure that finance is able to be effective in helping countries realise their mitigation ambitions, it is recommended that the mixture of significant financial and non-financial barriers in these countries need to be addressed simultaneously.

3.1.3 Financial instruments

- Financial instruments were considered to be important in targeting financial/economic and technical barriers, to unlock the largely un-exploited mitigation potential in vehicle technology (especially for large fleet buyers) and modal shift. The types of financial instruments considered most relevant were:
    - **Equity**: The involvement of private players may be encouraged by a combination of revenue (toll /usage fees/ congestion charges, fare collection, etc.) and guarantees (from local government or foreign MBD) for projects
    - **Public-Private Partnerships (PPPs):** PPPs already play a small role in financing transport infrastructure investment but moving forward, there is more scope for them to play a key role. The structure of PPPs should change to raise equity from the private sector rather than debt. For example, the capital investment is made by the private sector on the basis of a contract with government to provide agreed services and the cost of providing the service is borne wholly or in part by the government. It is recommended that specific regulations of PPP will be developed and put into place in each of the countries
    - **Loans/debt**: Low-cost and medium-term loans for the initial upfront investment in low carbon vehicle technologies have been a key success story in many of the case studies. This is likely to be particularly important for organisations buying large fleets of heavy-duty vehicles. Another viable option of debt finance is the provision of green bonds. Some of the countries reviewed have small/weak bonds market, so support may be required from donors to develop and issue or underwrite green bonds
    - **Grants and capital funding**: The direct provision of capital for investment to improve and develop an efficient public transport system (i.e. systematic route planning and reliable scheduling of services), and for the procurement of more efficient public transport vehicles have been a financial instrument successfully implemented in India and Vietnam. Grant funding can be provided to support city-level projects such as bus rapid transit systems (e.g. South Africa) or more comprehensive city-level transport schemes such as in Chile. They can also be used for support and training of public sector staff on integrated transport and planning issues and to roll out behaviour change campaigns to promote public transport.
    - **Grants** (along with other forms of demand-side financial incentives) are useful tools to get around the initial up-front cost of more efficient (thus more expense in the short term) technologies. In Vietnam however, affordability has to be coupled with minimum quality as in Vietnam, where affordable Chinese electric motorcycles where unable to grow significantly due to poor quality and maintenance available

- Policy instruments have a key role to play in encouraging a shift to more fuel efficient vehicles, as well as encouraging the use of alternative fuels[8]. These could include:
    - Fuel efficiency standards are likely to be a key way to improve the fuel efficiency of new vehicles and have shown to be highly successful in other countries and regions (e.g. Europe). Chile already works with fuel efficiency standards but could consider expanding mandatory standards to heavy-duty vehicles and other means of transport, for instance, to achieve impacts at scale
    - Higher taxes for less efficient vehicles can be effective in encouraging greater numbers of more fuel efficient vehicles. Chile already offers tax incentives for energy efficient vehicles. However, they will need to be restructured carefully to avoid penalising lower and middle income families. Fee bates – where smaller, more fuel efficient vehicles are encouraged through a rebate – are one way to shift the tax burden on to those more able to pay
- Examples of innovative and successful financial instruments being applied with the potential to be up scaled and implemented across other countries were:
    - The Indian government has invested in developing nodal transport terminals providing the upfront capital for investment having the sole equity stake. Costs are recuperated though rent of retail spaces in the terminal or via the use of the transport hub by the different transport modes. This can be applied to both passenger and freight transport hubs. To further support the development of these nodal points, lines of microfinance made available to SMEs to develop the economy around transport nodal points has been deemed a successful tool
    - Although only yielding a small capital return, India has identified the use of advertising space on public transport vehicles/hubs as a potential revenue pathway. The profits from this are recycled back into the transport system to improve and enhance the service
    - Setting up toll systems on transport routes would allow for revenue returns for investments for the private sector, as has been the case in Vietnam
    - In South Africa, syndicated loans have been shown to be a good way of drawing in private sector financing to large-scale infrastructure projects. They involve parallel co-financing and an A- and B-loan structure (e.g. a development bank plus private sector), that extend the development bank's Preferred Creditor Status to commercial banks that invest in a transaction (note that this is an important factor in mitigating country risk from a project, thus providing a risk mitigation instrument). Additional benefits can be offered to participants, including exemption from restrictions on currency conversion on interest and principal and exemption from withholding tax

[8] Please note, policy instruments alone would not met the potential for alternative fuel use. It would have to be combined with other financial instruments to create the demand and develop the technology

3.2 Energy efficiency within the industrial sector

Energy efficiency within the industrial sector was considered in four countries: India, Vietnam, South Africa and Chile.

3.2.1 Mitigation potential, implementation of mitigation potential to date and policies

- The mitigation potential was generally the highest for technologies that are ubiquitous across all industrial sectors, such as more efficient electrical motor systems and drives, boilers and steam systems. Energy management was found to have medium-low potential, except for Vietnam, but this is partly because this measure can be an enabler for technology-based measures
- The mitigation potential associated with individual sectors varies between countries, depending on the prevalence of specific energy intensive industries. For example, in South Africa there is a large mining sector, and measures to improve the efficiency of onsite power generation have a large mitigation potential. In Chile, copper mining, which is the main energy intensive industry in the country, also has large mitigation potential across mitigation categories (including e.g. optimization of the combination of variables in the Semi-Autogenous Grinding (SAG) mills, implementation of high pressure rollers, reduced lighting consumption, fleet management in mines and electric demand management). In India, there is a large cement sector and measures to increase the use of alternative fuels and raw materials within the sector have a large mitigation potential within the industrial sector overall. In Vietnam, an important mitigation potential exists within its growing industrial sector, especially in cement, steel, chemicals and paper & pulp.
- Mitigation activity to date has largely focused on large, energy intensive industries such as iron and steel production, mining and cement manufacture. However, a large un-exploited mitigation potential still exists here. There has been much less activity to address the mitigation potential associated with small and medium sized enterprises. In Chile, policy efforts have been focused on replacing outdated equipment aiming to tap at this potential. However, these efforts are limited and the potential remains largely untapped.
- While the un-exploited mitigation potential associated with industrial energy efficiency is large (in the case of India and South Africa), this does not always align completely with policy priorities in the countries, which often focus on renewable energy generation and large infrastructure projects. In Chile, for example, industrial energy efficiency remains voluntary despite the large potential it presents, and even though the energy prices are the second highest in the region (after Brazil), industry has not yet taken full advantage of its energy efficiency potential. Similarly, in India and Vietnam, as the main driver for industry is on production growth, additional incentives may be needed to encourage investments in energy saving initiatives or more energy efficient production processes.

3.2.2 Barriers

- Although energy efficiency measures are typically cost-effective and pay back over the medium term, the upfront access to finance is a significant barrier for industrial energy efficiency for SMEs as well as large industrial organisations (with the exception of India, where the availability of capital for large industries is less of an issue). Other financial barriers include:
    - Limited budget within companies for energy efficiency
    - Limited access to financial instruments
    - A focus on investment costs instead of life cycle costs which hinders investments in energy efficiency measures

- In terms of accessing finance from financial institutions, other factors also come into play:
    - Lack of access to external capital for industrial energy efficiency projects is also linked to the nature and size of typical projects. Unlike energy generation and transport projects, which are typically large infrastructure investments, industrial energy efficiency is characterised by a large number of comparatively small/medium sized projects. The high transaction costs associated with such projects makes them less attractive to commercial banks
    - The financial sector's technical understanding of the industry projects is often limited, which often leads to a higher perception of risk. Particularly for SMEs, due to the weaker balance sheets, and limited insurance against larger investments
- A number of significant barriers were common across the case studies:
    - Limited capacities in all organisations involved in industrial energy efficiency, from the industrial companies themselves and energy service providers who often lack the expertise to prepare investment quality business cases, through to financial institutions, who may not understand the requirement of industrial energy efficiency projects and government bodies, who often lack the resources and expertise to enforce existing policies
    - Technical barriers were found to be significant. Uncertainties associated with new technology, particularly where there is a lack of service infrastructure for implementation, logistics and maintenance of the technology (e.g. where equipment suppliers are based overseas and only represented by local sales agents). For many countries, limited electricity grid capacity at a local level can restrict expansion of industrial facilities that would be accompanied by equipment and efficiency upgrades. In particular, a lack of reliable baseline energy data in India hinders energy management at all levels, the ESCO business model and implementation and monitoring of energy efficiency policies
    - In most of the countries reviewed (with the exception of South Africa) energy efficiency policies are in place. However, there is a need for additional enforcement nationwide and stronger imperatives on industry to take action
    - The lack of energy efficiency prioritisation by large operators/ industrial organisations is a key barrier in many of the countries. This reluctance to adopt new technologies and the perception that implementing industrial energy efficiency measures will result in potential interruptions in production was found to be a behaviour barriers, particularly in Chile and Vietnam
- Similar to the transport sector, a mixture of financial and non-financial barriers was identified for the energy efficiency improvements in the industrial sector. In order for countries to realise their mitigation potential it is recommended that both types of barriers are addressed simultaneously

3.2.3 Financial instruments

- The study found that financial instruments were considered to be the most useful in targeting barriers such as lack of access to external capital and perception of risk to unlock the under-exploited mitigation potential in the industrial sector. The types of financial instruments considered most relevant were:
    - Concessional loans for new equipment, as well as credit lines for SMEs (microfinance). This would particularly help to unlock the greatest mitigation potential in India which would come from energy efficiency improvements across the industrial sector. In Chile the available (ICF and credit lines offered by KfW and Chilean Economic Development Agency) and proposed (clean energy facility) debt instruments provide financial incentives to industries for EE investments
    - Grants for energy audits and capacity building. This could not only be used to target the mitigation potential in energy efficiency improvements, tackle energy management, but also to enhance new and innovative technologies in country. This would be particularly relevant in South Africa as these areas have the greatest potential in the country
    - Subsidies and tax breaks for energy efficient equipment can help countries reach the mitigation potential of replacing dated and less efficient technologies. In Chile, there are examples of subsidised consultancy services provided by the Chilean EE Agency to assess potential energy savings, create implementation plans, and conduct financial analyses for energy efficiency measures. These are offered to the private sector such as SMEs
    - Taxes on fossil fuel consumption or price controls on energy
- More innovative financial instruments are needed to address some of the key barriers. For example:
    - Instruments to standardise and aggregate projects to make them more attractive to investors, for example a market aggregator for small and mid-sized projects as mentioned in proposal for the Chilean market
    - The ESCO market is better developed in some countries compared to others (i.e. more developed in South Africa, less developed in India or Vietnam). Hence, risk mitigation measures such as energy savings insurance (financial guarantees) to back up the performance guarantees provided by ESCOs can usefully strengthen the ESCO model
    - Flexible clean energy funds financed through a public benefit charge on energy bills or funding from international donors. Such funds could be used in a variety of ways to best suit the local situation. These can both be used to target SMEs and larger industries
    - The development of a green bonds market to raise debt for industrial energy efficiency improvements
- Non-financial instruments, or technical assistance provided in association with financial assistance is very important for overcoming the remaining barriers to industrial energy efficiency. For example:
    - In order for developing countries to reach their potential and improve industrial processes the provision of technical knowledge (capacity building and knowledge sharing) from more developed countries. This, combined with the use of loans (as mentioned above) can allow industries to procure the most efficient technologies

  - Capacity building support to government bodies, such as support in designing, implementing, monitoring and enforcing industrial energy efficiency policies
  - Support to local banks and financial institutions with evaluating industrial energy efficiency projects more effectively and developing innovative financial instruments to unlock the mitigation potential
  - Energy efficiency Standards and Labelling Program can provide clear information about EE gains through a range of appliances and equipment. Existing programs in Chile, for example, cover electrical products sold in Chile, fuel efficiency standards for light-duty vehicles and fuel economy labelling for heavy duty vehicles. Expansion to cover EE in industries and businesses, building codes for new buildings, promotion of EE in existing buildings, EE improvements in glazed areas, or energy performance standards for energy related equipment and appliances (residential and commercial) could be considered. Such standards also exist in South Africa
- Examples of innovative and successful financial instruments being applied with the potential to be up scaled and implemented across other countries were:
  - Grants for energy audits and capacity building has successfully been applied in Chile, and has promoted energy efficiency amongst Chilean Fruit Growers. However, this has not been offered to other sectors with higher mitigation potential
  - Establishing state-level clean energy funds using the public benefit charge concept; the creation of a facility to provide energy savings insurance; the establishment of a "Clean Energy Financing Facility" to facilitate financing of industrial energy efficiency projects on a pilot basis, have been recognised as finance mechanisms to tackle the scaling up of energy efficiency financing in India - thus unlocking one of the country's greatest mitigation potential in the industrial sector
  - Chile is looking at introducing an Emissions Trading System (ETS) to help reduce industrial emissions. A first step may be a sectoral crediting/trading mechanism for the energy sector (including energy efficiency measures) with a view to a gradual transition to an emissions trading scheme

3.3 Renewable energy within the electrical sector

Renewable energy within the electrical sector was considered in Ecuador.

3.3.1 Mitigation potential, implementation of mitigation potential to date and policies

- The mitigation potential for hydropower in Ecuador is between 1-3 times greater than other types of renewable technology in the country. Hydropower is expected to make up approximately 90% of the electricity mix by 2016 (in 2012, a contribution of 50% was achieved)
- The strong Government support for hydro power is due to:
  - Abundance of rivers and water resources
  - Cost-effectiveness as it is currently the least-cost renewable energy technology in Ecuador
  - Local knowledge to operate and maintain the technology (although large parts such as turbines are sourced externally)

- Compared to the countries analysed in an earlier European Commission project 'Global Climate Finance Needs', Ecuador is unusually advanced in producing renewable energy. In the other countries, the renewable energy penetration is negligible or below 10% (notable exceptions are Samoa which also utilises hydropower and Ethiopia which imports hydropower)
- A smaller and largely unexploited mitigation potential from geothermal is also present in Ecuador as well as some potential in solar energy, biomass and biogas
- A feed-in-tariff provides support for biomass, biogas and small-scale hydropower

3.3.2 Barriers

- Ecuador is a unique case because of the substantial support for hydropower. Most barriers for implementing and financing hydropower have been successfully addressed by government intervention (with some financing provided by other countries)
- Barriers for other renewable technologies are similar to those in other countries, including a range of institutional, financial, information and capacity barriers
- Institutional barriers include ongoing support for fossil fuels (i.e. subsidies) and lack of consistent support for alternative renewable energy sources (other than hydropower), thus reducing the incentives for project developers. In addition, the energy sector is nearly entirely nationalised, which increases administrative complexity and reduces incentives for private project developers and investors
- Informational barriers were found to be important for some technologies. For example, comprehensive market studies are not available for all technologies (especially for marine energy)
- Cultural barriers affecting access to finance include a perception of renewables (other than hydropower) having a high risk profile. In addition, a lack of experience within the banking sector can also hinder the access to finance

3.3.3 Financial instruments

- Ecuador has recently financed eight large hydropower plants with a combination of Chinese loans and government funding. This is part of an agreement which includes the export of oil from Ecuador to China. Hence, a strategic alliance with China has been a key policy for promoting large scale renewable energy in Ecuador
- It is possible that this business model can be replicated for further hydropower plants, and hence there may be a diminished need for climate finance targeted towards hydropower (noting that the country is on track to achieve its 90% renewables goal in 2016). In this respect, the Ecuadorian case differs from countries such as Chile and Indonesia
- However, the replicability of this business model for technologies other than hydropower is less evident, due to the specific nature of the recently negotiated hydropower contracts. While it seems possible that hydropower alone can decarbonise the electricity grid, further studies may be needed to confirm the level of risk involved (such as adverse impacts of climate change on water resources). Hence, it may still be relevant to consider instruments that can further diversify the energy mix
- Ensuring close alignment with government policies, financial instruments for targeting small-scale renewables or replacing fossil fuels with renewable electricity may be relevant to consider, for example:
    - Providing incentives for households to use renewable electricity in cooking instead of cooking oil (ideally, while also removing or reducing subsidies for cooking oils)

  - R&D grants for feasibility studies and/or applicable forms of public-power partnership for exploiting non-hydropower renewables, especially geothermal energy. Given that hydropower is expected to supply the majority of the country's immediate electricity needs, consideration of additional large scale renewables could also involve:
    - An assessment of the potential for exporting electricity
    - The viability of hydropower in the long term (i.e. taking into account climate change impacts)
    - Opportunities for replacing fossil fuels with renewable electricity in the domestic and transport sectors
  - Public-private partnerships (PPPs) may be another model for raising additional finance for non-hydropower renewables, given that there are some PPPs already in operation. For example, in the City of Cuenca, electricity is produced from landfill gas through a PPPs
- However, guarantees and loan schemes may not be the most effective tools in Ecuador. The centralised nature of the electricity market may not see these instruments necessarily increase market access for new players

4 Conclusions

This report has analysed the financing of meaningful climate mitigation actions and initiatives across case studies in Chile, India, Vietnam and South Africa in the transport and industrial energy efficiency sectors, as well as the renewable energy sector in Ecuador. By analysing these meaningful climate mitigation actions and initiatives, the work specifically emphasises bankable 'best practices' of equity-based solutions and debt finance options with profitable project returns that have a large potential for upscaling to other sectors and countries. The roles for other types of financial instruments and interventions (e.g. risk mitigation, aggregation, grants) are also considered, as well as non-financial instruments (e.g. policy, capacity-building).The results and suggestions in this report are evidence-based, drawing on in-country interviews, literature review and 'real-life' examples.

This report informs financial institutions, institutional investors, and other private sector stakeholders regarding financing options in different geographies and sectors, providing a basis for developing future business cases. Policy and regulatory options are provided for potential consideration by national governments (as well as Development Finance Institutions and Multi-Lateral Development Banks), including incentives for engaging private sector actors and institutional investors from both developed and developing countries and the creation of a financially attractive environment for low-carbon investment.

Appendix B to this report provides relevant and detailed information and data on the case study country (and sector) climate investment plans (CIFs), with an identification and assessment of specific financing needs for climate mitigation investments and possible uptake. In addition, Appendix A provides examples of climate-earmarked investments made so far as well as the climate finance needs for the researched case studies in this report. Both appendices provide useful information, data and intelligence for financial institutions and institutional investors on potential financing strategies for climate mitigation efforts, giving a starting point for scaling up climate finance investments and further work on implementation. This further work will be specific to the country and sector, but will likely include assessment of investment needs and cost benefit analysis.

Overall, the report provides the following conclusions and recommendations for the future targeted of climate finance:

1. Financial and non-financial barriers need to be addressed simultaneously

For climate finance to be successful, both financial and non-financial barriers need to be addressed simultaneously. For example, in the transport sector, public transport services and infrastructure require extensions and improvement but at the same time it is recommended that negative perceptions towards public transport are addressed in order to ensure ongoing passenger modal shifts.

2. Climate finance needs to be sector-specific

Climate finance needs to be targeted differently between different sectors. For example, for industrial energy efficiency access to attractive finance is a key concern (with capacity building needed for both industry and lenders), whilst for the transport sector, access to capital is an additional requirement. For renewables, fiscal reform measures such as addressing tax breaks and subsidies for fossil fuels become more

important, to improve the competitiveness of renewables (although the likely impact of fiscal reform measures will differ country-to-country depending on the level of tax enforcement).

3. Climate finance needs to be country-specific

Climate finance and financial instruments need to be targeted in a country-specific manner in order to take into account the various continuous stages of development of countries, as well as nuances in barriers (especially institutional and behavioural barriers) and climate policy approaches between countries. Countries such as South Africa, Chile and Ecuador have more advanced financial sectors and are able to use more sophisticated instruments compared to India and Vietnam. As the financial sectors of developing countries improve, they can progressively become capable of using more sophisticated financial solutions.

For example, for Vietnam, the development of the financial sector may not necessarily follow the overall development of the country due to the centralised political structures in place and barriers related to transparency. Hence, it is important to assess the stage of development, financial sophistication and financial literacy of a country when considering which financial instruments to apply.

At the same time, many barriers are common between countries, preventing the potential for scaling up successful approaches. For example, given the cross-cutting nature of climate change coordination between ministries to avoid 'silo' thinking seems important. Likewise, capacity-building could improve climate policy/programme competencies. One approach to address this could include mainstreaming climate change within existing donor support and by increasing the climate effectiveness of donor support overall, but also engaging with additional Ministries on climate change.

4. Climate finance and financial instruments should increasingly involve the private sector

It could be beneficial to involve the private sector in climate finance and financial instruments by slowly moving away from the use of traditional grants and low-cost loans from international public donors. Such grants and low-cost loans may not be sustainable sources of financing over the long term. Private sector participation may come from within the country as well as from outside the country. Climate finance should seek to support both, as relevant to individual country circumstances. This participation could translate into additional equity holdings by private players, as well as a growing role for PPPs and eventually raising fund on capital market via green bonds (climate bonds).

Private equity stakes within climate change initiatives could be favoured when possible and appropriate. For example, investors could have a stake in the assets, or a guarantee on return revenue, for instance from toll/congestion charges and fare collection on public transport routes. In countries such as Chile, international/regional instruments such as EELAF II, a private equity fund, have already been successfully implemented. These provide equity finance to mid-market companies supporting and providing energy services to the EE sector. Such a scheme requires a relatively well developed financial sector and hence may not yet be possible in every other developing region. For large infrastructure projects, PPP frameworks and regulations should be considered (for example, this is already used in Vietnam in the transport sector).

Eventually, low-cost loans should be considered for only those specific types of projects where local interventions and private intervention are difficult – for example, in Chile, for individuals/small corporates seeking to improve their vehicle fleet. As a country becomes more developed financially, a combination of tax incentives and subsidies can substantially improve the sourcing of finance.

In countries with a more sophisticated financial sector (such as South Africa), green bonds can help raise capital for the financing of climate friendly initiatives. Successful green bonds depend on factors such as the sophistication of financial sector, and the existence and robustness of the corporate bond market. Also important is the proven track record of the underlying technologies, as well as the number and congruence of the smaller projects component of the aggregated portfolio being financed by green bonds. However, when countries are not at a level of financial development where corporate bonds are sufficiently developed, then international donors and/or local governments may support successful bond issuances by providing financial guarantees or insurance for return on investment.

In addition, more financially mature countries such as Chile could establish mechanisms for aggregating several medium sized projects in order to render them more attractive to commercial banks via securitisation. Market aggregators help create a critical mass through bundling small projects, therefore helping to overcome financial barriers. Technical issues are also addressed when they take care of some project development and implementation steps.

These various examples emphasise the importance of carefully appreciating the status and maturity of the local financial sector when identifying the most appropriate approach for financing climate change projects, as well as giving consideration to how it can best be supported and engaged.

5. Climate finance should carefully consider 'low hanging fruit'

Whilst recognising that climate finance should always align with country level priorities, there may be scope to harness additional low hanging fruit. For example, while mitigation efforts are often focussed on improving public transport, the greatest mitigation potential for the transport sector was for all countries in the this study found in fuel efficient vehicles.

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Appendix A: Climate investment needs

This appendix provides a summary of investment needs for each country/sector.

A.1 Summary of investment needs for each country/sector case study

Table 12: Investment needs for each country/sector

Country /sector	Project/measure	Financing need (US$M)	Source of financing	Comment	Source
Transport sector					
Chile	National Energy Efficiency Plan 2010-2020	914	427 US$M from government	The study covers different sectors: buildings, appliances, industry & mining, transport and electricity.	CIF (2013) Clean Technology Fund Investment Plan for Chile, Revision https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_IP_Revision_Chile_Sept2013.pdf
	Santiago Green Zone Transport NAMA - Promotion of Zero and Low Emission Vehicles (ZLEV)	3.69	1.19 US$M from local stakeholders 2.5 US$M from NAMA international funds	The Santiago Green Zone Transport NAMA would be 2.5 years and its cost would be 17.7 MMUSD where local stakeholders will finance 30% approx.	CIF (2013) Clean Technology Fund Investment Plan for Chile, Revision https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_IP_Revision_Chile_Sept2013.pdf
	Santiago Green Zone Transport NAMA - Low Carbon Emission for Public Transport Buses	6.46	2.7 US$M from local stakeholders 3.76 US$M from NAMA international funds		
	Santiago Green Zone Transport NAMA - Promotion of Bicycle Use	1.37	0.42 US$M from local stakeholders 0.95 US$M from NAMA		

			international funds		
	Santiago Green Zone Transport NAMA - Traffic Re-design and Traffic Management	6.24	0.79 US$M from local stakeholders 5.454 US$M from NAMA international funds		
India	Rajasthan Urban Transformation	490	90 US$M Government agencies, 300 US$M ADB and 100 US$M CFT Carbon finance and other Project sponsors/other lenders will also provide finance, but the figures need to be confirmed.	Financial plan covers emission reductions from the transport sectors, as well as MSW disposal, sewage treatment and buildings.	CTF INVESTMENT PLAN FOR INDIA, October 2011 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_India_investment_plan_101411.pdf
	Eastern Dedicated Freight Corridor	4,111	483.44 US$M APL Khurja – Kanpur 538US$M APL Kanpur-Mughal Saral 365US$M APL Ludhiana - Khurja 975US$M IBRD – APL 1 Khurja – Kanpur 1050US$M IBRD –APL 2 Kanpur – Mughal Sarai 700US$M IBRD – APL 3 Ludhiana – Khurja		CTF INVESTMENT PLAN FOR INDIA, October 2011 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_India_investment_plan_101411.pdf
	Jewaharlal Nehru National Urban Renewal Mission (JnNURM)	19,793	No breakdown provided	Investment over a seven year period	Twelfth Five Year Plan (2012–2017) Economic Sectors http://planningcommission.gov.in/plans/planrel/12thplan/pdf/12fyp_vol2.pdf The original figure for total investment is Rupee 123,711

				crore. USD$ was calculated using an India Rupee to US dollar exchange rate of: 0.016 US Dollar
Investment in Urban Transport under India's 12th Five Year	83,075	GoI	The Government has laid out plans in its 12th Five year plan (2012-2017) to invest $ 83 billion in urban transport.	Twelfth Five Year Plan (2012–2017) Economic Sectors http://planningcommission.gov.in/plans/planrel/12thplan/pdf/12fyp_vol2.pdf The original figure for total investment is Rupee 519,221 crore, which includes Gross Budgetary Support (GBS) of Rupee 1,94,221 crore, Internal and Extra Budgetary Resource (IEBR) of Rupee 2,25,000 crore and private sector investment of Rupee 1,00,000 crore. USD$ was calculated using an India Rupee to US dollar exchange rate of: 0.016 US Dollar
Delhi Metro Rail Corridor, Phases I and II	6,600	No breakdown provided	It been utilised to develop a transit network of about 190 km at an approximate cost of USD 34.4 million/km	Promoting Low carbon transport in India - Low carbon mobility in India and challenges of social inclusion: Bus Rapid Transit (BRT) Case Studies http://www.unep.org/transport/lowcarbon/Pdf%27s/BRT_Casestudies_India_fullreport.pdf

	Pune High Capacity Bus Systems	205	No breakdown provided	BRT system with a total length of 101.77 km The pilot project has two of the major routes connecting three major bus terminals. These are: 1. Swargate–Hadapsar (East-West Corridor), which was designed by the TRIPPS, IIT Delhi 2. Swargate–Katraj (North-South Corridor), which was designed by the PMC These two corridors were sanctioned by the MoUD at a total cost of USD 13.84 million for a total length of 12.6 km	Promoting Low carbon transport in India Low carbon mobility in India and challenges of social inclusion: Bus Rapid Transit (BRT) Case Studies http://www.unep.org/transport/lowcarbon/Pdf%27s/BRT_Casestudies_India_fullreport.pdf
South Africa	Technological Transformation Programme on Sustainable Transport for South Africa: Component I (Vehicle Efficiency Program)	375	57.5 from CTF, 257 from ADB, 60.5 from GoSA (including Provincial Governments)		UPDATE OF CTF INVESTMENT PLAN FOR SOUTH AFRICA, CTF/TFC.12/6/Rev.1, October 27, 2013 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_TFC.12_6_Update_of_CTF_Investment_Plan_for_South_Africa_.pdf
	Technological Transformation Programme on Sustainable Transport for South Africa: Component II (Bus Rapid Transit)	TBD	TBD		UPDATE OF CTF INVESTMENT PLAN FOR SOUTH AFRICA, CTF/TFC.12/6/Rev.1, October 27, 2013 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_TF

				C.12_6_Update_of_CTF_Investment_Plan_for_South_Africa_.pdf
National Infrastructure Plan	80,000 over 3 years	GoSA	Funding to boost both existing and new major infrastructure projects	DEA website http://www.gov.za/issues/national-infrastructure-plan
Freight rail infrastructure upgrade and expansion programme	Roughly 27,200 (Rand 300bn)	Transnet		http://www.transnetfreightrail-tfr.net/MDS/Pages/Strategy.aspx http://mg.co.za/article/2012-04-13-transnet-reveals-mega-upgrade
Passenger rail investment on rolling stock	Roughly 4,600 (Rand 51bn) [BDLive, 2011]	National Treasury	Contract for Rand 51bn, total funding available from National Treasury capped at Rand 53bn	http://www.sabc.co.za/news/a/1610dc80436820bd9dd99d856359f483/R51bn-train-manufacturing-plant-to-be-based-in-Springs-20142603 (note, PRASA website currently under maintenance so official documentation not available)
Development of transport infrastructure in South Africa	614	Development Bank of Southern Africa		PowerPoint presentation – Development Bank of South Africa (2014), Linking Southern African countries – regional trade and development update – The North South Corridor
Investment in South Africa transport network	Roughly 8,500 (Rand 93.4bn.)	A syndicated loan – AfDB loan of 400m and loan from commercial lenders of 200m [AfDB, 2014]	To facilitate regional trade and integration through the improvement of the South African transportation network	PowerPoint presentation – African Development Bank (Jan 2014), Financial Products and Services
"Catalytic infrastructure"	164,000	TBD	Investment need for Southern Africa for	Regional Infrastructure Development Master Plan

				developing infrastructure – identified by Southern Africa Development Community's Regional Infrastructure Development Plan Breakdown of costs: (US$ M) 61,000 road, 26,000 rail, 60,000 ports and water transport, 17,000 aviation	Energy Sector Plan (2012) http://www.sadc.int/files/5413/5293/3528/Regional_Infrastructure_Development_Master_Plan_Energy_Sector_Plan.pdf
	Development of priority transport corridors	Not known	JICA	Priority corridors identified for industrial development in Southern Africa by JICA in 2013	"Southern Africa Growth Belt Initiative Phase 2 – corridor development for economic growth", JICA 2013 http://www.jica.go.jp/activities/issues/transport/ku57pq00000zzbte-att/2013SAGB_02ENG.pdf
	Development of priority transport corridors	Not known	TBD	Programme for Infrastructure Development in Africa (PIDA) and the Regional Economic Coordination initiatives (RECs) have identified development corridors to foster regional economic growth and integration through infrastructure development	http://pages.au.int/infosoc/pages/program-infrastructure-development-africa-pida
Vietnam	Ho Chi Minh City Urban Mass Rapid Transit (MRT) Line 2 Investment Program	1440.5	50 US$M from CTF, 550 US$M from MDBs (540 US$M has been approved by ADB), 332.5 US$M from GoV	These figures are from 2013 (ADB source). At that time, other sources for co-financing of the 508 US$M remaining had to be sought	CIF (2013) Clean Technology Fund Investment Plan for Vietnam, Revision and ADB (2012) Transport Sector Assessment, Strategy and Road Map

	Hanoi Metro Rail System Line 3 Project	1636.9	100 US$M from CTF, 393 US$M from MDBs (290 US$M has been approved by ADB), 267 US$M from GoV	These figures are from 2013 (ADB source). At that time, other sources for co-financing of the 876.9 US$M remaining had to be sought	CIF (2013) Clean Technology Fund Investment Plan for Vietnam, Revision and ADB (2012) Transport Sector Assessment, Strategy and Road Map
	Hanoi LRT Line 3 Extension	Unknown	ADB committed 200 US$M with expected approval in 2015		CIF (2013) Clean Technology Fund Investment Plan for Vietnam, Revision and ADB (2012) Transport Sector Assessment, Strategy and Road Map
	Nhon-Hanoi Metro line project	Unknown	AFD committed 143.65 US$M in July 2014	This project seems to be commissioned only in 2016	CIF (2013) Clean Technology Fund Investment Plan for Vietnam, Revision and ADB (2012) Transport Sector Assessment, Strategy and Road Map
Industrial energy efficiency sector					
Chile	National Energy Efficiency Plan 2010-2020	914	427 US$M from government	The study covers different sectors: buildings, appliances, industry & mining, transport and electricity.	Universidad de Chile (2010)
	Renewable Energy Self-Supply and Energy Efficiency (RESSEE) RESSEE preparation grant	1,941.8	CTF, GoC, IDB loans, IDB's Canadian Fund loan, IBRD grants, IDB grants, GEF, IFC loans, Bilateral (KfW and LAIF) and other private sector sources		Universidad de Chile (2010)
India	National Mission for Enhanced Energy Efficiency (NMEEE)	1,980	50 US$M CTF 1930 US$M Private Sources (no further breakdown was provided)	This funding is for the Super-Efficient Appliances Development project is envisaged for five years, from 2012 to 2016	CTF INVESTMENT PLAN FOR INDIA, October 2011 https://www.climateinvestmentfunds.org/cif/sites/climateinv

					estmentfunds.org/files/CTF_India_investment_plan_101411.pdf
	Partial risk guarantee scheme for new technologies in energy efficiency	1,885	20 US$M Government of India, 25 US$M CFT, 20 US$M GEF, 50 US$M ICF, 1885 US$M Private Sources (no further breakdown was provided		CTF INVESTMENT PLAN FOR INDIA, October 2011 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_India_investment_plan_101411.pdf
	Scaling up renewable energy and energy efficiency investments in the private sector	1000	Provided by CTF, IFC and a variety of sponsors/ other lenders.	Finance will be provided 50% Direct, and 50% Wholesale	CTF INVESTMENT PLAN FOR INDIA, October 2011 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_India_investment_plan_101411.pdf
	Energy Conservation in Small Tea Processing Units in South India	2.05	0.95 US$M GEF, 1.1 US$M Co-financing by GOI/other stakeholders related to project implementation	Sponsoring agency: United Nations Development Programme (UNDP) Supported by: Ministry of Environment & Forests (MoEF), Ministry of Commerce, Government of India (GOI)	http://www.iipnetwork.org/IIP-IndiaFinancing%20Landscape.pdf
	UNDP – Removal of Barriers to Energy Efficiency Improvement in the Steel Rerolling Mill Sector	30.75	GOI, FIs, and project promoters	6.75 US$ M for TA	http://www.iipnetwork.org/IIP-IndiaFinancing%20Landscape.pdf
	Industrial Energy Efficiency Project (IEEP)	150	ADB	A total of 26 subprojects involving 31 energy	http://www.iipnetwork.org/IIP-

				improvement schemes were funded under this effort.	IndiaFinancing%20Landscape.pdf
South Africa	South Africa Industrial Energy Efficiency Initiative	15	IFC and AfDB	Finance to support private sector energy efficiency (EE) projects through collaboration with Financial Intermediaries (FIs) and Energy Services Companies (ESCOs)	CIF (2013) Clean Technology Fund Investment Plan for South Africa https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_TFC.12_6_Update_of_CTF_Investment_Plan_for_South_Africa_.pdf
	Manufacturing Competitiveness Enhancement Programme (MCEP)	Budget allocation: Approx. 516	Government of South Africa	To date, 110 applications have been approved for grants valued at $ 4.7 million (R512.5 million) (under the Production Incentive and the Working Capital Loan Facility). Sectoral distribution as follows: • Agro-processing: $ 3.5 million (R384 million) • Metals: $ 1 million (R111 million) • The remainder spread across the chemicals, plastics, electro-technical, printing and film sectors	Industrial Policy Action Plan http://www.thedti.gov.za/news2013/ipap_2013-2016.pdf USD $ 516 has been calculated based on R5.8 billion, and a South African Rand to USD exchange of 0.09.
Vietnam	ADB Industrial Energy Efficiency Project	50	ADB pledged 50 US$M in 2009 (concessional loans)	ADB decided to cancel this project in 2013 due to underperformance	CIF (2009) Clean Technology Fund Investment Plan for Vietnam http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/vietnam

					_investment_plan_kd_120809_0.pdf
	ESCO-led EE programs	265	Combination of: Government of Vietnam, ADB, CTF, Carbon Fiancé, GEF, Private Sector, and other co-financing.		CIF (2009) Clean Technology Fund Investment Plan for Vietnam http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/vietnam_investment_plan_kd_120809_0.pdf
Renewable energy in the power sector					
Ecuador	6 Hydropower plans under construction, capacity of 200-1500 MW	200	Chinese loans – 7% interest rate, Government of Ecuador	There are currently 6 hydropower plants under construction (operational in 2016). The largest is the Coca-Codo-Sinclair (1500 MW) whose estimated cost is $ 2 billion of which $ 1.68 will be covered by loans from China. The plant is owned by a state-owned company Coca-Codo-Sinclair EP.	http://www.laht.com/article.asp?ArticleId=358131&CategoryId=14089 Ministerio de Coordinación de los Sectores Estratégicos (2012): Catálogo de Inversión para los proyectos Estratégicos.
	3 geothermal power plants (40-90 MW)		Not known	Ecuador is planning to build three geothermal power plants (Chacana, Chachimbiro, and Tufiño) to be operational in 2020-2021. The feasibility studies have been completed but there are no official investment needs estimates published by the GoE.	The estimates of the energy generation potentials vary; these estimates are taken from: https://www.celec.gob.ec/index.php?option=com_content&view=article&id=102&Itemid=258

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http://www.unep.org/transport/lowcarbon/Pdf's/BRT_Casestudies_India_fullreport.pdf

Appendix B: Climate Investment Plans

This Appendix provides extracts from the country's climate investment plan, produced for the Climate Investment Funds (CIFs) (where available). It highlights the current project pipeline:

B.1 Chile

The government of Chile has designed a plan that taps US$200 million from the Clean Technology Fund (CTF) to address key risks, costs, and liquidity barriers by providing concessional financing and technical assistance intended to stimulate the development of Chile's solar power and energy efficiency markets. Chile's CTF investment plan was drafted under the leadership of the government in coordination with the Inter-American Development Bank (IDB), members of the World Bank Group (IBRD, IFC), and key Chilean stakeholders. Chile's CTF funds are expected to leverage over US$1 billion.

B.1.1 Transport

There were no investment plans outlined for projects or programmes for the transport sector in Chile.

B.1.2 Industrial Energy Efficiency

IDB/IFC: Renewable Energy Self-Supply and Energy Efficiency (RESSEE)

The goal of this program is to fast-track the scale-up of Renewable Energy Self-Supply and Energy Efficiency projects in order to decrease the carbon footprint of Chile's energy matrix.

The program objective is to promote the market development for RESSEE projects by increasing the demand of potential off-takers and removing financial barriers. Financial access will be developed in coordination with capacity building through RESSEE preparation grant among off-takers, LFIs, and technical service providers. The projects targeted are small-scale and will be financed either by LFIs, a government agency, or a private fund. The preparation grant of RESSEE will design how CTF funds will be channelled.

IDB/IFC: RESSEE preparation grant

The preparation grant of the RESSEE program will contribute in overcoming the barriers by providing tools to the market such as potential sub-economic sectors, workshops to key stakeholders and pilot projects ready for financing. The RESSEE preparation grant includes the following activities:

- Market development (executed by IDB) intended to validate and refine the target market and develop concrete actions to reduce the entry barriers for energy efficiency (EE) and renewable energy self-supply (RESS) production schemes
- Capacity development (executed by IFC) aimed to increase awareness, knowledge and expertise of key stakeholders in the market

- Project development (executed by IDB) to develop a series of EE and RESS production pilot projects ready for financing by documenting the entire process so as to provide guidance for future projects
- Identification of possible financial structures and mechanisms (executed by IFC)
- Program evaluation (executed by IDB) to develop the design of a randomized experiment or other methodology to evaluate the impact of the intervention

The investment plans for both these initiatives are outlined in the table below, columns titles "Component III" and "Component IV".

Financing source	Component I (CSPP)	Component II (LSPVP)	Component III (RESSEE)	Component IV (RESSEE Prep Grant)	Component V (MiRiG)	TOTAL
CTF loans and grants	67	50	49	1	33	200
GoC	20	0	20	0	14.5	54.5
IDB loans	125	50	50	0	50	275
IDB's Canadian Fund loan	30	0	0	0	0	30
IBRD grants	0	0	0	0	0.5	0.5
IDB grants	1	0	0	0	0	1
GEF	0	0.6	2.8	0	0	3.4
IFC loans	0	50	50	0	0	100
Bilaterals (KfW & LAIF)	148.6	295	0	0	0	443.6
Other private sector	109.4	274.4	250	0	200	833.8
TOTAL	**501**	**720**	**421.8**	**1**	**298**	**1,941.8**

Co-financing figures to be revised at the time of program design

B.2 India

There are four priority initiatives being proposed in India for CTF funding:

- Himachal Pradesh: Development Policy Loan on Environmental Sustainability and Climate Change
- Support for the National Mission for Enhanced Energy Efficiency (NMEEE)
- Partial Risk Guarantee for Energy Efficiency Technologies
- Support to the Jawaharlal Nehru National Solar Mission (JNNSM)

B.2.1 Transport

Rajasthan Urban Transformation (ADB)

Part of this project aims at reducing emissions from transport, as well as municipal solid waste disposal, sewage treatment, and buildings. There was only an indicative financial plan for the whole programme, not broken down for transport.

Source	Amount (US$Million)
Government Agencies	90
Project Sponsors / other lenders[a]	TBD
Carbon Finance[b]	0
ADB	300
CTF	100
Total	490

Eastern Dedicated Freight Corridor

The Eastern Dedicated Freight Corridor Project (DFC) has been given a high priority among the government‘s infrastructure programs owing to the large impact it will have on freight transport in the country. It seeks to expand freight capacity and increase Indian Railway (IR) share of the national freight market with far reaching impacts on both transport costs and energy consumption in the transport sector. From an energy consumption perspective, the proposed project seeks to significantly shift the mode of freight transport from road to rail, and through systems optimization, it will enhance the carrying capacity of high-value export cargoes and critically needed energy supplies, as well as improve the competitiveness of passenger service with buses. Finally, the Eastern Dedicated Freight Corridor Project will invest in the construction of electric tracks, rather than using the conventional diesel locomotives.

Indian Railways (IR) is the fourth busiest railway in the world in terms of total traffic unit-kilometres carried. As a result of the rapid growth of IR‘s freight traffic, from 557 million tonnes in 2004 to 833 million tonnes in 2009, the line capacity utilization on IR‘s most heavily trafficked routes exceeds 100% by a significant margin. The four routes that form a quadrilateral connecting Delhi, Mumbai, Chennai and Kolkata, are the most heavily trafficked. While these routes, better known as the
Golden Quadrilateral (GQ) account for just 16% of the network‘s track length, they carry more than 60% of the total freight transported by IR. With freight traffic in the country projected to grow at more than 7% per annum, IR urgently needs to add capacity on these routes. Recognizing this, the government approved an IR proposal to establish dedicated freight-only lines, paralleling the existing Quadrilateral routes.
Emissions from the transportation sector contributed to about 8 % of energy based emissions in 2004, but it has the fastest growing GHG emissions of any sector.

As India grows and gets further interconnected, the GHG emissions are likely to accelerate if the current trend continues. Projections indicate that the share of transport related GHG emissions will continue to rise and should other sectors achieve moderate levels of efficiency, GHG emissions from the transportation sector could reach 25% of India‘s total GHG emissions within a couple of decades. This is due in large part to the expected growth rate of vehicle population in the country, which has experienced an increase of 5 to 15% per annum depending on the class of vehicles. India‘s transport sector has mixed ownership and management, with the public and private sector participating in both development and operation of transport services[31]. The institutional arrangements reflect the complex arrangements between the various government entities at the Central and State levels in the country.

Railway transport has always played an important role in the land transport market. So far, the existing railway transport system has not caught up with the increased demand derived from the country‘s recent rapid economic growth. The investments in both Eastern and Western Freight Corridors are an attempt to significantly improve rail

transport in the country. It is expected that these projects will increase rail share of container transport, and lead to efficiencies in transport.

However, the planned modal shares may not materialize if:

- The demand for bulk transport outweighs the capacity expansion
- Travel speed by road becomes faster due to the introduction of more modern trucks and highway network expansion
- Adequate intermodal systems are not established

The proposed financing plan:

Financing Plan (US$m)			
Source	**Local**	**Foreign**	**Total**
Borrower:			
APL 1 Khurja - Kanpur	483.44	0.00	483.44
APL 2 Kanpur - Mughal Sarai	538.00	0.00	538.00
APL 3 Ludhiana – Khurja	365.00	0.00	365.00
International Bank for Reconstruction and Development:			
APL 1 Khurja - Kanpur	0.00	975.00	975.00
APL 2 Kanpur - Mughal Sarai	0.00	1,050.00	1,050.00
APL 3 Ludhiana – Khurja	0.00	700.00	700.00
Total:	**1,386.44**	**2,725.00**	**4,111.44**

B.2.2 Industrial Energy Efficiency

Implementation support to national mission on enhanced energy efficiency (World Bank)

In recent years, India's energy consumption has been increasing at one of the fastest rates in the world due to population growth and economic development. Commercial primary energy consumption in India has grown by about 700% in the last four decades. Driven by the quest for improved quality of life, energy usage in India is expected to grow at an exponential rate. Since close to 70% of the energy needs are met by coal, the energy sector alone accounts for half of India's carbon-dioxide (CO_2) emissions. In such a scenario, enhancing energy efficiency is the fastest and cheapest means to save energy, for national energy security as well as for reducing GHG emissions. At present India is fifth lowest in the energy efficiency in the world but studies suggest that there is a huge potential for substantial improvement

With National Mission for Enhanced Energy Efficiency (NMEEE), India has embarked on an ambitious plan to cut its energy consumption with the following policy aims:

- Reduction of 98 million tons of carbon dioxide emissions annually by 2014-15
- Avoidance of electricity generation capacity addition of 19,000 MW
- Save fuel in excess of 23 million metric tons of oil equivalent (mMtoe)

The proposed CTF intervention has the potential of buy-down costs through investments by early stage adopters, assisted through financial incentives.

Transformational change could be achieved by changing the energy usage in industries through market-based incentive mechanisms rather than regulation. Such systems change the nature of policy actions, like regulation, in the industrial sector.
The CTF would provide concessional financing to support two specific programs under NMEE, as follows: A $50 million fund to accelerate the deployment of Super-Efficient Fans (under SEEP).

The duration of the first period of the Super-Efficient Appliances Development project is envisaged for five years, from 2012 to 2016. The proposed financing plan is outlined below:

	Support to NMEEE SEEP (2012-16)
Sources	
CTF	50
IBRD	
Private Sources	1,930
Total	*2,000*

Partial risk guarantee scheme for new technologies in energy efficiency

Accelerated deployment of low-carbon energy technologies in the rapidly growing Indian economy could help to bring down the trajectory of growth in global carbon dioxide emissions. The Integrated Energy Policy Report, 2006, estimates that India will need to increase primary energy supply by three to four times and electricity generation by five to six times from 2006 to meet the lifeline per capita consumption needs of its citizens and to sustain an eight percent growth rate. The government plans to provide universal access and to increase per capita consumption to 1,000 kWh by 2012. This translates to an installed generation capacity requirement of approximately 800 GW in 2031-32 compared to the installed capacity of 160 GW in 2010 (at 8% GDP growth rate). In the backdrop of this unprecedented growth in energy demand, the Government of India's Nehru Solar Mission (NSM) and National Mission on Enhanced Energy Efficiency (NMEEE) under the National Action Plan on Climate Change have provided policy goals to achieve a higher penetration of low carbon options. While NMEEE aims to increase the energy efficiency of the country by 20%, the NSM aims to achieve solar energy installations of 20GW by 2020.

Some of the biggest barriers to wider adoption of EE measures relate to the understanding of energy efficiency technologies by financial institutions, availability of commercially proven technologies on energy efficiency, lack of developed market for ESCOs and higher discounting rates applied by decision-makers to such investment due to high current capital costs and uncertainty of future returns.

Slow adoption of commercially-available and proven-at-scale alternative energy options can have several consequences including higher costs of debt. Financial institutions and commercial banks are averse to investing in projects whose technologies or processes have not been deployed widely due to their perceived higher-risks in construction and operation, leading to higher costs of debt and smaller allocation in their lending portfolios. The nature of a Partial Risk Guarantee (PRG) magnifies private investment in new technologies, generating leverage. Under the NMEEE, the Bureau of Energy Efficiency (BEE) is currently setting up a small PRG facility, which has been seeded with an initial capital of USD 20 million from the Government's own budget. It is expected that the GoI-funded Phase I of the PRG will leverage EE investments of 30 times[20] the initial corpus value. Large RE capacity

investments and enhanced EE equipment in an economy of India's size will bring down unit costs of new technologies for other emerging countries of the world as well, providing for global benefits.

Based on prior experience with risk-sharing facilities from the World Bank's and IFC's operations, it is expected that about 10% of the corpus available for risk-mitigation will be called on. Assuming a 2:1 debt to equity ratio, the concessionary resources will be leveraged about 30 times[21]. Divided in two phases, the financing plan would be as follows:

Partial Risk Sharing Facility	
Sources	**US$ m**
Govt of India	**20**
CTF (IBRD)	**25**
GEF	**20**
IFC	**50**
Private Sources	**1,885**

Scaling up renewable energy and energy efficiency investments in the private sector (IFC)
Financing plans will be developed at the proposal stage. The following is a conceptual financing plan for indicative purposes.

Source	**Wholesale Finance**	**Direct Investment**	**Total (US$ million)**
Sponsors / Other lenders	300	300	600
IFC	150	150	300
CTF	50	50	100
Total	**500**	**500**	**1,000**

B.3 South Africa

To address its energy needs and reduce its GHG emissions, South Africa will tap US$500 million from the Clean Technology Fund (CTF) for investments in renewable energy and energy efficiency. South Africa's CTF investment plan was drafted under the leadership of the government of South Africa in coordination with the African Development Bank (AfDB), members of the World Bank Group (IBRD, IFC) and key South African stakeholders.

B.3.1 Transport

The Vehicle Efficiency Programme (VEP), fuel switching programme that involves the conversion of conventional diesel/petrol engines of the existing vehicle fleet to dual fuel system (liquid fuel/CNG) including implementation of related infrastructure (e.g. filling stations). The vehicle fleet considered for the programme are the public transport fleet, i.e. buses and minibuses/taxis, government buses/minibuses and heavy freight trucks with expected CO_2emissions reduction of 50-60% per unit

depending on vehicle category or type. A sequel to Phase 1B (i.e. Phase 2) is anticipated, expanding the project footprint across the national public transport network, based on the replicability and scalability attributes of VEP. The overall programme aimed at transforming the transport sector from 'business as usual' practices towards making climate change and low-carbon economy central to its investment is referred to as the Technological Transformation Programme on Sustainable Transport for South Africa (TTP-STSA).

An accurate cost estimate will be derived from further analysis and a detailed design exercise. However, historical cost data from the pilot project has been used, taking into account a 10% reduction for economies of scale: R16,000 per unit for taxi and R180,000 per unit for trucks and buses. Excluding the cost of the hard infrastructure, estimated cost is USD 375 million. Based on the balance from the phase 1 window, estimated as between USD 50 million and USD 100 million, the financing plan assumes a minimum allocation of USD 57.5 million to phase 1B VEP. This funding came from CTF funds that had been previously allocated to the Energy Efficiency Sub-Component of the Sustainable Energy Acceleration Program and Solar Water Heater Sub-Component.

Based on this phase 1B pilot, the demand for the VEP programme is likely to increase significantly. An aggregated total on all fleets comprising buses, taxis and trucks to be converted under the program is estimated as 4000 during the first two years of the project (a critical learning period for the project) and 38,000 units for the full programme over a 20 year period. The tentative financing plan is outlined in the table below. Funding for the Bus Rapid Transit part of the TTP-STSA (Component II) has not yet been decided.

Financing source	***TTP-STSA***		
	Component I (VEP)	***Component II (BRT)***	***Total***
CTF executed by AfDB	57.50	TBD	57.50
ADB Loans	257		257
GoSA (including provincial government)	60.50		60.50
TOTAL	**375.00**		**375.00**

B.3.2 Industrial Energy Efficiency

A joint initiative of the IFC and AfDB, the sub-component aims to support private sector energy efficiency (EE) projects through collaboration with Financial Intermediaries (FIs) and Energy Services Companies (ESCOs). More specifically, the programme developed under this sub-component seeks to encourage transformation of the energy efficiency sector by establishing a source of funding for on-lending by FIs to small and medium-sized industrial operations for investments in energy efficient equipment.

Lenders		CTF allocation (Planned)	CTF commitment (Actual)	Balance
CTF	IFC	7.5	2.3 (31%)	5.2 (69%)
	AfDB	7.5	0	7.5 (100%)
Total		15.0	2.3 (17%)	12.7 (85%)

B.4 Vietnam

The high-level overview of the financing requirements for Vietnam's proposed programs and projects through the CTF are outlined in Table 13.

Table 13: Project Financing Plan (indicative, US$ million)

Financing Source	Proposed Programs and Projects					
	Industrial Energy Efficiency (ADB – Annex 1)	High Voltage Transmission Technology (ADB – Annex 2)	Urban Transport (ADB – Annex 3)	Smart Grid Technology (IBRD – Annex 4)	Clean Energy Financing Facility (IFC – Annex 5)	Total
MDBs	40	260	500	180	200	1,180
GOV	25	40	100	100	0	265
CTF	50	50	50	30	70	250
GEF	0	0	0	0	0	0
Carbon Finance	10	0	0	0	0	10
Other Co-financing	40	200	500	0	0	740
Private Sector	100	500	0	0	900	1,000
TOTAL	265	1,050	1,150	310	1,170	3,445

Source: ADB and IBRD country programs; financing plans in Annexes 1-5; ADB, IBRD, and IFC staff estimates; IFC discussions with commercial banks and potential project sponsors.

B.4.1 Transport

The transport sector currently contributes about one fourth of energy-related GHG emissions, slightly less than electric power generation. GHG emissions are projected to increase at approximately the same rate as for power generation and industry. A large percentage of the population now owns motorbikes, with a smaller percentage owning cars. In addition, car ownership is expected to increase dramatically as incomes continue to increase.

Table 14 shows GHG-reducing interventions in the transport sector in Vietnam. The table lists the potential savings compared with current trends and government plans, and associated order-of-magnitude costs. The table also shows that the planning and construction of urban rail systems in Vietnam's two major cities has begun and that GOV is working on biofuels and CNG busses.

Table 14: GHG Reductions in the Transport Sector in Vietnam

Sector/Sub-sector	Activities planned or underway	Potential Emissions Reductions	Indicative Costs
Urban Rail	Initial construction on 5 lines in Hanoi; initial design stage for 6 lines in HCMC	1.6 $MtCO_2e/y$ reductions in major cities (from rail lines plus connectivity investments)	US$50-150 million / km
Bus Rapid Transit	n/a	0.33 $MtCO_2e/y$ reductions in Hanoi and HCMC	US$2-10 million / km
Electric vehicles	n/a	4.2 $MtCO_2e/y$ reductions by introduction of electric motorcycles replacing 50% of fleet	(US$3500 / motorcycle?)
Fuel switching (CNG, LPG, and biofuels)	Pilot testing of CNG in HCMC buses; initial biofuel production	E10 and B10 targeted by 2020; E20 potential is 1.6 $MtCO_2e/y$ reductions	Development funding needed for feasibility studies and front-end engineering design

Sources: CTF Joint Mission notes; GHG reduction estimates from ADB (for urban rail) and World Bank Carbon Finance Assist (for other interventions).

Priority activities GoV is proposing to use CTF financing to provide enhancements to the urban rail projects being planned in Ho-Chi Minh City and Hanoi, and develop a comprehensive urban public transport system. The project responds directly to the government's priority on addressing pollution levels in dense urban areas (identified during the Joint Programming Mission to focus CTF resources). The ADB project will strengthen linkages between transport modes (buses, other public transport, private transport modes), which will increase the catchment areas of the new urban rail lines. A variety of measures will be developed including introduction of high efficiency buses (hybrid technology and cleaner fuels), urban rail/bus interchanges and integrated ticketing, park and ride facilities in urban outskirts, and modified parking charges in the core urban areas. The introduction of low carbon buses will set an example for fuel efficient public transport vehicles across Vietnam. In addition, policy reform measures will be developed that are aimed at discouraging private vehicle usage and encouraging public transport patronage. These measures will be initially designed for the Ho-Chi Minh City Line 2, and then adapted to the Hanoi Line 3 periphery. But the same measures can be applied at all 6 lines in Ho-Chi Minh City and all 5 lines in Hanoi.

The indicative financing plan for the 'URBAN TRANSPORT PROGRAM' project is shown in the table below:

Source	(US$ million)
GOV	100
ADB	500
CTF	50
Carbon Finance	0*
GEF	0
Other co-financing	500
Private Sector	0
Total	1,150

Note: * The possibility of carbon finance has not yet been evaluated.

B.4.2 Industrial Energy Efficiency

Table 15 shows the savings that are possible from EE interventions in Vietnam. The table summarizes examples of EE interventions in the industrial and in the commercial/ residential/ public sectors, as well as in power transmission and distribution. The table shows the potential energy savings compared with projected business-as-usual consumption in 2010 and the order-of-magnitude costs of these interventions if they were implemented. The table also reports measures that have already been implemented in these sectors.

Table 15: Energy Efficiency Interventions and Savings in Vietnam

Sector/Sub-sector (examples of Interventions	Already Implemented	Potential Savings	Indicative Costs
Industrial EE (e.g., efficient drives, distributed generation, co-gen and tri-gen using natural gas)	Time-of-use meters have been installed at 5600 consumers; scale up by PCs and LDUs	15 – 20% annual savings on 2010 consumption = 2 – 2.7 mtoe/y = ~ 5 – 6.7 $MtCO_2e/y$	< US$1 million / MW
Commercial, residential, and public sector EE (e.g., including lighting, space cooling, refrigeration, water pumping)	Compact fluorescent lamps (CFL) and T8 tube lamps have been introduced and scale-up is planned	10 – 30 % annual savings on 2010 consumption = 1.3 – 3.9 $MtCO_2e/y$	< US$0.1 million / MW (total project cost) [Philippines Energy Efficiency Project, ADB 2009]
Transmission and distribution loss reductions (incl. high-voltage conductor technology and Smart Grid)	System losses have been reduced to about 10% for EVN-managed grid. Losses in LDU-operated systems may still be as high as 25%.	3% reduction in T&D system-wide losses [on 190 TWh increase from 2010-2030 @ 0.65 tCO_2e/MWh] = ~ 3.7 $MtCO_2e/y$	Incremental cost based on further reductions of 3%

Source: ADB technical assistance reports; WB CF Assist 2009
LDUs = local distribution utilities, PCs = Power Companies

The energy intensity in the Vietnamese industrial, residential and commercial sectors is high and the power sector still experiences transmission and distribution losses above international benchmarks. Possible interventions for demand and supply side EE, which could be co-financed by the CTF include:

- Industrial EE (ADB): Investments in waste heat recovery and other measures at 10 enterprises with average production capacity of 1.5 million tons per year each would cover about 25% of the cement sector output. The investments directly supported by CTF are estimated to achieve at least 10% savings of electricity and coal consumption. Total energy savings of 26% at the 10 enterprises would deliver a total of 1.8 Mt CO2e/y reductions. The CTF co-financed investments could be replicated throughout the sector, covering up to 40 enterprises by 2030, with total emissions reductions of 7.8 Mt CO2e/y, representing about 25% of current total industry sector emissions. Similar efficiency measures would be incorporated into the design of new installations in the cement sector and in other industrial sectors.
- ESCO-led EE programs (ADB) and initial capitalization of an Energy Conservation Fund (ADB): In parallel with the industrial EE activities, ADB plans to support an expansion of the nascent energy service company (ESCO) business and the GOV-

proposed Energy Conservation Fund as investment vehicles to promote replication and scale-up of EE activities. The ESCO activities would cover small and medium size enterprises (SMEs) and the commercial sector. In addition, to performance contracting, other service modalities can be utilized to facilitate quick expansion of 3rd-party EE services. Providing start-up capital for the Energy Conservation Fund will also enable rapid start-up of operations to accelerate expansion of EE investments. Replication using these investment vehicles would result in an additional 10 Mt CO_2e/y reductions.

- The indicative financing plan for the project is shown in the table below.

Source	Total (US$ million)
GOV	25
ADB	40
Other co-financing	40
CTF	50
Carbon Finance	10
GEF	0
Private Sector	100
Total	265

- New financing for private sector investment in EE (IFC): Proposed interventions include risk sharing facilities, lines of credit, mezzanine finance facilities, and capacity building programs to help address perceived risks and mobilize local financing to support EE and clean production in the industrial, commercial and residential sectors, as well as direct investments in RE project development.

The following is a conceptual financing plan for the proposed investments of risk sharing facilities, line of credit, mezzanine finance facilities, and direct financing to RE/EE/CP projects. This indicative financing plan has been formulated according to IFC's experience in designing and implementing similar financing mobilization programs in other developing countries. The targeted mobilization of up to US$1.17 billion to support RE/EE/CP shall be achieved in the next few years. Detailed financing plans for each transaction will be developed at the project proposal stage.

Source (US$ million)	RE	EE/CP	Total
Sponsors / Other lenders / Carbon Finance *	400	500	900
IFC	90	110	200
CTF	40	30	70
Total	530	640	1,170

Note: * The possibility of carbon finance has not yet been evaluated.

B.5 Ecuador

There was no climate investment plan available for Ecuador on the CIF website. Further information could not be provided.

B.6 Sources of Information:

CIF (2013) Clean Technology Fund Investment Plan for Chile, Revision

https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_IP_Revision_Chile_Sept2013.pdf

CIF (2011) Clean Technology Fund Investment Plan for India
http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_India_investment_plan_101411.pdf

CIF (2013) Clean Technology Fund Investment Plan for South Africa
https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_TFC.12_6_Update_of_CTF_Investment_Plan_for_South_Africa_.pdf

CIF (2009) Clean Technology Fund Investment Plan for Vietnam
http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/vietnam_investment_plan_kd_120809_0.pdf

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