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## RESEARCH ARTICLE

**DEVELOPING GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT OF KASHMIR UNDERPASS PROJECT IN FAISALABAD**

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## ARTICLE DETAILS

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## ABSTRACT

Road development projects are important as they provide economical, political and social benefits but delays can occur. EIA is conducted for every project as required by the Environmental Protection Act of 1997 and the Environmental Policy of Pakistan for the purpose of ensuring mitigation of environmental impacts due to project activities. The Kashmir Underpass project in Faisalabad is assigned to FDA, for the purpose of satisfying growing need of traffic load due to population increase in surrounding areas in newly developed societies. This research examines the different factors of project affecting the environment. Questionnaire approach was utilized to gain insights of environmental impacts due to the project. Results showed that 93% of respondents didn't know about EIA and why it is necessary. Respondents were facing impacts from dust particles, noise, traffic, business loss etc. These impacts were analyzed and guidelines were developed for EIA of Kashmir Underpass Project.

## KEYWORDS

Environmental impacts, Questionnaire, Survey, Mitigate, EIA guidelines.

## 1. INTRODUCTION

A road construction project is important as they result in the formation of the necessary road network, which has economic, political, and social benefits. Although road projects are important, they suffer from delays due to political, depletion of funds, or improper planning (Mahamid et al., 2013). Whenever new societies get developed in an area the population increase exponentially, which results in greater traffic load on road networks which were built according to previous needs. Upgradation of existing road networks is found to provide significant economic benefits along with some negative effects because of delays and mismanagement (Holvad and Preston, 2006).

Construction projects pose some environmental impacts. Pakistan is considered as a partly unsustainable country (Rassafi and Vaziri, 2005). EIA is an important part of a project as it assesses the environmental impacts of activity and also helps prepare mitigation plans for reducing the degradation of environmental aspects. Pakistan has followed the environmental legislation in the form of EIA (Pakistan Government, 2000). In Pakistan, EIA is disregarded in many projects and if it is conducted, the data collected is not precise and accurate. There are many reasons why EIA in Pakistan is not given importance (Saeed et al., 2012). As a whole, the EIA system is a little inaccurate in regards to implementation and institutional level (Nadeem and Hameed, 2011).

To mitigate and monitor environmental impacts, it is necessary to conduct EIA, with great detail in collection of different variables that directly or indirectly affect the environment. Those variables are found and classified according to guidelines of EIA. The EIA process can be listed in nine steps; preliminary activities, scoping, baseline study, environmental impact evaluation, mitigation measures, assessment of alternative measures, preparation of final document, decision-making, monitoring of Project Implementation and Its Environmental Impacts (Ahmad and Sammy, 1985). This was the objective of research, to identify, categorize and analyze factors affecting the environment when conducting a project and to propose mitigation and monitoring plan to further reduce impacts.

The Kashmir Underpass Project was assigned to Faisalabad Development Authority-FDA, which aims to direct and isolate the Canal Expressway from Kashmir Bridge, by constructing the underpass that goes through and under the Kashmir Bridge junction of Kashmir Road and Chak 208 road. The underpass will streamline the traffic flow through Canal Expressway on both sides and the perpendicular traffic coming from and towards either side of the Canal Expressway. Figure 1 illustrates the site map, alternative route being compromised by high traffic flow and construction site area. Figure 2 shows the projected map after Kashmir Underpass Project completion.

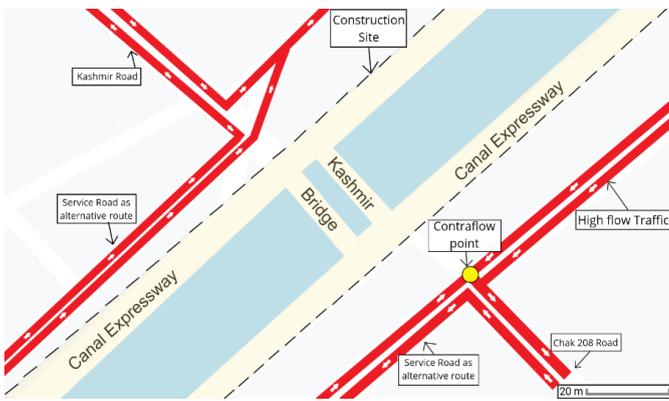
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**Figure 1:** Site map, alternative route for high traffic flow and construction site area



**Figure 2:** Projected map of Kashmir Underpass Project.

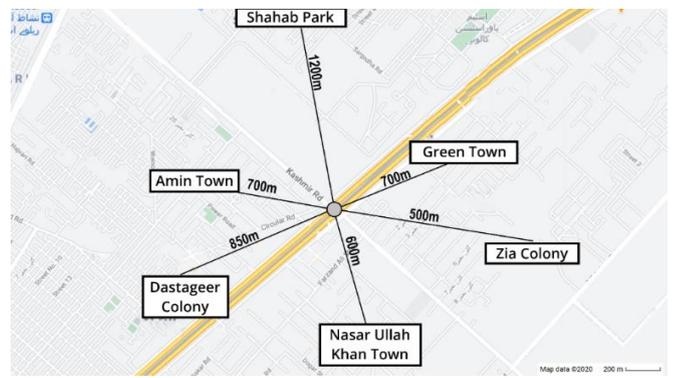
## 2. DESCRIPTION OF AREA

Lyallpur (Now known as Faisalabad) is located in central Punjab, at coordinates 31.45°N, 73.13°E, with an elevation of approximately 185m from sea level (Farooq and Gheewala, 2020; Cheema et al., 2006). Kashmir Bridge was a high load intersection bridge that connected Chak 208 road, Kashmir road, and both sides of Canal Expressway as shown in figure 3 (Bing maps, 2020). Due to the development of residencies, during the last couple of years in surrounding areas of Canal Expressway, the population increased and traffic load got exponential.



**Figure 3:** Pre-project construction Ariel view of Kashmir bridge.

As shown in figure 4, the distances between the construction site and residencies under the impact radius, which was found to be 1.5km. Due to daily traffic jams, locals were facing long waiting times, degrading of air due to difference in distance covered by vehicles, and engine running at still vehicles w.r.t. to time. The Kashmir Underpass Project was allotted to Faisalabad Development Authority (FDA) along with other departments in 2018, to satisfy the transportation needs for the area under consideration.



**Figure 4:** Distance between residencies under the impact radius and project site.

## 3. RESEARCH PLAN

A research plan is a strategy that involves logical steps with strong reasoning taking into account all the feasible factors related to the research topic.

### 3.1 Sampling

The target samples were residents and workers. The sample size was approximately 170 but the sample success rate was 88% so to keep the results more precise and relevant only 150 samples were considered. Of the total 150, there were 60 project workers and the remaining 90 were resident and employees/workers (shop-keepers, mechanic shops, roadside cafes, etc.)

### 3.2 Sampling process

The sampling data was collected randomly.

### 3.3 Objective stakeholders

The questionnaire receivers were mainly two groups locals and workers who were related to or affected by the Kashmir Underpass Project activities either directly and indirectly. The local group included both the residents and local workers. The project worker group included people on the managerial level and the labor force.

## 4. METHODOLOGY

### 4.1 Baseline Survey

A baseline study was carried out by doing surveys of the Kashmir bridge before and during the initial stages of construction and development of the underpass. The objective of the baseline survey was to assess the physical characteristics of the site which included traffic load, noise level, topography, potential impact radius, etc. Consultation with local expertise was utilized to keep the environmental records precise.

### 4.2 Site identification and selection

The site was already selected by FDA for the Kashmir underpass, Canal expressway road existing alongside the canal had to be converted into an underpass and integrating with the existing Kashmir bridge by rebuilding it, for smooth flow of perpendicular directional traffic. The Kashmir road, Chak 208 road, and Canal expressway will get connected through this underpass and bridge.

### 4.3 Questionnaire survey

The questionnaire approach was adopted for public consultation to find environmental and socio-economic impacts on the public and their awareness of these impacts. The sample group included locals in the vicinity of the site, which were predicted to be affected by the impacts being considered. The questionnaire was able to highlight some of the issues faced by the public.

#### 4.4 Screening

Screening involves the filtering of areas that are under impact and not under the impact of the main project into consideration. The Kashmir Underpass project is connecting three roads perpendicularly named Kashmir road, Chak 208 road, and Canal Expressway. The localities around these roads include commercial and residential blocks making the impact radius up to 1 km.

#### 4.5 Environment Impact identification

The environmental impacts due to construction and development projects include water pollution, soil erosion, deforestation, air pollution, noise pollution. The Kashmir Underpass Project impacts mainly deforestation along the green belt, air pollution due to airborne dust particles, and some percentage of construction machinery and noise pollution due to ongoing traffic and machinery.

#### 4.6 Environment Impact evaluation

There were no existing environmental impacts record, the environmental impact evaluation was conducted by using intensity factors such as low, moderate, high. The only measuring device was used for noise levels through an android application on a smartphone called 'Noise Capture'.

#### 4.7 Mitigation plan

Mitigation measures are steps taken to reduce the intensity of impacts on the environment. These measures are deduced according to the time frame of impact and budget required for mitigation. A mitigation plan is formed for Kashmir Underpass projects for the impact caused on the environment.

#### 4.8 Monitoring plan

After the completion of construction, impacted areas are selected and monitored for mitigation of their impacts caused by the project.

### 5. RESULTS AND DISCUSSION

The questionnaire approach aimed at the difficulties faced by the locals and workers, and the impact on environmental aspects due to project activities. To deeply understand the relationship between impacts and the project activities an analysis is discussed below.

#### 5.1 Respondents

There are two main types of respondents:

1. **Local people:** These include residents, commercial workers, and daily wagers. Most of the residents belonged to residencies under the impact radius of 1.5 km as shown in the figure. The daily wagers and commercial workers were shopkeepers, rickshaw drivers, and employees of roadside mechanic shops and cafes. The commercial block also includes shopping malls, food courts, and schools alongside the Canal Expressway as indicated in the figure.
2. **Project Workers:** These include the labour and managerial employees working on the project that are not native people.

#### 5.2 Health Impacts

The airborne dust particles float in the air due to soil excavation, drilling and other project activities. This caused some people respiratory and nuisance problems. The questions "Are you experiencing any issue due to airborne dust? Is the dust irritating and if yes then is it temporary? Are you facing any allergic reaction when passing near construction site?" Figure 5 shows that 50% of the locals deemed the airborne dust more in intensity during project than before project and they experienced temporary nuisance. The intensity of effects of dust ranged from slight nuisance to allergic reactions depending on the person's biological and immune system state. Locals experienced eye and throat irritation almost on daily basis when commuting through the site.

The construction environment is harsh on health of workers. The dust particles restrict respiratory function if exposed long enough (Johncy et al., 2011). Workers were asked question related to dust impacts and precautionary measure for the impact on health. "Are you experiencing any issue due to airborne dust? Why not using masks and PPE? What happens if you get sick due to excessive exposure to dust?" These were the question asked targeting the health issue and remedy measures against the impacts on health. The workers were more prone to the effects of dust for a longer duration, but no PPE provided to project workers. 60% of the workers deemed the airborne dust caused them temporary nuisance. Workers that were old seemed to be affected more. These workers had no life or health insurance. They were on their own in this regard. It is clear that the situation can be dealt simply by providing PPE to workers and applying wet sweeping.

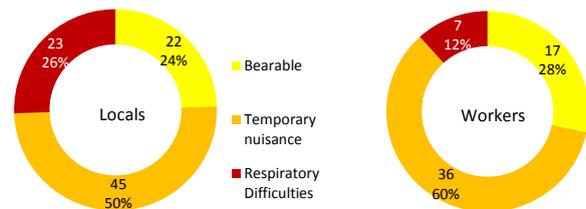


Figure 5: No. of peoples affected by Dust due to project activities w.r.t. locals vs workers.

Noise intensity was to be expected due to the heavy machinery but no noise PPE was provided to any project worker. Locals were asked "Is the noise too loud or unbearable? Do you only experience noise when near the site only or in your house/shop also? Do you experience pain or nuisance?" 45% of locals said that the noise is unbearable and causes nuisance. The impact is accentuated when people are stuck in traffic jam near the site. Although the effects were not temporary and the noise impact radius was under 330 m. The shop owners situated near site were the most affected as they experienced the noise more than residents.

Construction workers are exposed to high noise level most of their working time, but the noise impacts can be reduced through PPE and other techniques. (Fernández et al., 2009). Figure 6 shows that 73% of workers regarded the noise to be unbearable and causes nuisance after long exposure. Workers were asked "Does the noise causes nuisance? Is the noise being created throughout the working hours? Do you use any PPE?" They were not provided with the PPE, some workers were using cotton or earphones to hear less noise. Also, they stated that the noise depends on the construction phase and type of machinery being used. Some of the workers were accustomed to noise, as a result they tend hear low.

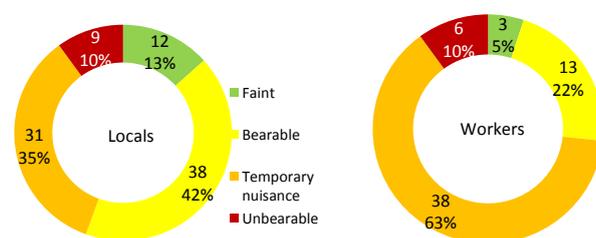


Figure 6: No. of peoples affected by Noise intensity due to project activities w.r.t. locals vs workers.

Locals were asked "Do you feel temperature increase due to construction activities? Is the effect only felt when near the site? What time of day the temperature impact is greater?" 88% of locals deemed the temperature increase or heat from project activities as bearable and temporary. The heat was most experienced around office and school timing due increased traffic load. According to a study, average maximum temperatures in Faisalabad ranged from 23 to 42.5°C from 1985 to 2016 (Arshad et al., 2017).

Workers were exposed to heat more than locals as they had to be on

construction site consistently. They were asked "Do you feel sick due to heat? Do you get rest time? Does exposure to heat depend on task assigned? Here again no PPE was provided to workers except some of them had construction jackets. Depending of intensity and heat release of a task workers did work in small shifts to offset the productivity decrease due to heat. Figure 7 shows that 22% of workers were facing declined productivity. The heat exposure to workers cause many health problems that result in decreased productivity, the temperature impacts can be reduced by providing rest hours and decreasing physical load (Butt, 2012).

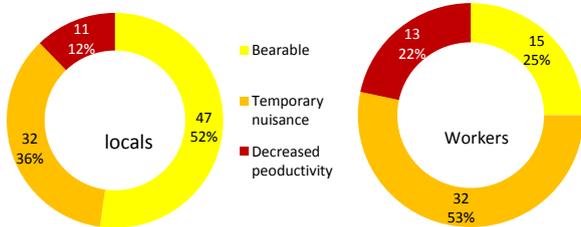


Figure 7: No. of peoples affected by heat release due to project activities w.r.t. local's vs workers.

5.3 Social Impacts

The social impacts were more intense than health impacts for locals. Due to construction activities, the road was constricted and the bridge was closed so the locals who had to commute on the other side of Canal Expressway had to go through the service road as an alternative route. That alternative route was already compromised due to high traffic load as shown in figure 1. The traffic jam would happen at around school and office timings at daily basis which resulted in chaotic situations, stress, delayed reach times etc.

Locals were asked "Do you commute through/near the construction site and if yes is it on daily basis? Does the traffic jam increase your travel time? At what time of day the traffic jam seems more intense? How much time did it took normally to get out of traffic jam?" These questions gave us some insights about the intensity, consistency and time range of traffic jams. The locals were most affected by it as they had to commute through the junction of traffic stress to access the main road i.e.; Canal Expressway.

The workers were asked same questions. They seemed to be less affected by traffic jams as their arrival and departure times from the site were after and before office timings respectively. They were able to provide more accurate information of time periods of traffic jams than locals as they were observing those near the site. Table 1 shows the traffic intensity w.r.t. time range. The data was formed by answers given from the locals and workers. The data was formulated on the basis of average intensity in working days of a week.

Traffic Intensity	Time
No	1 am to 5 am
Slight	6 am, 11 pm to 12 am
Normal	7 am, 10 am to 11 am, 3 pm to 4 pm, 10 pm
Moderate	12 pm, 5 pm, 9 pm
High load	9 am, 1 pm, 6 pm, 8 pm
Jam	8 am, 2 pm, 7 pm,

The other social impact was more impacting the local shops and businesses. The local shopkeepers and business personnel were asked "Did your business suffered due to ongoing project activities? Is the business going in loss or profit? What will the effect on your business after project is complete?" As shown in figure 8, majority of the business suffered loss. Figure shows that 73% of business were going into and 7% got shutdown. The reason for staying in loss and not shutting down was to sustain till the project is completed because Kashmir Underpass will streamline the transport that will bring customers that will result in boom in business. For most of the business men it was matter of resilience for the greater opportunity after project completion. 100% of the business owners were

certain about the booming of their business after completion of Kashmir underpass.

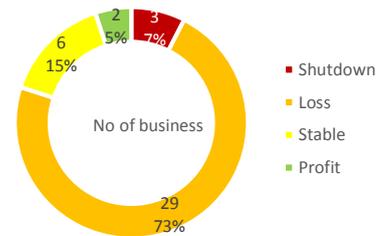


Figure 8: No of business w.r.t status

5.4 Environmental Impacts

The noise levels were measured by an android application called "Noise Capture" on a smartphone. The noise level was measured 15 days a month, according to the time range and the average reading was taken for 15 minutes. In table 2, the sound level range was calculated according to the average minimum noise level and average maximum noise level recorded in the sampling period.

Time / Day	Sound level (dBA)	Impact Severity
6 am - 9am	51-57	Bearable
9am - 12pm	64-72	Temporary nuisance
12pm -3pm	85-87	Unbearable
3pm - 6pm	84-86	Unbearable

The deforestation was done but not as aggressively as most of the projects happen. The major deforestation was done on some part of green belt between the Canal Expressway and the service road on both sides. Figure 9 shows the no. of people concerned about the deforestation. It is important to note that fewer project workers were concerned about deforestation. The reason is mainly that the workers weren't local to the area under consideration and it was not included in their duties as allocated by the supervisors and managers. The project managers assured us that after the construction completion the green belt will be rehabilitated.

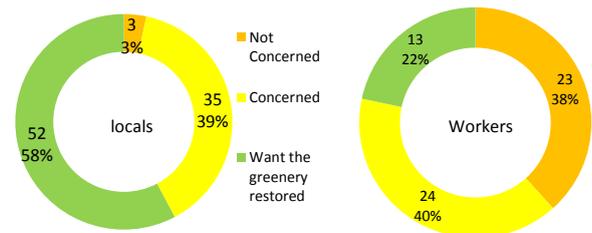


Figure 9: No. of people concerned about deforestation w.r.t. local vs workers.

The groundwater quality was not being affected by any project activities although there were water taps along the Canal road for drinking water that were removed for construction. Locals assured that groundwater quality was good enough for drinking a year ago but during the last two years many societies have been developed on farmlands and the only water source being used is groundwater through donkey pumps. There were no potential factors related to the project found for the degradation of groundwater. Some people pointed out the absence of a system to measure accountable water use that will result in degradation in groundwater quality as it is being used without check and balance.

5.5 EIA Awareness

According to figure 14, 94% of locals didn't knew about EIA and its importance. The 6% who knew about EIA, were Bachelor students. The students were familiar with the importance of EIA and they suggested that

EIA public awareness workshops should be conducted. As for the workers figure 15 shows that 5% of the workers which were managerial workers knew about EIA but they couldn't confirm that EIA for Kashmir Underpass Project was conducted or not.



**Figure 10:** No. of people concerned about deforestation w.r.t. local vs workers.

## 6. RECOMMENDATIONS AND MITIGATION MEASURES

The following measures are advocated to lower in all likelihood environmental and communal impacts:

- Allocation of walker overhead span in design;
- Public awareness plan should be developed for awareness of EIA;
- Alternative routes should be developed to offset high traffic load.
- Smattering of water in the constructing segment to manipulate dust;
- Dumping of stable waste and discharging of wastewater at the accredited sites;
- Preventing development work via height visitors flow especially in the opening and ending instances of mastering institutions;
- Taking moves like site visitors' signals, street markings, avenue illumination, site visitors' police pressure at distraction points, and utilization of boundaries to keep even site visitors present day and safety of avenue users.
- A EIA resubmission period should be assigned to control the Environmental aspects of a project.
- Cultivation of new flowers and bushes in the building duration to recompense viable thrashing of plant life and to control the air pollution, noise air pollution and dirt pollution; and
- Rehabilitation of damaged utility amenities on a major difficulty basis.

## 7. CONCLUSION

EIA is very important and necessary for any projects to determine its environmental impacts and to plan mitigation measures to reduce impact on environmental aspects. Although there no major degradation occurred due to project activities but there was a long-term effect of dust particle, noise, traffic load etc. Almost 94% of the workers and locals didn't knew about EIA. Those who knew about EIA were local student mainly linked to

engineering studies. The managerial employees were not sure if EIA had been done before for this project. There should some authoritative action for not conducting EIA and there should be a recheck schedule for ensuring the working and implementation of EIA and its mitigation measures. The guidelines provided before should be implemented.

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