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ENVIRONMENTAL IMPACT ASSESSMENT OF KATHMANDU TERAI FAST-TRACK

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Abstract

Road transport is dominant necessity for the overall economic development of any nation. In case of Nepal, an easy access between the Capital City and Terai, the store-house of the country and is very necessary. To facilitate this promotion of an improved core road network, Government of Nepal has launched the Kathmandu Terai Fast Track Project. Many concerned personalities and sectors had considered this project to be number one in the list of seventeen projects of national pride declared by the government. The main objective of this study was to identify the impacts of proposed project implementation on physical, biological, socio-economic and cultural environment of the project area and propose mitigation measures to avoid or mitigate such impacts. Primary information collection and secondary data review was the source of data with cross sectional descriptive study design. Data was taken purposively in the project affected area. Length of 72.6 km fast track from Kathmandu – Lalitpur – Makawanpur and up to Nijgadh in Bara district to link with the East West Highway will be of four lanes with 50 m on each side. The project was proposed to have 96 bridges big or small; 1.6 km long tunnel will be built in Thingan of Makawanpur on public-private partnership. It had projected costs of more than NRs 250 million. The impacts on land use will be on about 30km of agricultural land, 43km of forests and about 3km of other land uses, bridges etc. in the main alignment. The impacts on human life will mainly be in villages near the alignment. There are 38 villages within about 50m of the main alignment. The project can be continued with minimum of environmental degradation by applying the mitigation measures. Nation has been investing a lot of resources. Upon the completion of the fast track, the distance and time to reach the capital city from Terai will come down to only 1.5 hours and will transform the capital, eastern Terai and the country as a whole. It is estimated that NRs 4.5 billion will be saved annually of the transport cost. Therefore, Kathmandu Terai Fast Track Project can be considered as the single most important prospect for the improvement of traffic conditions and the creation of a major economic impact in Nepal over the coming decade.

Key words: Environmental Impact Assessment, Kathmandu Terai Fast Track, Mitigation

Introduction

Environmental impact assessment is the systematic identification and evaluation of the impacts on the environment caused by a proposed project. Environmental Impact Assessment (EIA) must be made for all development projects. They are designed to be a constructive tool which ensures that the project does not give rise to problems affecting any aspect of the environment. They help to ensure that development improves the way of life for the people affected, without damaging the natural surroundings. Sometimes a degree of damage is inevitable. In this case an EIA should find ways of reducing or compensating for the damage (National Road Authority, 2008). This is by the use of mitigation measures. An application of Environmental Assessment (EA) Study is legally required prior to the implementation of the project (HMG, 1997).

At a Sub regional Expert Group meeting in 2004, the Government of Nepal (GoN) highlighted the construction of a high standard link from the Terai to Kathmandu as a priority project. To fulfil this purpose, Kathmandu Terai Fast Tack (KTFT) project has been launched by the Ministry of Physical Planning and Works (MPPW). The location of KTFT road will follow the route from Kathmandu to south along the Bagmati River to Malta to approach Thingan and cross in a tunnel to run through the southern valleys that form the catchments of the Bakiya River to Chhatiwan and on south to the EWH near Nijagadh . Road originates at Sano Khokana (1300 m) in Lalitpur district in the Valley and runs along the Bagmati River crossing it near to Naikbandi in Soukhel VDC. The next river crossing of the road is close to the confluence of Sheshnaryan Khola and Bagmati River. The road then passes through Danuwargaon of Dukuchhap VDC and crosses Bagmati River again at Simpanimukh Basti (elevation 1200masl) of Chhaimale VDC. The road passes through fertile agriculture land and settlements until this point (www. www.ktm2day.com, 2014). The main element of the KTFT involves the construction of about 72.6 km of new highway between Kathmandu and Nijgadh. A further 18.3 km of the East West Highway from Nijgadh to Pathlaiya will be widened from two to four lanes with some replacement and new bridges. In addition there will be 17.6 km long spur road from Hetauda to the new highway joining at Budune, near Shiripur in Makawanpur District. The preliminary design for the main KTFT carriageway will involve a combination of cuttings and embankments with several high bridges and one tunnel of 1.3 km in length (www.ekantipur.com, 2014). The present route from Kathmandu to the Terai (Pathlaiya) requires 5-6 hours travel using a roundabout route of about 260 km (www.ktm2day.com). The KTFT route is expected to shorten travel time to as little as 1.5 hours; saving around 150 km with considerable associated fuel savings from around NRs 250 for a motor cycle to over NRs 3000 for a heavy truck. Over 5,000 vehicles per day will travel most sections of the KTFT on most days soon after opening. This will result in fuel savings alone of NRs 1,500,000/day or upwards of NRs 4,500,000,000 per year (www.ktm2day.com, 2013). The KTFT project therefore has broad national and international importance.

Materials and Methods

Before the selection of project for Environmental Assessment study, different projects approved by different governmental offices were studied and finally Chhaimale Village Development Committee (VDC) section was selected. Water and soil samples from different localities were collected and analyzed at the laboratory of Environmental Science Department, Tri-Chandra Multiple campus. Chloride content, Carbonate & Bi-carbonate content and hardness of water sample and pH, alkalinity and Chloride content of soil sample were estimated.

Secondary data was reviewed to get the basic concepts about the Environmental Assessment Study and to generate secondary data on the physical, biological, socio-economic and cultural environment of the selected study area and baseline information was collect accordingly. Census report of Central Bureau of Statics (CBS), profile of Chhaimale VDC, and other published unpublished reports, photographs and maps of the project area were thoroughly reviewed to generate the secondary information about the study area. Household survey was carried out at the project affected VDC of the project area from 26 Bhadra, 2070 – 30 Bhadra, 2070. Different cultural sites that may be affected during the implementation of project were documented during the process. To get more and precise information about the project and the impacts of the project in various sectors, different officials at related offices were consulted. Impacts of the project on various aspects of the environment around the project area during construction phase and operation phase were analysed.

Result and discussion

Baseline information

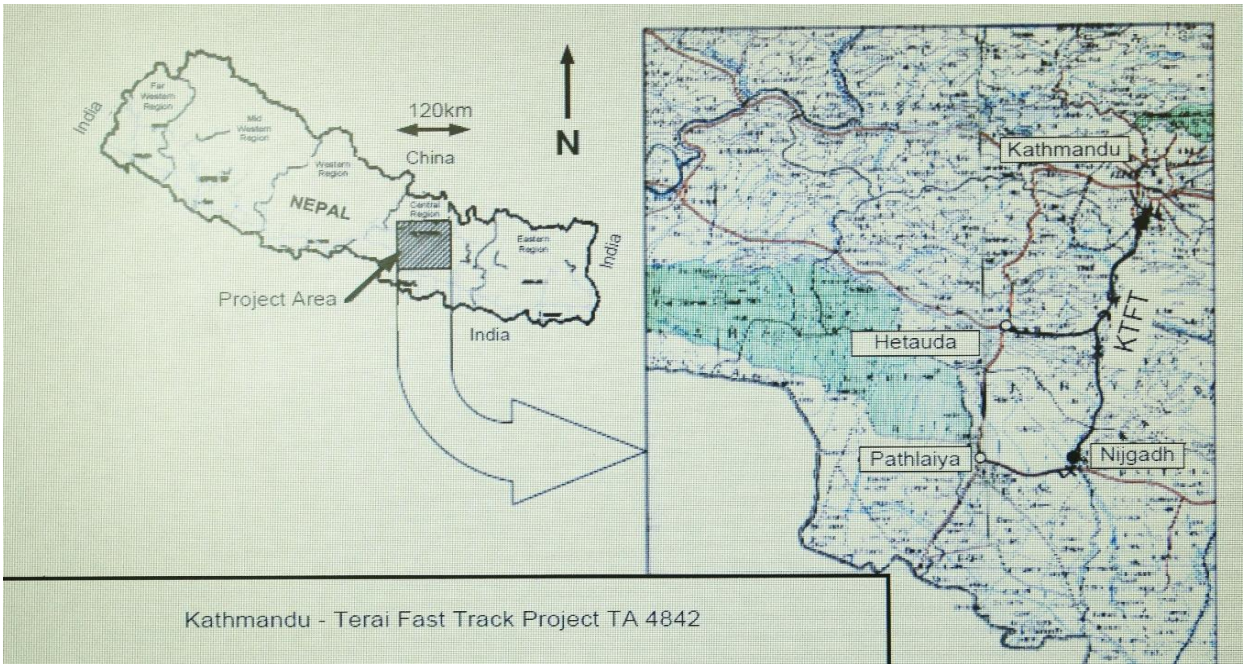

Figure1: Location of Kathmandu Terai Fast Track Project

Physical environment: At the time of study, it was monsoon season, and the climate of the area surrounding the fast track was moderate. The study area lies in the sub-tropical region and the temperate climate prevails here i.e. 1.1˚C – 31.5˚C (DDC profile, 2005). Precipitation in the form of hail, dew is minimum whereas precipitation in the form of snow occurs rarely. The annual rainfall in this area is 1640 mm. Temperature decreases in winter whereas summer season is characterized by fine weather with sunny days. Here, the wind movement is moderate less moisture content in the soil. There are various seasonal and perennial streams and rivers in the study area. The main river is Bagmati river which flows through the Kathmandu valley. Different seasonal springs (Khahare) serve as the part of drainage system in the study area. During rainy season the discharge of the rivers is high and cause flooding. Geologically the study area lies in the mid-hill region with rocky steps slope land structure. Sedimentary rocks like clay stone, sand stone, silt stone and igneous intrusive rocks were found. Just above the study area of Chhaimale VDC there was a stone quarrying site. The solid wastes are managed mostly by burning. People also throw some of the solid wastes from the slope towards Bagmati River without taking any prevention measure which may cause adverse environmental impacts. Food wastes are also fed to the livestock. Only few people make the compost of the biodegradable wastes which is later on used in agricultural land. Noise pollution was observed rare because there is not any big industry/factory running at this site which would produce large machinery sounds. There is stone quarrying process conducted at this area which produces some disturbing noise during the excavation activity but this site is quite far away from the residential area and has no any impact on residential area. Quality of air was generally good whereas source of air pollution is dust arising from ground or soil disturbance. In order to establish baseline water quality, samples were taken at several locations from Bagmati River and a spring nearby located at Chhaimale VDC, Ward no. 6. Water quality is analyzed by different parameters. Water samples consist of chloride (14.2 mg/L), DO (10.1 mg/L), BOD (48 mg/L), Hardness (144 mg/L), Alkalinity (10 mg/L), pH (7) and Temperature (19˚C) it is similar to the EIA of industrial development of Lumbini (IUCN, 2013). Water quality results indicate the polluted state of Bagmati River making its water unsuitable for drinking or irrigation purpose. Therefore special treatment on water is needed to make safe one (Table 1).

Table 1: Summary of Water Quality Analysis

Parameter	Sample value (Spring)	Comments	Sample Value (Bagmati)
Chloride	14.2 mg/L		-
DO	10.1 mg/L		0.85 mg/L
BOD	48 mg/L	Organically polluted	-
Hardness	144 mg/L	Hard Water	160 mg/L
Alkalinity	10 mg/L	Low alkalinity	18 mg/L
pH	7	Neutral	7.9
Temperature	19˚C		20˚C

For the quality of soil, samples were taken from a barren land adjacent to the track at Chhaimale VDC, Ward number six and were tested. Soil was immature, shallow and mostly contained inorganic materials (Table 2).

Table 2: Summary of Soil Quality Analysis

Parameter	Sample value	Comments
Carbonate	0	Low alkalinity
Bicarbonate	9.8 mg of HCO_3/100 gm	Little human influences
Chloride	35.5mg/100gm	Average salinization

Biological Environment: The forest existing in the project area includes community forests and national forest. There were 13 community forests and in the vicinity of the study area two community forests were observed (VDC Profile, 2014). Major plant species were noted during walk over survey was Bidens pilosa (Kuro), Ficus religiosa (Pipal), Pinus roxburghii (Chir Pine) etc. (Table 3) (IUCN, 2013).

Table 3: Species of Flora Noted in Walk-over Survey

S.N	Local Name	Common Name	Scientific Name
1	Dutch clover	Dutch clover	*Trifolium repens*
2	True grasses	True grasses	*Gramineae*
3	Kuro	Kuro	*Bidens pilosa*
4	Godpuchre	Horse tail	*Equisetum*
6	Pipal	Pipal	*Ficus religiosa*
7	Latte	Latte	*Amaranthus*
8	Salla	Chir Pine	*Pinus roxburghii*
9	Dubo	Cynodon	*Cynodon dactylon*
10	Chinkapin	(Katus)	*Chrysolepis*
11	Sisno	Nettle	*Utrica dioca*
12	GandheJhar	Chick weed	*Ageratum conyzoides*
13	MathoJhar	Umbrella-sedges	*Cyperus species*
14	Bakaino	Persian lilac	*Melia azedarach*
16	Kauliful	Cauliflower	*Brassica oleracea*
17	Uniyiu	Fern	*Pteridophyta*
19	Titepati	Titepati	*Artemisia vulgaris*
20	Aakashe Lahara	Aakasbeli	*Cuscuta reflexa*

The selected site was quite far from forest area, so habitat of wildlife species was not found at the study area. The total population of the VDC was 4787 with 2381 male and 2406 female in 929 families (VDC Profile, 2014). Distribution of ethnic/ caste group in the project area revealed higher proportion of Tamang with very less number of Brahmin, Gurung, and other castes whereas Nepal census report showed that Chhetri has the high proportion (Census, 2011). Most of the people in the study area were Buddhists followed by some Hindus. Educational status of the project area was found to be moderate with some primary and secondary schools (Census, 2011). It was found that people usually goes to Kathmandu and other adjacent cities for higher education. However, the situation of primary as well as secondary schools was observed to be poorly equipped with little infrastructure facilities (VDC Profile, 2014). Major occupation of the people in the area was found to be agriculture.

A considerable proportion of population had gone abroad for employment. Some members of most families were also engaged in government and private sectors. Major agricultural products were *Oryza sativa* (rice), *Zea mays* (maize), Triticum aestivum (wheat), *Solanum tuberosum* (potato), some vegetables, etc. While such crops were grown in subsistence level, fruits like Psidium Guajava (Naspati), Musa acuminate (Banana), *Choerospondias axillaris* (Lapsi), *Saccharum* (Sugarcane), etc were also found. Among them, Naspati was the major cash crop. People usually rely on the service provided by health-post present in the VDC. However, in case of more complex health problems, they went to Kathmandu. People having low income have no alternative other than visiting village level health-post. Beside these, some backward people still believe in traditional methods (Dhami, Jhakri) which was also shown in the study of problem of witch accusation in Nepal (Shah, 2009) and homemade herbal remedies. Solid waste was managed by burning, feeding to livestock, and converting to compost manure. People were aware about the use of toilets. More than 50% of people were found using traditional sources of energy such as fuel wood and agricultural residues for cooking. Every household was facilitated with electricity. Use of solar energy and other forms of renewable resources of energy was found below the expected level. Drinking water in the study area was mostly supplied through public taps that are piped from VDC controlled tanks. Some families also use water from natural sprouts. Availability of drinking water supply was reported not to be regular. Around the project area, each family holds some agricultural land and some non-agricultural land. Major livestock rearing in the study area were buffalo, cow, duck, chicken, goat, etc. Farmers were engaged in subsistence farming and so; do not spray pesticides unless affected by some diseases to plants. They also use chemical fertilizers along with green manure and compost manure in the field.

Impact Identification

In all developmental activities the implementation of the KTFT project was likely to bring various environmental impacts as a result of changes in the bio-physical and socio-economic environment. Some of beneficial impacts were large number of skilled, semi-skilled and unskilled human resource will be required during construction phase and depending upon the type and nature of skill, locally available workforce will be given employment priority. This will help to sustain livelihood for the locals to some extent. Land value will start to change soon after the construction starts. Various unstable slopes of the project area were stabilized during the construction work through the implementation of bio-engineering. As the part of the construction work, the banks of the river were embanked this will help to mitigate the river bank cutting, encroachment and erosion. Impact of these works will be medium significance, local and site specific and will be seen for the long period of time. The project will help to increase economic activities by introducing different income generating activities such as small scale industry, tea shops, etc. These impacts will be long term and people will be benefitted.

Whereas some adverse impacts were like drilling, quarrying, blasting and running of the construction equipment and machinery will lead to the pollution of the air by dust particles,

particularly in dry season. The movements of the vehicles during construction of roads, to some extent, can spread soil, dust and chemical particles into the atmosphere, which may affect human health, vegetation, and some wildlife visiting/passing the area. A significant proportion of the KTFT will run through forest land. Clearing of mass forests will expose the land for erosion and landslide. The stability of the slope may get decreased due to use of heavy equipment and machinery. The removal of the vegetation cover accelerates the rate of wind erosion and water induced erosion. During the construction phase the landslide and mass movement are likely to occur which may result in the change in the topography and landform of the area. Adjacent forests will be exploited for fuel wood and Non-Timber Forest Products (NTFP) (IUCN, 2013). This ultimately imposes its effect on the wildlife and other fauna of the forest. Rare, protected and endangered species available may get lost. Distribution of animals and their ecological balance may get affected. Construction of the road will fragment some forest land, which will affect the natural corridor for the movement of different wild life. The road alignment passes through the currently existing cultivated agricultural land. This road will destroy the agricultural land and turns it into barren area. Public/private properties have to be cleared for the construction. This would change a person to homeless which will increase insecurity. The excavated materials and the waste materials that are generated during the construction phase if not disposed in appropriate place creates different sorts of problems. Some of the waste generated may be of hazardous nature which may pollute the surrounding soil and water bodies. The disposed spoils may alter the natural drainage pattern. These problems are site specific in nature but may be of long term significance if not managed properly. Surface and ground water bodies in the project area will get contaminated with various chemicals used. This will alter the quality of water of the surface water bodies and ground water bodies. The effect will be direct short termed and site specific in nature. The heavy equipment used during the construction phase generates the noise and vibration which increases the level of noise pollution. Phenol compounds in the bitumen have a low odour threshold and extremely low concentrations can cause nuisances. Its spilling can cause pollution of soil and water and also health problems which is discussed in the study of social and environmental safeguard framework (Government of Nepal, 2008).

During the operational phase, costs associated with are expected to be reduced by the KTFT. Travel time will be reduced by approximately four hours and that will bring significant advantages. As soon as this new highway comes into operation, traffic pressure will significantly reduce in the existing route to Terai. It will reduce noise and air pollution. The KTFT is also anticipated to improve access to facilities and services such as health, educational facilities, markets, jobs and other public services. It is also expected that even the poorer people would have access to these services. Access to health services will be easier and time of travel will be reduced, and patients can more easily be taken to good hospitals in a shorter time and more comfortably. More Employment opportunities are expected because of business and trade. The development of planned and well managed urbanization in the project area will be helpful in controlling haphazard and concentrated urbanization. This road

will play a major role for the development of rural areas. The value of the land plots in the vicinity of the new road will increase. The present rural areas will be the easily accessible areas in the future. Products will be brought to a wider range of markets more quickly; especially important for the perishable products like fresh milk, fruits and vegetables.

Whereas adverse impact like**,** the number of vehicles will increase vehicle exhaust which will ultimately add up to the level of air pollution in the project area. Road safety may be affected as faster traffic will result from the new, smoother road surface. New settlements will be built around the project area. This will increase pressure on massive exploitation of adjacent forests. Alterations in topographic structures and land use patterns will bring about change in microclimatic condition of the project area. With the operation of the project, the water of the nearby rivers could get polluted due to the wastes discharged from human settlements. Clearing and encroachment of forest area leading to illegal poaching of wild animals may get accelerated due to easy access of road transportation. Distribution of wild fauna may get affected. Washing of vehicle on the aquatic bodies, leakage of lubricants near the water bodies will directly impose their impact on the aquatic life. The settlement of the people later on may not get confined to the vicinity on each side of the road. Such expansion of the settlement area beyond the integrated settlement area will create new sorts of environmental problems along with the destruction of agricultural land, forest or other open area.

Mitigation measures

A lot of environmental impacts during the construction and operation phase of the KTFT project were observed and analyzed. They range from the annoying to the critical level. Some of those problems can be mitigated and the project could be continued and operated with minimum damage to the existing environment.

At the phase of construction

The project should be planned with the intention to cause minimum of the impact as possible during the activities like drilling, quarrying, blasting and running of the construction equipment and machinery. Use of construction equipment and machinery in haphazard way may cause landslide and erosion. So the work should be carried out with detailed planning of bioengineering works. The leakage of the fuel and lubricants create various sorts of problem. If these fuel and lubricants are handled and used properly their leakage can be controlled. Mitigation will be required in the form of reinstatement on the bioengineered slopes and compensatory planting for the loss of private, government and community forests. Accidental Bitumen drums should be stored in a dedicated area, not scattered along the works and any small spills of bitumen or chemicals should be cleaned up immediately. The project should be passed through the area where minimum amount of forest area lost. No extra forest should be cut except at 50m width of the road. To decrease the pressure on local forest supply of fuel wood, fire wood can be minimized by using other alternative resources like Bio-gas plant, micro hydropower etc. To mitigate the effect of forest clearance, plantation should be done on both sides of the road. For the protection of wildlife, awareness raising training

should be conducted to the local people about the protection of the wildlife and their importance. Prohibition on the open storage and spillage of loose soil in and around the construction site, use of cover to the loaded trucks to prevent blowing of loose construction materials, covering of stock piled spoils, use of good quality fuel, adequate filter in the vehicle, etc. will help to reduce the air pollution in great extent. Ban the use of pressure horn, use of noise barrier in the work place, silencer on the vehicles & crushing plants, limitation in the use of explosive in the possible extent, etc. will minimize the noise pollution in the project area. Special attention should be given to provide job opportunities to the local people on the project based on their qualification. The health problems may arise due to the sanitation issues and pollution. The problem can change into epidemic within a certain period of time. Special attention should be given to health and sanitation issues in the labor camp. Whereas similar discussion was done for mitigation in Assessment of plans and projects significantly affecting Natura 2000 sites (European Commission, 2001). Different sorts of accidents may occur during the construction of the project. Special attention should be given to create fearless and secure workplace. In case of occurrence of accidents, treatment team with first aid and minor health service facility should be kept stand by in the project area. Use of child labor should be strictly prohibited. Illegal hunting and poaching should be controlled by strict enforcement of laws and monitoring. Community based mechanism could be used for this purpose.

At the phase of operational

Awareness of road safety should be raised among affected communities. Traffic safety measures such as warning signs, delineators and barriers should be installed. Also, road safety audits should be carried out and recommendation be implemented. The illegal cutting of trees should be controlled by strict enforcement of laws and by strict monitoring. Unmanaged way of settlement will create varieties of problems. Strict rules and regulations should be made and enforced to establish the planned and integrated settlement area. Proper mechanism should be used to manage the waste generated from increasing settlements. People should be trained and encouraged to use grey water for irrigation and in the kitchen garden and to use different techniques of solid waste management like composting, reuse and recycle. Building of septic tanks made compulsory would give significant positive results. Increasing demand of energy for various household and commercial purposes can be maintained by the use of alternative sources of energy. Bio-gas of moveable dome type, where energy is generated using the organic waste or the solar energy would be useful. Government should encourage those alternative sources of energy. Plantation of some selected plant species such as Asoka plant are found useful in absorbing noise and air pollutants and hence decreasing the level of pollution. Wastewater treatment plant and landfill site should be built on the project area to manage water pollution and solid waste problem. According to the rural energy policy of Nepal there was also mentioned as a similar policy for mitigating the impact (Rural Energy Policy, 2006). Government should provide the

micro loan to the affected poor people for the establishment of their own business for livelihood along with necessary training.

Conclusion

The environmental impacts from Kathmandu Terai Fast Track construction will mostly take place during construction stage but there are also some impacts for the operational stage (e.g. water quality, air quality and compensatory tree planting maintenance etc.) that must be addressed in the operational stage. Some other aspects of alignment must also be readdressed in the detailed design and construction stages. The KTFT construction impacts are likely to be broadly similar to most road projects but the steep unstable terrain, significant forest areas and numerous potential impacts to water resources in particular make thorough implementation of the environmental mitigation measures critical to the success of KTFT. The social impacts from KTFT that will take place during the construction phase will carry over to the operational stage and the mitigation of impacts will require monitoring throughout the first three years of operation. The proposed mitigation and management plans are practicable but require additional resources. The KTFT constructed and operated to four lane standard is a feasible and sustainable environmental option but thorough implementation of the EMAP and RAP is required throughout the KTFT construction and operation in order to minimize impacts to acceptable levels and to retain public support for the project.

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