Abstract: After the decades of conflict and political transition, Nepal is going to embark on an accelerated economic growth for which transport development has been recognized as one of the core strategies. With an objective of providing some valuable insights to the policy makers, this paper adopts a broad-brush approach to review the past efforts, identify current challenges and opportunities, explore linkages with theoretical concepts, and finally list out important strategies that would guide Nepal’s transport development towards a sustainable ends. Most importantly, the paper highlights some of the agenda which can potentially serve as the corner stones for sustainable transport system but have not yet been properly discussed at the policy making level. It is expected that the contents of this paper would provide useful guidelines for the transport policy makers in Nepal.

Keywords: Sustainability; Transport; Economic Development

1. INTRODUCTION

In Nepal inadequate and unbalanced transport infrastructure is often blamed for underdevelopment and increasing regional disparity. Political instability, non-inclusiveness and ethnic conflict are the growing issues in Nepal where uneven distribution of income across the regions has been taking place. Because of geographical complexity, current settlement pattern and slower development process, people from some parts of a country are struggling to achieve the minimum access to the services and economic activities. Whereas, in some places of the country urbanization is so rapid which has given rise to the increasing income, resulting the requirement of more speedy and reliable transport system. Inadequate transport infrastructure has further widened the regional disparity.

Recently, government of Nepal has set a target to uplift the economic status of the country from the least developed to the developing country by the year 2022. The estimated annual economic growth rate is 9.2% until 2022 for the graduation from least developed to the developing nation. However, the average annual economic growth rate over 1960 to 2013 was less than 2%. To achieve the ambitious rate of economic growth, National Planning Commission (NPC) has pointed some new policy options such as change in resource allocation pattern, increase in absorption capacity of economy, ensuring development friendly policy and so forth. NPC has also estimated the need of investment to achieve this goal. The estimated growth rate of investment is 19% per annum (GON, 2014a). Transport sector is identified as a major sector for the investment (NPC 2014).

Since transport is the “infrastructure” of the infrastructures it needs due attention for the rapid economic growth. Transport has been taken as a major sector since 1956 when periodic planning process has been introduced. With the analysis of current scenario of transport development, this paper identifies issues, challenges and the strategies for the transport development for the rapid economic development.
In the early stage of transport development government of Nepal focused on connecting the boarders of neighboring country, primarily with India and later with China. East West highway construction was the second stage of transport development. Connection of all district headquarters by road was targeted on 10th plan (2002-2007), however, it is still in implementation. Recent discussion goes for rapid, safe, reliable, comfortable and low carbon technology.

Looking back to the previous national periodic plans it reveals that some effective policy were introduced but not implemented. For instance, in the first national plan (1956-61) the concept of ‘value capture’ was introduced for “the land whose value is increased due to construction of road should be taxed”, but never implemented. Moreover, it is presented that transport is the only means which can reduce the regional disparity (Fourth plan 1970-75). A detailed summary of transport policy and written in various national plan is presented in Table: 1

<table>
<thead>
<tr>
<th>Plan</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Plan</td>
<td>Various taxation are needed such as : fuel tax, registration levies, tax on vehicle, taxation on land whose value increased due to construction of road.</td>
</tr>
<tr>
<td>1956-61</td>
<td>Extensive survey for ropeway were planned</td>
</tr>
<tr>
<td></td>
<td>Railway link planned to connect Hetauda (ropeway station)</td>
</tr>
<tr>
<td>2nd plan</td>
<td>First plan could not achieve due to lack of finance, technical manpower and equipment.</td>
</tr>
<tr>
<td>1962-65</td>
<td>In 1958, Regional Transport Organization (RTO) was established</td>
</tr>
<tr>
<td></td>
<td>Program was formulated with the concept of East West and North-South highway.</td>
</tr>
<tr>
<td>3rd plan</td>
<td>In 1961 RTO was dissolved with the reason of not achieving the target.</td>
</tr>
<tr>
<td>1965-70</td>
<td>Policy was initiated to provide Bus and Truck services by Individuals and companies</td>
</tr>
<tr>
<td></td>
<td>Grant were provided to Panchayat(district and village) to construct the local road</td>
</tr>
<tr>
<td></td>
<td>National Transport Organization was established (to coordinate the ropeway, railway and other means of transportation) Road</td>
</tr>
<tr>
<td>4th plan</td>
<td>Transport development is necessary to overcome regional disparity</td>
</tr>
<tr>
<td>1970-75</td>
<td>Kathmandu ring road started to construct.</td>
</tr>
<tr>
<td></td>
<td>Provide market to rural economies</td>
</tr>
<tr>
<td></td>
<td>To connect isolated community</td>
</tr>
<tr>
<td></td>
<td>First priority was road and second was air transport</td>
</tr>
<tr>
<td></td>
<td>Road classification: Motor able (Highway, Trunk road, Road) and non-motor able (Jeep track, Mule track, Foot track)</td>
</tr>
<tr>
<td></td>
<td>Twenty year perspective plan aimed to connect zonal and districts headquarter by 1985</td>
</tr>
<tr>
<td>5th plan</td>
<td>Infrastructure is major for national development and regional balance</td>
</tr>
<tr>
<td>1975-80</td>
<td>4 regional headquarter established and road construction proceeded by those regional office</td>
</tr>
<tr>
<td></td>
<td>District and local roads were constructed through panchayat by providing grant and technical support</td>
</tr>
<tr>
<td></td>
<td>Promoted special activities along completed road to foster economic growth</td>
</tr>
<tr>
<td></td>
<td>Targeted to connect zonal and districts headquarter</td>
</tr>
<tr>
<td></td>
<td>Trolley Bus system was completed</td>
</tr>
<tr>
<td>6th plan</td>
<td>Railway development was not necessary because of situation of mobility</td>
</tr>
<tr>
<td>1980-85</td>
<td>Small airport was felt necessary across the country.</td>
</tr>
<tr>
<td></td>
<td>Roads connected to main tourist destination and national level project location will be constructed based on regional balanced approach.</td>
</tr>
<tr>
<td></td>
<td>Policy will adopted to attract private sector in transport investment in urban area</td>
</tr>
<tr>
<td></td>
<td>Feasibility study will be conduct for alternative means of transportation which is based on electricity.</td>
</tr>
<tr>
<td></td>
<td>Labor based construction will be adopted for the employment generation</td>
</tr>
<tr>
<td>7th Plan</td>
<td>Long term policy will be adopted to construct roads East-West, and North-South</td>
</tr>
<tr>
<td>1985-90</td>
<td>Focus more on maintenance and control road accidents</td>
</tr>
<tr>
<td></td>
<td>Straight alignment will be prioritized to construct East-West and North-South road.</td>
</tr>
<tr>
<td></td>
<td>Urban Road Master plan will be prepared and followed.</td>
</tr>
<tr>
<td></td>
<td>Slogan is “decade of transport and communication” of Asia and Pacific region</td>
</tr>
<tr>
<td>Plan</td>
<td>Objectives</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8th Plan 1992-97</td>
<td>20 year road master plan will be prepared and followed</td>
</tr>
<tr>
<td></td>
<td>A Separate unit at DOR will be established to reduce accident both in urban road and highway</td>
</tr>
<tr>
<td></td>
<td>Kathmandu Bhaktapur Trolley Bus will be expand up to Tribhuvan University, Kirtipur</td>
</tr>
<tr>
<td></td>
<td>Transport service regulation will be adopted to participate private sector</td>
</tr>
</tbody>
</table>

**Objectives**
- To strengthen regional indivisibility
- To connect village to urban area
- To reduce transport cost

**Policy**
- Develop the foundation for toll collection in Bridge and such toll will be used for maintenance of bridge
- Emphasize on road connecting “Farm to Market”
- Encourage private sector for construction and operation of road and BOOT system will be introduced with incentive.

<table>
<thead>
<tr>
<th>9th Plan 1997/98-2001/02</th>
<th>Objectives of physical infrastructure was to alleviate the poverty</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Development of agriculture road for the promotion of agriculture productivity</td>
<td>Weak relation between national and regional objective</td>
</tr>
<tr>
<td></td>
<td>Develop transport system less expensive and favorable to environmental conservation Develop traffic management system to control traffic accidents and pollution.</td>
<td>Construction of road without appropriate study and research</td>
</tr>
<tr>
<td></td>
<td>20 years master plan will be formulated</td>
<td>Lack of interregional coordination and cooperation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poorly utilization of locally available resources</td>
</tr>
</tbody>
</table>

**Objectives**
- Road project will be selected based on minimum adverse impact on environmental and regional imbalance.
- Adopt low cost technology, to minimize environmental degradation
- In the area of heavy traffic road widening with cycle lane will provide
- Adoption of planned system to repair and maintenance
- All district HQ will be connected
- Road will constructed to link northern mountain to Tibetan market
- East-West highway will be developed as an Asian Highway and regional commercial route.
- Roads under local transport system will be handed to local bodies
- Institutional development for decentralization
- Integrated transport master plan will be formulated
- Vehicular pollution will be reduced in Kathmandu valley and other cities
- Nepal emission standard 2000 will effectively implemented

**Objectives**
- Road will be constructed based on sector wide road program (2007-17): roads should be available within 4 hours walking distance in Hill and 2 hours walking distance in Terai.
- 8 trade transit which connect northern China and Southern India will be developed
- 3 parallel East-West highway including current East-West, Mid Hill and Postal at Terai will be developed
- Alternative highway will be developed to connect Kathmandu and Terai

**Objectives**
- Road network will expand in Kathmandu Valley based on urbanization pressure and considering safety and environmentally friendly
- Organizational structure will be developed for the Kathmandu-Pokhara and East-West electric railway

**Strategy**
- District and regional headquarter connection
- Identify railway and other means of transportation
- Promote public private partnership in transport sector
- Construction ropeway, waterways which are important for tourism sector will be attracted through BOOT/BOT system
- Disabled friendly road will be developed
- PPP Cell will be established to promote PPP
- District connecting road and national strategic road will be made all weather
- Construction of Mid hill highway and Kathmandu-Terai fast track road will proceeds
- Road network will expand in Kathmandu Valley based on urbanization pressure and considering safety and environmentally friendly
- Organizational structure will be developed for the Kathmandu-Pokhara and East-West electric railway
<table>
<thead>
<tr>
<th>13th plan Policy paper</th>
<th>• Footpath and bicycle lane will provide where possible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Work will be started to prepare DPR of East-West Railway</td>
</tr>
<tr>
<td></td>
<td>• Private investment will attract through PPP to construct Metro rail in Kathmandu valley</td>
</tr>
<tr>
<td></td>
<td>• In the planning period, DPR of East-West railway will be prepared and construction of Simara – Bardibas section will be started</td>
</tr>
</tbody>
</table>

### 2.1 National Transport System

In general national level transport is dominated by road network development, however, in remote districts air transport is only one option for travel other than walking. In some major urban destination, air transport is the alternative one for travel time sensitive passenger. Figure-1 presents map of nationwide strategic road networks and airports over the country and figure-2 shows the trend of road network growth over time.

![Nationwide road network and airport location](image)

**Figure 1: Nationwide road network and airport location**

Source: Department of roads, GON

Prior to national planning process started in 1956, Nepal had only 626 Km of roads and 59 Km of railways. Planning of East-West highway and North-South routes were formulated during second five-year plan period. Successive plans were focused on basic access and connectivity. However, physical achievement is not so impressive. Two of the district headquarters are still not connected to the national road network. In addition, quality achievement is also unsatisfactory. As shown in Figure-2 out of 12,000 Km of nationwide road network, only about 5,000 Km of roads are paved, rest of the roads are earthen and gravel, most of them are only functioning on dry weather. In addition, the statistics shows 1 Km road is available for about 2,300 people and 8 Km of road falls on the 100 square Km of area. These situation states that the transport development is still in primary stage even though the planned development process was started 60 years ago.
National urban development strategy (NUDS-2015) covers the study of urban settlements, which only includes all municipalities and metropolitan area. Total 191 designated urban areas are the habitat of 38.26% people (GON, 2015), however, the definition of urban area is only on basis of existence of small shopping area, services centers and population density. Figure-3 shows the urban centers and connecting road networks over the country. East–west highway in southern part of Nepal serves the large number of population and urbanized area.

Recent initiative of East-West mid-hill highway passing through the central part is another important corridor for the hilly population. In addition, it is necessary to give the due importance to connect northern part of the country for the two reasons though it is less populated area. Firstly, northern mountains are attractive tourist destinations, and secondly Nepal can be benefited through
the rapidly growing northern neighbor China. In this regard, the conventional cost benefit analysis of transport projects would not be able to capture wider benefits and impacts.

So far, the Nepal government implemented almost all the transport projects. Recent policy initiatives leads to involve the private sector for the construction of Kathmandu-Terai Fast-Track (KTFT), Kathmandu-Kulekhani-Hetauda Tunnel (KKHT) highway under the public private partnership (PPP) policy. However, such big investment projects leave some major policy question, such as: why Nepal needs both parallel (Figure: 3) KTFT and KKHT projects simultaneously? How would be the demand pattern? Is only tolled expressway the best option to connect the Terai? Is the revenue guarantee model the better option for the invitation of private sector? Why we need private sector for the development of such project if we have wide range of fiscal spaces. Is the expected travel time from proposed second international airport and capital city Kathmandu justifiable? Without finding suitable answers of those questions, implementation and sustainability of such projects are questionable.

![Figure 3. Planned parallel expressway project KTFT and KKHT Both are under PPP policy.](image)

2.1.1 Urban Transport

2.1.2 Urbanization and mobility

With the recent declaration of additional 131 municipality, the total of 191 urban areas have been designated. Overall 38.26% people live in urban areas (GON, 2015). Kathmandu valley includes three districts, namely Kathmandu, Lalitpur and Bhaktapur with total land area of 899 sq km having population of 2.5 million. Kathmandu Metropolitan city is the largest urban unit with a population of 975,453. Greater Kathmandu with an approximate radius of 12 km functions as a single contiguous urban area (GON, 2014b).
The second largest city, Pokhara is a habitat of 255,465 people. Similarly, the smallest municipality, Dhulikhel has only 14,283 population. Some of the municipalities outside Kathmandu Valley have public buses for the public transport. Whereas, in smaller size municipalities, there is no provision of public transport services. Proper planning for pedestrian space is also lacking. In municipalities in the Terai region, three wheelers known as Rikshwa, non-motorized transport service is important public transport mode. In general, the understanding of urban transport is known for Kathmandu Valley. It is necessary to give a due attention in municipalities outside Kathmandu valley in time.

### 2.1.3 Urban transport in Kathmandu valley

Since last 20 years the number of private vehicles are growing dramatically. But the road area has not been significantly improved. However, recent road widening work eases some level of congestion in some places for short term.

Total vehicle population registered in Bagmati zone until 2013 are 647,895 i.e. 41.6% of the national figure. Most of the registered vehicles in Bagmati zone are running on the roads in Kathmandu valley. From 2008 to 2013, average annual growth figure for motorcycle and light vehicles in Bagmati zone is recorded as 12.4% and 7.9% respectively (GON, 2014c). Figure 4a shows the trend of motorcycle and small vehicles number in Bagmati zone. Similarly, figure 4b shows the rapidly increased car ownership over time. Car ownership rate (including jeep and van) in Kathmandu valley is approximately 32 per thousand populations in the fiscal year 2011/12. This trend of private vehicles obviously demands more road area ratio but due to predetermined urban form it is almost impossible to increase the road area.

Because of fastest growing vehicles and limited road spaces urban mobility is worsening day by day. Kathmandu Valley is around 6% of total urban area (Pant and Dongol, 2009) within the length of 1595 km (JICA, 2012) road which is lower figure. Whereas, in developed cities like city of London-25%, Inner London- 18.3%, Inner New York- 25.7%, Tokyo 23- 16.3% Seoul City - 13.6% of land is occupied by road (Morichi and Acharya, 2013).

<table>
<thead>
<tr>
<th>S No</th>
<th>Name of Route</th>
<th>Average travel speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thapathali – Kalimati –Kalanki – Thankot Road</td>
<td>8.78 km/h</td>
</tr>
<tr>
<td>2</td>
<td>Keshar Mahal – Balaju – Modku (Trisuli Road)</td>
<td>10.94 km/h</td>
</tr>
<tr>
<td>3</td>
<td>Jamal – Lazimpat – Maharaigunj – Budhanilkanta Road</td>
<td>11.06 km/h</td>
</tr>
<tr>
<td>4</td>
<td>New Road – Paropakar – Chauni – Sitapaila – Ramkot–Bhindunga Road</td>
<td>10.49 km/h</td>
</tr>
<tr>
<td>5</td>
<td>Balaju bypass – Phutung Road</td>
<td>10.00 km/h</td>
</tr>
</tbody>
</table>

Source: (JICA, 2012)
JICA (2012) explores that average travel speed within the ring road of Kathmandu is less than 20 km/h. Table-2 shows the average travel speed of top five routes where 8.78km/h is the lowest speed. This shows the severe mobility problem of Kathmandu valley.

Dynamics of urbanization and rapidly increasing motorization have direct impact on travel mode share. JICA (2012) gives the picture of mode share in 1991 and 2011. Figure 5 shows the pattern of different mode share. If it is compared only among motorized mode figure 5a, the percentage share of motorcycle has significantly increased and reached 45% from 23% in 1991 with the falling share of bus. With the comparison of four mode including non-motorized the share of walking has decreased from 53.1 to 40.7% and bicycle also decreased significantly while bus share seems stable. To attract and keep public transport riders, present day might be the suitable time to initiate the mass transit option. However, ongoing policy debate has been focused on the marginal issues like starting of Bus Rapid Transit (BRT), study of cable car along major corridor. Since available current low road width and impossible to expand in future introduction of BRT system in Kathmandu is out of question.

2.1.3.1 Public transport service

Since 1959, public transport service was started in Kathmandu Valley, different capacity of vehicles namely Tempo, Mircro Bus, Mini Bus, and large bus are in operation in Valley’s road. (JICA, 2012) explores the situation of public transport services in Kathmandu Valley (Kathmandu Post 2015).

JICA (2012) study explores the situation of public transport operations in Kathmandu valley. There are 6600 public vehicles including Large Bus, Mini Bus, Micro Bus and Tempo operated by individual operators providing the services for passengers under the umbrella of 72 Byabasahi Samittee (so called syndicate). Figure -6 shows the number of public transport vehicles in Kathmandu valley. Similarly, table-3 shows the capacity of each vehicle which are in operation in...
Kathmandu. Both figure-6 and table-3 shows that vehicle operation in Kathmandu are dominated by small capacity vehicles (Minibus and Microbus). In recent years, because of road area ratio is very low (about 7%) and growing number of small capacity vehicles, congestion is being common in Kathmandu.

2.1.3.2 Environmental issues

One of the major public health issues in Kathmandu valley is air pollution caused by vehicular emissions. There are 1600 premature death annually due to air pollution MoEP (2005). Old vehicles, poor quality of fuel and inefficient engines are the causes of emission of pollutant. Recent initiative of road widening works and delay in construction is causing pollution by dust in dry and mud in rainy season in many roads of Kathmandu.

2.1.4 Rural transportation

Only national road network was the priority sector for the long period due to budget constraints. In 1970’s some initiatives were made to construct the rural road under the Integrated Rural Development Projects, IRDP. Another, milestone initiation was started in 1995 by providing direct grant to Village Development Committee for the various development activities. Most of the VDC has allocated the budget for the construction of rural road network. In 1997, Nepal government established a new department called Department of Local Infrastructure and Agricultural Roads (DoLIDAR). Since then, DoLIDAR leads for the planning and construction of district level roads. Village Development Committee are also free to allocate the budget for the construction of village roads. Figure 7 shows the physical achievement of rural roads until 2012. However, the quality of rural roads is still questionable. Despite, the large physical achievement, roads are poorly constructed. Proper engineering design and minimum technical standards are still lacking. Almost all earthen roads and large number of gravel roads are closed in rainy season and need massive investment in maintenance at the beginning of dry season. Moreover, regional disparity of physical achievement is very high. Mostly central and Western regions are very rich of road network.

![Rural Road: Regionwise and Pavement Type](image)

Figure 7: Rural road inventory by development region and pavement type.
Data Source: DoLIDAR, 2012

Recently DoLIDAR has published a guidelines for the District Transport Master Plan (DTMP). Most of the district have prepared their master plan for the future development of transport network.

The means of public transport service in rural area are informal para-transit (Jeeps, three-wheelers and vans). However, due to monopoly of rural transport operators the service quality is very poor. Because of poor quality of construction and insufficient geometric condition of rural roads accidents are increasing in rural roads.
2.1.5 Air transportation

The significance of air transport in Nepal is meant to address the two objectives. The first one is to provide accessibility to remote areas, where no other alternative means of other transport exist. The other is lowering the travel time for time sensitive passenger. Out of 48 airports only 34 are in operation including only one international airport in Kathmandu. Due to the geographical situation and saturation level of Tribhuvan International airport in Kathmandu, recently, government has initiated to construct a second international airport about 80 Km south from Kathmandu. Financing the project is now in under debate and another challenge is to construct the international airport with the current poor internal capacity.

2.1.6 Rail transportation

A narrow gauge 53 Km rail line was constructed by the East India Company for the purpose of carrying goods to India, especially for the transportation of wood from Nepalese forest in 1937 (Bhattrai and Sitaula, 2011). Since then Nepal has not constructed any other railway line. However, in the first 5 year plan (1956-61) an extension of railway line up to Hetauda, nearest southern city of Kathmandu, was proposed but never materialized. In the sixth, 5 year plan (1980-85) development of railway was completely rejected, because, policy declared the mobility situation was not suitable for the railway.

In recent years, nationwide electric railway has been given a priority. Government of Nepal has been preparing detailed project report (DPR) for the various section based on feasibility study report (GON, 2010). From the fiscal year 2014/15, a section of construction project has been started. However, the feasibility study fails to consider the recent technological development in rail transport. One of the most serious concern of the feasibility study is the recommended gradient. The suggested gradient is only 1%, whereas, with the Electric Multiple Unit (EMU) technology, railway track can be constructed up to 4% of gradient. With the provision of such 1% gradient, connecting Kathmandu, the capital city with Terai will be made a 255 km additional detour route. Another major drawback of this study is the track gauge. A broad gauge track had been suggested without doing any research. But many of the countries have been adopting a standard gauge. It seems that suggestion on the feasibility study and DPR is questionable. Without addressing those consequences, starting a construction of railway project raises serious concern about the right allocation of resources and sustainability of the transport project.

2.2 Recent Gorkha Earthquake and a New Debate for Regional Restructuring

On the noon of Saturday, April 25, 2015, 7.8 moment magnitude earthquake struck the central region of Nepal and on 12th May, 7.3 moment magnitude of a big aftershock again jolted. These unfortunate events took a heavy toll in terms of loss of life and property. About 9,000 people died and 22,300 people injured, over 1,000,000 households were affected including about 500,000 houses damaged. Moreover, 7000 schools and many public buildings and infrastructures were completely damaged. National Planning Commission (NPC) in assistance with numerous international experts from bilateral and multilateral donor agencies undertook post disaster need assessment (PDNA), which presented a picture of immediate damage and made recommendations for the reconstruction needs. But the needs identified in PDNA appeared not to have reflected the real need of the country in the aftermath of such a devastating disaster. Only recovery from the loss and damage would not address the strategic need of the society. For example, around 200 settlements of 15 districts need to be relocated (Republica 2015) due to hazard-prone situation of the existing location. Providing infrastructure including transport connectivity is the primary task for the resettlement planning, but the need accessed in PDNA has focused only on rebuilding of damage structures (PDNA 2015).
Moreover, Nepal’s infrastructure development and urban form is in primary stage. Many people are living in remote villages with difficult topography where even providing basic facilities like schools, hospitals, and access roads is quite challenging. In some places people have to walk more than a day to travel from one village to another. In addition, most of the people are living with the subsistence agriculture and income is not enough to sustain even the basic needs. Youths from village are going abroad for foreign employment, such as in Malaysia and Gulf Countries, and housewives are migrating to urban area for schooling of their children. Therefore, it is necessary to make a plan for resettlement of some earthquake affected areas and this is the right time to initiate because people are aware that they should reside in a safe habitable place. Identifying geographically and geologically suitable habitable places across the country, identifying carrying capacity of that places, planning for town/city or municipality, planning for hierarchical connecting transport infrastructures based on size of the relocation places might be the important tasks for the regional restructuring of whole country and proceed towards the sustainable development.

Likewise, in case of capital region of Kathmandu Valley, the earthquake reconstruction strategy should go beyond the just recovering the damaged physical structure. Urban expansion in the valley was the result of haphazard land development to respond the increasing demand of housing as the city population expanded. Inadequate and unplanned road network, weak land-use regulation and lack of earthquake resistance constriction practice resulted in range of urban problem including higher vulnerability to disaster. There is a broad realization at the political and policy making level to use this crisis as an opportunity to reshape the urban structure of Kathmandu Valley possibly by adopting the concept of transit oriented development with new urban centers. This is also high time for planning Mass Transit System (MRT) so that first metro line can be operational by 2025, which would be right timing as prescribed by Morichi and Acharya (2013).

3. THEORETICAL CONCEPTS AND IMPLICATIONS FOR NEPAL

3.1 Literature Review:

There is a growing body of literature that recognizes the importance of transport for balanced economic development. A number of academics and researchers have been arguing on the importance of the early pattern of spatial development, which can be a subject of path dependence with a direct implication for regional disparity. Transport investment play major role in shaping the early spatial patterns. In addition, agglomeration economies in association with transport network largely determine the patterns of economic concentration and possible nature of path dependence. When growth concentrates into a suitable location, labor and capital get further attracted. Leading region is then emerged and enters into a virtuous cycle. On the other side, lagging regions, due to geographical nature of being less attractive for investment and work force, enter into a vicious cycle. Finally regional disparity is widened. Literature on spatial economics and agglomeration mechanism demonstrates that accessibility as well as economic growth can be enhanced with the interaction of economy of scale and decreasing transportation cost(Ahlfeldt and Feddersen, 2010; Fujita et al., 2001; Fujita and Thisse, 1996; World Bank, 2009).

Spatially connected transport infrastructure might be one of the instruments for the balanced regional development. World Bank (2009) explains three dimensions of development namely distance, density and division. Distance is an important dimension for the balanced economic development. Transport investment cannot reduce the distance but can reduce the transportation cost (specially travel time) with help of technology. Therefore, transportation cost matters for the location of production and service centers. World Bank report further suggests to the developing country to make spatially connected transport infrastructure, transformation like growing cities and ever mobile peoples are essential for the growth. The pattern of spatial development in developing
country is in evolving phase and yet to take firm shape. Therefore, the process of planned regional restructuring with the efficient transport technology like high speed rail to connect lagging region can be started for the balanced sustainable development (Morichi and Acharya, 2011).

3.2 Implications for Nepal

Characteristics of developing country like Nepal differ from the developed country since transport development is in primary stage. Many places are yet to be connected even by earthen road. Only means of transport for the remote area is walking. Morichi and Acharya (2011) describe the various characteristics of developing country in terms of speed of growth, population density, settlement pattern, capacity and resource availability. They argued for the necessity of unique practical strategy for the sustainable transport investment.

National level transport network affects widely on regional economic development. With the introduction of transport mode, new cities emerge, rapid urbanization takes place, and therefore, any transport network project is not an independent ‘project’. Fixing the alignment, choosing the technology and mode of service have direct consequences to the regional development. Functional urban area basically created by the less travel time within the region. For instances, high speed rail makes two city (like Kathmandu and Hetauda) closer and agglomerate the economy which finally creates single urban entity called metropolitan region. Different mode or technology may have different impacts including possibility of infrastructure “lock-in”. For example if Nepal considering alternative technology for high speed transport such as expressway or high-speed railway, it is important to evaluate both technologies taking long-run impacts in view. If expressway network is built first, the resulting spatial patterns may not allow to build an effective system of high speed railway. Therefore, timing of investing in particular mode is very important for the sustainable development (Morichi and Acharya, 2013). In addition, transport has a key role for the reduction of regional disparity. Although, considerable research and practices have been done on the transport and spatial development, as (Morichi and Acharya, 2011) explained in developing country like Nepal, has not given due attention for the policy research.

Basically, in Nepal, investment decision in any transport project is done on the traditional cost benefit analysis (CBA). But this CBA is based on direct user benefit (OECD, 2002) and cannot take into account of wider economic benefit. For example, more than 100 years old transport infrastructure still generating wider economic benefit with significant evolution of regional structure. Wider economic impact of transport infrastructure is not captured by CBA which includes ‘returns to scale, agglomeration, thickening of labor markets and market power, as well firms and household behavior’ (Transport Research Centre et al., 2008). Therefore, developing country like Nepal, where transport and spatial structure are still in preliminary stage, can improve the project appraisal methodology with the consideration of wider economic benefit. Moreover, it can be considered country specific characteristics like, geography, geology, settlement pattern, population density, availability of natural resources etc. For example, Nepal has high potential for the production of hydroelectricity so it is better to invest on electricity based transport technology rather than fossil fuel.

4. ISSUES OF TRANSPORT AND ECONOMIC DEVELOPMENT IN NEPAL

As government of Nepal identified 15 sectors for the investment to graduate the country’s economic status from least developed to developing country by 2022, transport is one of them (GON, 2014a). However, transport is the prerequisite to all 14 sector’s enhancement.

Transport sector was excluded from the millennium development goal (MDG), whereas, poverty reduction was the targeted policy since 9th plan (1997/98-2001/02). The policy seems
appealing, however, without providing transport facilities, significant improvement in economic growth was not materialized. Large number of youths have been going for the foreign employment. To some extent, remittance mitigates some level of poverty (Acharya and Leon-Gonzalez, 2013), but rapid economic growth in the country becomes only as a dream. Most of the donor agencies focused directly on the hunger, health, women empowerment, child mortality, environment sustainability, community development. Such policy created large number of jobs for NGO activist. Most of the budget is allocated for the trainings and awareness program resulting no any significant contribution to the GDP growth.

4.1 Transport is the ‘Infrastructure’ of Infrastructures

Since Nepal has very low physical achievement in transport infrastructure, other infrastructures such as hydropower, urban development are lacking behind. Transport infrastructure is the prerequisite for most of the investment priority sector identified by national planning commission to be graduated from least developed country to developing country. Because without any ease in mobility of labor and capital the cost for other sector would be high and finally investment could not be materialized.

There is a necessity of ‘paradigm shift’ in policy making. (Mody, World Bank, 1997) demonstrated secretes of East-Asian miracle which is based on infrastructure development. It explains three features of successful investment decision and operation such as: “sustained and powerful government leadership, the nurturing of complex institutions, and adaptability to change”. As we discussed in previous section, without conducting any policy research, problems facing in allocation of resource is obvious. Therefore, sufficient investment in the research and development could be the basic level of approach. Planning and proper selection of suitable project and technology might be the primary action. Moreover, institutional capacity of public and private sector is the prerequisite for the rapid growth. Enhancement of domestic capacity for implementing the mega projects is another fundamental requirement for the infrastructure development.

4.2 Transport Investment

The East Asian miracles was guided by the huge investment in infrastructure particularly in transport infrastructure. Infrastructure investment in six East Asian countries rarely decreased below 4% of GDP and sometimes it reached up to 8% (Mody, World Bank, 1997). In recent years huge investment in transport infrastructure leads the double digit economic growth. For example: China has started to construct the high speed railway in 2007, the total length of HSR over 12,000 Kilometers and it is rapidly growing (World Bank 2014).

It appears in Nepal the budget allocation for Strategic Road Network (SRN) 1.2% of GDP in 2007/8 increased to 2.3% in 2011/12 (GON, 2013). But the capital budget expenditure rate is being much below than the allocation since decades. So real investment in transport sector is obviously in lower rate. Significant investment in transport sector with the development of the international capacity of private (contractor and consulting) and public sector might be the prerequisite for the rapid economic development.

4.3 Transport and Macroeconomic Impact

In Nepal, transport investment and development may have much significant bearing on macroeconomics situation than normally is the case. Nepal suffers a huge trade-deficit, large part of which is due to the import of petroleum products (Figure 5). Almost all of imported fossil fuel is used by transport sector. Transport investment for efficient route or low-carbon technology (such as
electric train or electric vehicle) would therefore can significantly decrease fuel import. Besides, transport investment can also contribute to kick start economic growth through so-called Keynesian multiplier effect provided that use of domestic factors is maximized in transport projects.

4.4 Development of Low-carbon Transport System

Figure 9 shows the graph of GDP versus CO2-emission kg/capita across the selected country over the world. Trend line reveals that the CO2 emission per capita and GDP per capita are strongly correlated (following a power function with exponent <1). We can see some oil consuming and oil producing countries like USA, Canada, Australia, UAE and Kuwait are above the trend line. Some Asian country like Japan, Korea, and Hong Kong are falls below the trend line. Moreover, some rapidly growing Asian countries like Thailand and Malaysia are above the trend line. Nepal lies at the bottom of trend line. In terms of per capita transport emission of CO2, Nepal accounts for a much lower figure than international comparison. As the pattern shows, different countries have different carbon emission path. Country like Nepal has to choose the alternative path.

Most importantly, as the transport system is yet to be developed, Nepal has a unique opportunity of adopting low-carbon transport system, such as electric railways. Government of Nepal has already embarked on building national network of electric railway. Since Nepal electricity generation is almost all from hydro power, there is real opportunity of developing zero-emission transport system in Nepal. With the development of low transport, Nepal can achieve
economic development in three ways. First one is it reduced the dependence on imported fossil fuel second it can use internal resources which creates employment and opportunity inside the country and finally Nepal can earn from carbon trade.

5. KEY STRATEGIC MEASURES

In order to address the issues discussed above following are listing of the key strategies. The strategies measures suggested below are likely to overcome the challenges and best utilize the opportunities.

5.1 Increase Transport Investment

To accelerate the economic growth, investment in transport infrastructure should be significantly increased. Nationwide transport network planning should be guided on the planned regional development vision. Current level of transport system is just for the minimum access, which needs to be upgraded for significant productivity and growth. With the consideration of reduction in travel time connecting between major cities through high speed railway would be an option for the agglomeration of economies. In addition, better connect to the local city with major urban hub, focus on sustainable mode like electric railways, trolley bus in local cities and provision of efficient and reliable public transport system should be a policy guidelines. Identifying mega projects for the investment such as high speed railway, metro rail in Kathmandu valley. To materialize all the vision, sufficient investment on research and development would be the primary requisite.

5.2 Integrated Transport System

The basic element of sustainable transport system is the best use of infrastructure and technology. For this it is important to make a sustainable transport policy and translate into achievable action plan with the efficient integration of infrastructure and services. For example, introduction of Kathmandu metro rail, more spaces might be available for the specific bicycle lane and pedestrian path, however, it demands rigorous research. As National Environmentally Sustainable Transport (EST) strategy for Nepal stated that the sustainable transport system might be achieved through the integration at the level of physical infrastructure (include land use and transport coordination), co-ordination between various modes and network, co-ordination between service and fare, regulatory integration with the environment of level playing field for the competition between modes and services (GON, 2014b) and finally current situation of so called syndicate of transport operators should break with win-win approach.

5.3 New Technology

Given the difficult terrain and complex geology, building transport infrastructure is a challenging task. For this, Nepal should look beyond the conventional approach and be open to adopt even high-end technology. Technology related to transport infrastructure or service operation is not so much difficult to own and adopt in Nepal given the good stock of trained technical manpower available now in Nepal. On the other hand, new technology such as railway or even High-Speed Rail (HSR) can directly contribute to low carbon transport, and also regional development effects. Another area is the use of intelligent transport system (ITS) for efficient and safe operation of road transport. Moreover, development of cable car in remote scattered and touristic important places could be a
technological option. Such technological options should be well examined and be adopted where possible.

5.4 Alternative source of funding and financing

Currently, the source of funding and financing is largely from annual budget allocation (government revenue) and ODA grants and loan. Recently, an alternative funding source has been created in the form of ‘Road Maintenance Fund’ under the Nepal road board (source of fund is a small fuel surcharge). Recent slump in the rate on fossil fuel, most of the government around the world immediately changed the decreased value into a fuel tax for the earmarking of infrastructure development fund. But in Nepal, Nepal Oil Corporation (NOC) has decreased the fuel price which negligibly reduced in the public transport fare. It can be certainly said that in future, the present sources alone would not be enough for required investment. Therefore other sources, such as private sector financing, value capture (through property tax or other means), additional fuel tax and vehicle tax for earmarked transport fund, should be explored.

5.5 Enhancing institutional capacity:

Finally, domestic capacity for planning, implementation and operation of transport facilities should be significantly improved. This includes capacity of government agencies, domestic consulting firms, domestic civil contractors, and academic institutions. Since decades, infrastructure sector has been facing the problem of underspending of the allocated budget, delay in construction and overrun the cost of completed project. Without improving the international capacity gap of public and private (Contractor and consultants), development vision might be only a dream. Strong incentive mechanism, and government policy like in the time of Seoul-Pusan expressway construction in Korea (Mody, World Bank, 1997) should provide for the development of internal capacity.

6. SUMMARY AND CONCLUSION

Ever since the planned development process was started in 1956, transport sector has been given prime importance in Nepal. With the conventional policy making process, and weak implementation capacity, Nepal government has set the target to upgrade the country status from least developed to developing by 2022. Meanwhile, recent devastating earthquake incurred heavy losses on lives and infrastructure. Although, many people lost their lives, this disaster gives an opportunity for the policy maker to materialize the vision of ‘New Nepal’ with the help of regional restructuring. With an objective of providing some valuable insights to the policy makers, this papers adopts a broad-brush approach to review the past efforts, establish the relevant theoretical linkage, identify current challenges and opportunities, and finally list out important strategies that would guide Nepal’s transport development towards a sustainable ends.

Transport development trend summarized the past policy initiatives since 1956 on the national planned document. But the physical achievements during planned period (1956-2013) were not materialized to the extent that planners envisioned in the planned documents. This might be due to the lack of implementable practical policy, lack of policy research and analysis, and institutional capacity for the implementation of projects. Current physical achievement of transport infrastructure is only for the basic access and many of the remote regions and villages are still far from the minimum access. Only 50 percentage of the national transport network are all weather quality and very few rural roads are functional during rainy season. Even the recent planning of two expressway projects and East-West railway project fail to address some strategic policy questions, and now there is growing realization for the urgent need of deeper policy analysis taking the long-
run dynamic impacts of major transport projects into consideration. In addition, new debate has been started to initiate for the regional restructuring after devastating earthquake. Furthermore, with the relevant theoretical literature review a linkage between theory and associated issues is established and useful policy implication for Nepal is drawn. It can be argued that, with the development of new smart cities with the identification of nationwide habitable places and connecting by efficient transport infrastructure with appropriate technology, rapid economic growth could be materialized.

Finally five key strategic measures are proposed in this paper for the development of sustainable transport system over the country, namely: increase in transport investment; development of integrated transport system; adoption of new transport technology; identifying alternative source of funding and financing; and enhancing the institutional capacity for the effective implementation. Most importantly, the paper highlights some of the agenda which can potentially serve as the cornerstone for sustainable transport system but have not yet been properly discussed at the policy making level. It is expected that the contents of this paper would serve as a useful reference for the transport policy makers in Nepal.

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