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Karachi Circular Railway in CPEC, Potential for CDM

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ABSTRACT

In developing counties transport development is closely linked to economic progress, however in case of Pakistan the development of transport projects increase burden to the national and provincial budget in terms of development expenditures but also in shape of subsidies provided to these projects for the operation and maintenance. Considering transport sector development, the Government of Sindh is going to develop Karachi Circular Railway (KCR) project, which costs around US $ 205 – US $ 207 million, under China-Pakistan Economic Corridor (CPEC), through which a Chinese firm will design and construct the project on Engineering, Procurement and Construction (EPC) basis. As the transport activities includes numerous health and environmental harms, this project can be helpful for earning significant non-fare revenue, which can be helpful for returning of this loan or either meeting some operation & maintenance expenditures. KCR under CPEC may explore the project portfolio of the Clean Development Mechanism (CDM), which is expanding rapidly, though there are limited numbers of transport sector project. Through this paper we examine the situation of transport sector projects in CDM. This include some of the successful projects registered in CDM, based on the data related to fleets, cars, motorbikes, and other vehicles the potential carbon emission and shifting mode of transport from personal vehicles to KCR, potential of KCR project as CDM project and way forward to gain carbon financing. We may conclude that it is possible to design the project design document for CDM project of KCR under CPEC as the project boundaries fit into the framework of CDM. However due to repetitive projects scope we need some additionality in the project like solar power stations, lighting and other measures to reduce the carbon beside the railway network.

Keywords: Karachi Circular Railway, CPEC, Clean Development Mechanism, public transport

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1. INTRODUCTION

Karachi is the port city with plenty of working and job opportunities. This create a magnetic attraction to the people across the country. The increase population however increase the pressure on city to be livable. There is an increase in the commuting costs, traffic congestion, increasing road accidents, environmental pollution and all other social and cultural problems even became bigger. The absence of mass transportation system will further be aggravated. After the energy production the transport especially, motor vehicles are major contributor to urban air pollution on most of the Pakistani cities. These pollutants can be CO, HC, NOx, SPM and SO2, Karachi is facing unprecedented motor vehicle growth, particularly in personalized mode of transportation. As a result, Karachi is experiencing serious urban traffic and environmental pollution related problems. Karachi said to be an arid zone base on the geographical location, this contributes to High dust particles / suspended particulate matters, inadequate and unpaved roads contribute the re-suspension of dust in the city. Other sources are dust from vehicles, construction, and demolition. The other category of vehicles comprising of light motor vehicles, trailers, tractors, buses, etc. In contrast to personalized mode of transportation (two wheelers and cars), the share of buses in total registered vehicles has gradually increased, showing a gradual neglect of public transportation system regarding the personalized mode of transportation.

In the absence of the comprehensive transportation system, heavy burden on the inadequate public transport, no dedicate lanes or any other traffic management, the city's existing public transport system have only 4.5% of the total vehicles fleet and serves about 42% of the commuter's demand. The majority used the private vehicles for commuting, which are estimated 36% of the total vehicular traffic however contain only 21% of the passengers. Another mode is para-transit (Rickshaw, Taxis) are about 10% of the vehicles on road and comparatively picking up 8% of the total customer which is good numbers of customers as of its size. Another mode is contract carriages 2% of the vehicles fleets however carry 10% of the total passengers1. The buses carry majority of the commuters which is about 5.6 million per day, accounting of 42% of the total motorized travel modes. There are approximately 21,800 buses registered and operated on road, which means a bus carries an average 257 passenger per day. As the demand of the KCR increases, based on its effective, efficient operations and maintenance, it is expected and understandable that the commuting pressure on existing road traffic will reduce due to mode shifting and passenger will transfer from the existing modes to the KCR.

KCR will be operated in 6 sets of locomotives with capacity of 17,520 trips per hour per direction (tphpd), the initial demand was forecasted at 14, 524 tphpd and the system has the reserved capacity of approximately 17%. As the demand will increase over the span of time (long-term demand), the system will carry 23,421 tphpd, to control this the number of peak house trains (pairs) shall be increased, with maximum designed transport capacity being 26,280 tphpd.

2. REVIEW OF LITERATURE

2.1 Background of the KCR:

The KCR was one of commercially profitable and technical reasonable transport project in 1970's and 1980's. it was introduced in 1964 to provide alternate, cheap and rapid transport system, the project was completed in two phases in 1969. However due to many unforeseen reasons the service was shut down and open many times between 1990 to 2005. The major reasons came out were poor upgradation of infrastructure facilities, ticketing problem unavailability of engines, train time management, dirty and untidy passengers' cars floor. Karachi face serious social and violation problems as well, that become hindrance in developing and upgrading the infrastructure required to run KCR smoothly. On the other hand, unauthorized encroachments at stations, nearby railway tracks, make it more problematic to operate KCR. The first revival plan of 1999 was a failure due to unstable government, law & order situation, weak governance and institutional barriers.

The population of Karachi increased rapidly. Natural growth, development, rural migration towards urban areas, migration due to climate impacts are the factors that caused serious increase in population and thus the need of commuting services also increases. This time financial institutions provided financing and loan facilities for public to buy cars. This become a major loss as people prefer their own car instead of travel by mass transit.

In 2006 JETRO, carried out the financial and technical study for the KCR. It was a comprehensive study to cover Railway Line, Traction Power Supply, Train Operation Safety System, Transport Control System, Headway at peak hour, Train formulation, Required number of train-sets, Depot, Year to be opened, Operating Sections, demand forecast, Section of Maximum Passengers Volume, Maximum Passengers Volume in Peak Hour (Passengers/Peak Hour-Direction), Total number of trains （per day), Cost, Economic Analysis and Financial Analysis.

The reopening of the KCR will revitalize the commuting and assist in improving the living and social conditions for its citizens by offering an initial step in the provision of a solution to the

chronic traffic congestion problems. However, the reopening of KCR should not be a stand-alone solution in the overall transport problems for Karachi but must integrate with other priority plans in order that the future travel needs. In this respect, the KCR project should integrate with the wider transportation plans of the CDGK/KMTC and its priority transport corridors plan. The KCR, in itself may not possess the capacity of acting as the prime mover of commuter traffic in Karachi. Nonetheless, it has a sound potential of linking up with other modes of regular and mass transit systems to provide sustainable, environment friendly, efficient and affordable means of transport. As KCR become the part of CPEC people of Karachi have high hopes to see KCR running within few years.

The introduction of Karachi Circular Railway will be more sustainable if the economic and environmental factors will be added with the societal benefits. This will be possible when adopting the high-speed rail system, using of alternative fuel source and ensuring efficiency of energy use. The project monitored ambient air quality along the Karachi cycle and sampled at various locations, the monitoring items included CO, CO2, NOx, SO2, and PM10, taking into account wind speed, wind direction, temperature and relative humidity and other meteorological data. Ambient air pollution sources mainly are diesel rolling stocks and motor tricycles, fixed sources of pollution mainly from several factories near the exhaust emissions and construction activities of the dust. According to the Air Quality Supplementary Monitoring of SUPARCO. when the ridership from road (mostly by personal cars) shift to rail network, the estimation and reduction of emission (CO, CO2, NOx, Sox, HC and PM). Based on the estimation of KCR initial report we will try to find out and analyze the situation.

2.2 KCR Project CPEC:

“The KCR is the integral part of the comprehensive Mass Transit System envisaged for this mega city. There is a high public demand for the KCR with ample ridership of 700,000 per day. Karachi is among the most populated cities of the world and there will be ample returns on any investment made in the city in wider economic terms. These economic benefits include reduced vehicle operation cost and travel time cost. It should be understood that a comprehensive mass transit system is the only solution to address the bourgeoning population of this mega city. The work is already been started on various Bus Rapid Transit [BRT] lines, which complemented the KCR and tried to reduce the misery of people.

As far now the joint committee agreed in principal for inclusion of KCR as part of the CPEC component, the working group of transport related project has been asked to work on the

projects based further studies and consultation, the feasibility study was completed in Mar, 2017 and in first PC 1 was completed in July, 2017, the KCR ground breaking ceremony is expected in year 2018.

Under the CPEC projects the KCR and Pakistan's Railway ML-I are the two key projects related to railway and these were the projects which are not only helping in infrastructure development but also helpful in the social development of the citizen. The China Railway Construction Corporation Limited (CRCC), categories ML-I as strategic project and KCR as economically viable project and they are hoping that this KCR project has achieved headway and will hit the ground very soon.

The CPEC which itself is a part of the China Belt & Road Initiative not only focusing the network of rail and road but also providing the facilities to the cities to make them livable. The CRCC is very efficient and professional firm to build this mega project with fast pace. Beside the projects of ML-I and KCR, the CRCC also wants to explore the investment opportunities especially in the economic zones being implemented under CPEC from the government of Pakistan is expected that Chinese firms should ensure capacity building for the local manpower by providing them employment and on job training. CRCC is already working in Pakistan and interested to expend its cooperation in infrastructure and industrial development sectors. The firm also expressed its commitment at various levels to work closely with Pakistan's technical education institute to ensure capacity building of local youth and more employment in future.

2.3 Clean Development Mechanism (CDM):

Clean Development Mechanism –one of the 'flexibility mechanisms' under the Kyoto Protocol stimulates sustainable development and emission reductions in developing countries while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets

Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) is dealing with climate change and mitigation. It is the milestone towards global carbon mitigation efforts. This protocol has resulted in the establishment of carbon markets by adopting the Clean Development Mechanism (CDM). Pakistan ratified the Kyoto Protocol in 1997 and implemented it in 2005. To ensure the smooth functioning of carbon trading business in Pakistan, CDM related infrastructure was developed. Mainly this includes the establishment of CDM Cell in Pakistan, but a number of private consultancies also came into being with the emergence of this mechanism.

The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO2. These CERs can be traded and sold and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets. The CDM is the main source of income for the UNFCCC Adaptation Fund, which was established to finance adaptation projects and programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The Adaptation Fund is financed by a 2% levy on CERs issued by the CDM.The CDM is one among the flexible Kyoto Protocol mechanisms facilitated implementation of Green House Gas (GHG) emission reductions in developing countries. Such GHG emissions are procured

by the developed countries to meet their emission reduction targets under the Kyoto Protocol. The CDM was created to assist non- ANNEX I Parties in achieving sustainable development, transfer of sustainable technologies and contributing to the ultimate objective of the Climate Convention while enabling ratifying Annex I parties to use Certified Emission Reductions (CERs) from project activities in non- Annex I countries- including Pakistan- in order to contribute towards their compliance of national greenhouse gas emission reduction targets during the first commitment period (2008-2012). Under the CDM, ratifying parties Annex I parties are allowed to implement projects that reduce emissions in non- Annex I Parties or absorb carbon through afforestation or reforestation activities. In return, ratifying Annex I parties receive CERs while the project activity assists the host country in their development process and climate change mitigation. As GHG abatement costs in developing countries are expected to be much lower than in industrialized countries the CDM gives the Annex-I country the opportunity to achieve their abatement targets at lower costs while providing sustainable development projects with a mitigation potential to the host country.

The CDM was conceived in order to assist countries with a binding emission reduction target in achieving partial compliance with their country target by carrying out project activities aimed at reducing emissions in the developing countries like Pakistan that yet do not have such obligations. The underlying idea of the mechanism is to take advantage of cost- efficient mitigation options everywhere in the world; in other words, to achieve the same environmental benefits at lower costs, with so- called least- cost abatement measures. The Protocol hence intends to support industrialized countries in reducing their costs of compliance.

In order to preserve a high probability of keeping global temperature increase below 2 degrees Centigrade, current climate science suggests that atmospheric CO2 concentrations need to peak below 450ppm. This requires global emissions to peak in this decade and decline to roughly 80% below 1990 levels by the year 2050. Such dramatic emissions reductions require a sharp move away from fossil fuel, significant improvements in energy efficiency and substantial reorganization of our current economic system. This transition can only be achieved by far-reaching national and international climate policies. Carbon offsetting is an increasingly popular means of taking action. By paying someone else to reduce GHG emissions elsewhere, the purchaser of a carbon offset aims to compensate for – or "offset" – their own emissions. Individuals seek to offset their travel emissions and companies claim "climate neutrality" by buying large quantities of carbon offsets to "neutralize" their carbon footprint or that of their products.

Carbon offset markets exist both under compliance schemes and as voluntary programs. Compliance markets are created and regulated by mandatory regional, national, and international carbon reduction regimes, such as the Kyoto Protocol and the European Union's Emissions Trading Scheme. Voluntary offset markets function outside of the compliance markets and enable companies and individuals to purchase carbon offsets on a voluntary basis.

2.4 CDM for Transport Sector

There are 32 transport projects registered in CDM, mostly targeting the BRT, recently few projects related to MRT's and Metro Trains were registered. The Mumbai Metro One Project and Mode shift of passenger from private vehicles to MRTs for Gurgaon Metro are two projects in India and LRT system in Tunis are similar kind of projects listed and registered in CDM. Registration of a project is required to estimate the emission reduction in period of time. For KCR project the CDM Methodology ACM0016 Ver. 2 and Ver, 4 can be applied with modification, however the additionality shall be considered to make this project acceptable. To develop a CDM project in Pakistan, potential areas have been categorized into few major sectors. These sectors include; energy, solid waste management, industrial processes, and agriculture and forestry. These are the broad areas and every project proponent select one of the suitable areas in which a potential CDM project can be developed. It is worthwhile to mention here that most of the projects from Pakistan are from energy sector. They have been registered with UNFCCC and are being awarded with CERs. Agriculture, forestry and transport are the sectors in which no project could have been registered and approved. This is because of the additionality criteria and specific conditions to meet for the registration.

2.5 CDM in Pakistan

Pakistan is way behind the potential market of CDM adoptability and acceptance, according the UNFCCC CDM Registry total projects registered are 34, in process of registration 14, approved projects (with DNA/CDM Cell) are 48 and Applied for letter of intent are 05. Most of the projects are from energy and power sector in line with the CDM National Operational Strategy. The strategy outlines 6 types of projects that are eligible including energy; land use, land use change and forestry; agricultural and livestock practices; waste management; transportation and; industrial processes. Considering the type of project, KCR and the location it seems there is a market and opportunity to register the KCR project with a carbon offset protocol. Significant revenues can be generated if there are adequate amounts of reductions and for a KCR project, this is through a baseline credit system. At the current stage of analysis both the voluntary and mandatory markets seem like viable options.

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3. METHODOLOGY

3.1 Evaluation of the Potential:

The carbon market has its own potential either it would be mandatory or voluntary this split between the standards and the program provides various types of mechanism for project developer and allowing them for auction their carbons. This auction of emission can be national and international level. The KCR is a large-scale project and the financing sources are available for the project, however it is important to understand that the mechanism of carbon financing have limited demand of absorption capacity and it can be supplementary financing and can't be the to provide significant amount of financing. In Pakistan more, clarity is required in regulatory requirement for the subsidiaries to reduce the carbon emissions, the environmental policy does not apply any taxes, charge on carbon emissions.

The EU ETS due to the level of demand and trading represents the best market for Pakistani project developers to trade offsets due to the average price, eligibility of transport projects and overall demand compared to other markets. It is also important to acknowledge that the impacts of global agreements at COP21 on market prices and demand from various markets is yet to evaluated as actions based on COP21 are only starting to be initiated or have not begun as of yet.

3.1.1 Carbon Markets:

Before evaluating the different protocols, it should be known and understood the carbon market, which is described as 'selling and buying of emission permits generated by the

greenhouse gas (GHS) emission reduction projects or distributed by the regulatory body'. This is called carbon trading and the value is denominated as carbon credits, measured as CO2 metric tons (tCO2e). The carbon trading is a tool to engage developing countries for renewable projects, most of the protocols have criteria for selection of project including; additionality, type and sector of the project, co-financing and co-benefits, baseline study and requirements, validation, verification, initiating and crediting period, third party auditing, pricing, contract terms & conditions.

3.1.2 Market Systems

i. Carbon as Commodity

When dealing in the carbon trading markets, it should be understood that as tradable commodity there is an attachment of pollution with the cost / price. Behind this the idea of traditional economic theory is working, when business creates pollution the market forces pushes to pollute less. This associated cost with pollution is either permit / allowances or credit.

ii. Cap and Trade System:

The basic idea of this cap and trade system is that if polluter A doesn't emit its fully allowed /permitted limit (means polluted less than expected), in this case polluter A allows to trade those permits to another polluter B, who has emitting more emission then its permitted limit and paying for its right to pollute, in this scheme one permit is equivalent to 1tCO2e. Although there are concerns regarding the benefits of such a system on reducing greenhouse gas emissions, but the study will not delve into great detail in this regard as it outside the scope of the study.

iii. Baseline Credit System:

In the baseline system the credits are generated every time once a project is implemented under this scheme. These credits are allowed to trade either buying or selling as per the need from regulatory body, offsetting specific activities and becoming carbon neutral. This system has vital importance because it is against such baselines developed on business as usual scenarios, so the emission reductions are measured, and credits allocated.

3.1.3 Mandatory/Compliance Markets:

The mandatory carbon market is also known as compliance market, this market is more regulated and monitored under the national, international or the regional carbon governance, there are markets enlisted below based on the geographical applicability of the project at this stage.

- Kyoto Protocol Emission Trading (CDM)
- UNFCCC – Joint Implementation (JI)
- European Union Emission Trading Scheme (EU-ET)

- Canada's offset System for Green House Gases
- Australian Carbon Pollution Reduction
- Western Climate Initiative
- US State Power Plan Rules (OR, WA, MA)

For the purpose of this study the focus will be on those markets that are geographically applicable to Pakistan and thus will focus on the CDM and JI which cover all countries that have ratified the Kyoto Protocol (CDM) and Annex-1 parties to the Kyoto Protocol (JI)[15]. As Pakistan is a signatory of the Kyoto Protocol it can implement CDM projects and therefore the focus for the mandatory markets will remain on the CDM.

3.1.4 Voluntary Markets:

Those markets functioning outside of compliance or mandatory markets are referred as voluntary market, this allows entities to offset emissions through trading of offsets created through mandatory markets or within the voluntary market through Verified/Voluntary Emission Reductions (VERs).

However, when exploring the voluntary markets it is important to discern between programs and standards. There are options to choose and adopt the methodology for the implementation of CDM project, which is evidence that this market functioning effectively and there is opportunities for experimentation and innovation.

	Governance	Trading Volume[16]	Commodities
Mandatory Markets	Regulated by mandatory / compliance national, regional or international carbon reduction Regimes	466 MtCO2	Associated Baseline-and-Credit (Offset) Programme (CDM and JI)
Voluntary Markets	Function outside of the compliance (mandatory) market	13 MtCO2	Function outside of a cap-and trade systems

3.2 Research Objective and Hypothesis

The purpose of this research study is to provide a bird eye view specifically to the KCR project under CPEC and potential of this project for adaptation of CDM. The research hypothesis is that the KCR under CPEC has potential as CDM project.

3.3 CDM Adaption Methodology

To gain certified emission reduction in KCR Project under clean development mechanism, it is important to perform the cost-benefits analysis for prospective investors. The provincial government decided 2020 will be the operational year for KCR, so at the same time the formal governmental process can be initiated, opportunities for public-private-partnership mode, monitoring and reporting the emissions and air quality are key elements to do. The write up of proposal along with Project Design Document can be submitted at the time of project completion, which means mid of year 2020 will be the ideal time to submit the project.

Considering the substantial impact of the transport sector on the global climate, it makes sense to tackle this growing source of GHG by setting up CDM projects. The following steps describe the elaborate project cycle that projects have to undergo in order to become registered and generate CERs.

1. Preparation of the Project Design Document (PDD) by the project proponents. The PDD is the central document on the basis of which the Parties involved as well as the CDM

Executive Board decide on the approval and registration of a project. For the purpose of calculating the emission abatement or carbon sequestration achieved by the project, the PDD has to establish a so-called baseline, i.e. a scenario that reasonably represents the emissions that would occur in the absence of the project. Moreover, the PDD needs to demonstrate that the emission reductions are "additional" to any that would occur in the absence of the project. The PDD also has to contain a plan for monitoring the project's emissions.

2. Approval of new methodologies: When the Baseline and Monitoring Plan are not designed according to approved methodologies, the project proponents need to develop their own methodology and submit it to the CDM Executive Board (EB) for approval.
3. Approval by the Parties involved, including confirmation by the host Party that the project supports it in achieving sustainable development.
4. Validation of the PDD, i.e. an examination whether the PDD meets all requirements, by an independent auditing company accredited with the CDM Executive Board, called Designated Operational Entity (DOE).
5. Registration of the project activity by the CDM Executive Board.
6. Implementation of the project and monitoring of all relevant emissions / carbon sequestration by the project developer.

7. Verification and certification of the emission reductions / carbon sequestration by another DOE.
8. Issuance of the CERs by the CDM Executive Board

4.0 KCR POTENTIAL FOR CDM

4.1 Potential for Pakistan:

Pakistan is a developing country and its power industry infrastructure is weak, although in recent years there has been a great development, but the per capita energy resources are still lower than the world average. With the rapid economic development of Pakistan, the energy demand in the country is increasing at a level to inadequately meet the ever-increasing demand of energy...

Therefore, energy conservation is a long-term strategic policy of the successive governments to develop the economy. Government must adhere to the "energy conservation and development programs at the same time, saving energy in the first place" guiding ideology, and gradually improve energy efficiency and promote the national economy. Urban rail transit is a large electricity user in urban public utilities and is a long-term user. Electricity tariffs in urban rail transit operating costs accounted for a large proportion and power consumption directly affect the size of operating costs and economic benefits of the urban rail transit operators. Therefore, considering the implementation of the national energy strategy, improve the city rail transportation itself economic efficiency, and enhance the capacity for sustainable development of city rail traffic and other factors, the design of city rail traffic should pay special attention to the problem of energy saving. On the basis of meeting the needs of operation, it is not only necessary, but also of great significance to determine the corresponding energy conservation measures, which is also in line with the long-term strategic guidelines of the country's economic development. EU-ETS is the principal market in the Certified Emission Reduction (CER), the duration of this scheme is between year 2008 to year 2020 and so far 1.6Gtonne of CO2e were granted under this scheme, which is the largest issued quota in Kyoto Credit and estimated 60% of the total Kyoto Credit during this period.

Till date EU-ETS installations have already used 95% of their quota, suggesting a saturation possibly or unavailability within 2018-2019. In the absence of this historically largest buyer, Pakistan’s KCR still can turn to other sources that will welcome sellers of Kyoto credits. In particular, CERs generated from KCR, and CERs from all other transport and non- transport projects in Pakistan can be sold to a variety of private entities/Annex 1 countries’ domestic instruments, purchase programs, and voluntary cancellations of CERs. All CERs issued by the CDM are allowed e.g. by Mexico’s carbon tax and the republic of Korea’s ETS. In 2016. As CERs are expected to remain below EUR 1 levels well into 2016, pending EU-ETS reforms in 2019 and an overhaul in 2020, they will therefore be attractive to compliance entities.

Another demand source for KCR, CERs are purchase programs such as the RBF-based (Results-Based Finance), Ci-Dev (Carbon Initiative for Development), the PAF (Pilot Auction Facility for Methane and Climate Change Mitigation), and the Swedish Energy Agency purchase program.

Overall, however, these different sources do not represent a significant demand absorptive capacity between 2015 and 2020. That is, a surplus of CERs is expected to result. In this regard, it is important to note signals sent through the Intended Nationally Determined Contributions (INDCs). In particular, some countries that previously planned significant reliance on Kyoto credits e.g. the European Union countries and the United States (also Andorra, Martial Islands, and Gabon) explicitly rule out the use of international credits. In the case of the EU, certain divergent member state communications have resulted in an unclear picture of European demand for Kyoto credits, with some of the EU's own communications sometimes omitting mention of its ETS and elsewhere identifying it as its main instrument to deliver emission reductions[18].

Based on Ecofys's and World Bank's analysis of CDM registered portfolio (September 2015) the total pipeline of CDM projects still has the potential between 2015 and 2020 to issue and additional 6,600 Mt CO2e. It is unclear whether demand exists and can match this capacity. Their realistic CER demand projection up to 2020 is 750 Mt CO2e, still exceeding potential demand in their view. Ordinarily, this supply demand mismatch will result in locking CERs at half their March 2012 EU-ETS prices for the period up to 2020 & beyond.

Importantly, in view of local experts CERs obtained from KCR are eligible as units of trade in the EU-ETS. The transport sector and projects within the sector are not listed as ineligible CERs for European clearing houses. The clearing houses will however discontinue or regard as ineligible the KCR projects CERs should the government of Pakistan become subject to sanctions or trade controls by the EU, the UN or US Office of Foreign Assets Control.

4.2 European Commission Global Climate Finance Mechanism

Another demand source for KCR, CERs are purchase programs such as the RBF-based (Results-Based Finance), Ci-Dev (Carbon Initiative for Development), the PAF (Pilot Auction Facility for Methane and Climate Change Mitigation), and the Swedish Energy Agency purchase program. Overall, these different sources do not represent a significant demand absorptive capacity between 2015 and 2020. In particular, the World Bank's Pilot Auction Facility (PAF) is a tool to promote investment in projects by providing a new climate finance model. This facility can provide opportunities for auctioning credits, but it is important to

acknowledge that at the moment, this facility is only targeting methane emission reductions from industrial and agricultural processes. The idea behind this facility is to develop a pay-for-performance mechanism (through auctions) that will allow public funds and private investment into projects targeting reduced methane emissions. This is seen as a climate financing options for developing countries by providing a guaranteed floor price

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on carbon reduction credits, through the auctioning of put options (which are supported through donor funding). Through this mechanism resources from the PAF will only be disbursed when emissions reductions have been independently verified. Currently the PAF is targeting methane reduction projects and for this reason is not applicable to the KCR project planned in Karachi. However, as the facility matures it may scale up its activities and sectors that it is targeting, this may provide a viable financing option in the future for transport related projects.

The EU also looks to finance adaptation; the principles of their financing strategy are laid out in the 'Multiannual Financial Framework 2014-2020,' which is the mechanism for ensuring EU spending is planned and subject to budgetary discipline, defining maximum amounts for each sector to be invested in. The funding is provided through five European Structural and Investment Funds, the European regional Development Fund, European Social Fund, Cohesion Fund, European Agricultural Fund for Rural Development and European Maritime and Fisheries Fund.

4.3 Charges, levies or taxes on emissions:

Globally there is a trend for well-designed carbon tax instruments targeting various aspects of production through the classification of emissions. This represents a second market-based incentive available to regulators who will like to ensure 'polluters pay. When looking at emission taxes and subsidies the general objective is to design these instruments in order to develop in a way that promotes polluters to seek cost-reducing abatement strategies. Emission taxes allow for governments to offer financial incentives to polluters to reduce emissions, this can be done in two ways; placing a tax on each unit of emission or subsidizing polluters who reduce emissions. By placing a tax, polluters are incentivized to reduce emissions as a penalty is placed on polluters who produce emissions while subsidies provide a reward to polluters who reduce emissions. However, in Pakistan currently no such instruments are being utilized by regulators. As a consequence, industries are not provided any market-based incentives to develop abatement strategies. For this reason, the KCR project in Karachi, although producing carbon emissions will not be penalized for its emissions, nor will it be incentivized to find innovative solutions to reduce emissions. Thus, there will be no additional costs to the project under the existing regulatory structure.

4.4 Quantification of GH Emission Reduction and Removal

Baseline Emissions

The baseline survey is considering to be the trip distance per transport mode that would have taken place. The baseline emissions include the emissions that would have happened if the passenger uses the project activity, when the activity was not implemented. The data of the trip distance per transport mode and trip details are provided in the Karachi Mass Transit Investment Opportunity Report.

Trip Generation and Distribution

Knowledge of the trip generation and the distribution of trips amongst different modes (e.g. mode split) are important inputs to all transportation planning efforts. Below table shows the statistics of modes & trip rates by persons and estimated motorized trip rates respectively.

Mode	Users (Persons)		
	2008	2015	2020
Motor Cycle	2.3	3.3	4.0
Paratransit	1.1	1.6	2.0
Cars	3.3	4.8	5.9
Public Transport	6.9	11.6	14.8
Total	13.6	21.2	26.7

Item	No. Owning	Car/MC Owning	Total
Population Age over 4 years (1000)	10,709.20	2,118.40	12,827.6
No. of Trips	17,031.50	5,129.60	22,161.1
Trip Rate	1.59	2.42	5.9
Trip Rate Wt. Average			1.78

Through the above Tables it may be safely estimated that the motorized trips in Karachi were 24.28 million in 2008 and will be 37.73 million in 2015 and 47.53 million in 2020. The results of Person Trip Study reveal that 4.5% composition of Public Transport Vehicles carry 42% of Total Persons Traveling in the City. Whereas the Private Cars which is 36.5% of Total Vehicular Traffic carries only 21% of Persons, showing Lesser Average Vehicle Occupancy.

Project Emission

Based on Share Project Emissions[21]	
Passengers from buses	40.9%
Passengers from passenger cars	19.8%
Passengers from taxis	8.5%
Passengers from motorcycles	20.2%
Passengers from rickshaw	8.5%

Emission Factors

Emissions tCO2e[22]	
Passenger Cars	647,024
Taxis	55,635
Buses	11
Passengers from motorcycles	88,871
Passengers from rickshaw	22,093

CONCLUSION

For carbon offsets auctioning there are various financing mechanism available for projects developers and proponents, these mechanisms can be programs and standards based for registration, can also classified as voluntary and mandatory market. For the Railway project the EU-ETS is appropriate program to register with, due to the acceptability in this region, overall demand compared to the market, level of demand, trading that represents the best market for the average prices, eligibility of rail project. Although there are other mechanism and sources of financing the projects do exist, however for a project of KCR, which requires a significant amount of financing they be limited due to their demand absorption capacity, supplement finance, knowledge and acceptability of these financing.

The changes in the regulatory requirements will also be helpful to reshape the project, as Pakistan doesn't place any taxes or levies on carbon emission neither provide any subsidies for environmentally friendly projects or projects which reduces emissions. So the KCR project will not be face with external charges or subsidies. The reduction of duty on Hybrid and electricals cars will be helpful for cleaner environmental on a very small scale and time taking, however implementation of Carbon deduction projects will be helpful on a large scale.

The global financing comes under the influence of global conventions, strategies, bilateral and multilateral agreements and the recent development after COP 21 and the agreements signed under this conference, the demand and carbon market prices is still yet to be evaluated. This is

the preliminary documents, however a full-scale feasibility shall be undertaken to confirm the possibility and significant profitability, to register KCR project to earn carbon credits. For the purpose it is necessary to:

a) Estimation of future development and additionality to make this project prominent and unique
b) Estimating the reductions over 10-15 years period a full-scale application / model can be prepared
c) This report provides the details of carbon market potential, trends and opportunities overview, however an in-depth analysis for institutional capacity, trainings needs, local, provincial/federal government's institution to understand and execute such projects for sustainable development of cities
d) The participation of Pakistan is very limited in CDM / VCS and other carbon market, more opportunities can be exploring to avail these opportunities.
e) To initiate the project for CDM registration we need to follow the steps as defined in the section 3.3 mentioned above.

Based on the information and data collected from the reports and authorities it is predicted that 17% of the mode transfer and new addition of commuters will be added to the system which may reduce the emission about 21% in 2030, if the project will be initiated in 2020 and consider the current emission rate and estimation as baseline data.

Further to this few methodologies may be considered to develop the project design document, these methodologies can be modified as per demand and modeling of the project, scope, design, size and viability.

AMS-III.C. ver. 10 - Emission reductions by low-greenhouse gas emitting vehicles

ACM0016 ver. 2 - Baseline Methodology for Mass Rapid Transit Projects

ACM0016 ver. 4 - Baseline Methodology for Mass Rapid Transit Projects

The KCR will have the positive development impact, it will help Karachi city to reclaim its commuter the easy affordable and dignified mode of transport. The commuter's time will also save, and it may be considered as the productivity increase by punctuality.